The Journal of FINANCE
The Journal of THE AMERICAN FINANCE ASSOCIATION

THE JOURNAL OF FINANCE • VOL. LXXIX, NO. 1 • FEBRUARY 2024

Trading and Shareholder Democracy

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ABSTRACT

We study shareholder voting in a model in which trading affects the composition of the shareholder base. Trading and voting are complementary, which gives rise to self-fulfilling expectations about proposal acceptance and multiple equilibria. Prices and shareholder welfare can move in opposite directions, so the former may be an invalid proxy for the latter. Relaxing trading frictions can reduce welfare because it allows extreme shareholders to gain more weight in voting. Delegating decision-making to the board can help overcome collective action problems at the voting stage. We also analyze the role of index investors and social concerns of shareholders.

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DOI: 10.1111/jofi.13289

> "Shareholders express views by buying and selling shares; (…) The more shareholders govern, the more poorly the firms do in the marketplace. Shareholders' interests are protected not by voting, but by the market for stock (…)." (Easterbrook and Fischel, 1983, pp. 396–397)

IN MANY ADVANCED ECONOMIES, REGULATORY reforms and charter amendments have empowered shareholders and enhanced their voting rights in an effort to constrain managerial discretion.[1] As a result, shareholders not only elect directors, but frequently vote on executive compensation, corporate transactions, changes to the corporate charter, and social or environmental policies. This shift of power toward shareholder meetings assumes that shareholder voting increases shareholder welfare and firm valuations by aligning the preferences of those who make decisions with those for whom decisions are made—a form of "corporate democracy."[2] However, unlike the political setting, a key feature of the corporate setting is the existence of the market for shares, which allows investors to choose their ownership stakes based on their preferences and stock prices. Thus, who gets to vote on the firm's policies is fundamentally linked to voters' views on how the firm should be run. While the literature looks at many important questions in the context of shareholder voting, to date it has not examined the effectiveness of voting when the shareholder base forms endogenously through trading. The main goal of this paper is to examine the link between trading and voting and its implications for shareholder welfare.

Specifically, we study the relationship between trading and voting in a context in which shareholders differ in their attitudes toward proposals. We provide several key insights. First, trading aligns the shareholder base with the expected outcome, even if the expected outcome is not optimal. There can even be multiple equilibria, so that similar firms can end up having very different ownership structures and following very different strategic directions—a source of nonfundamental indeterminacy. Second, changes in a firm's governance environment can affect shareholder welfare and prices in opposite directions, which suggests that price reactions to voting outcomes may not be a valid empirical proxy for their welfare effects. Third, while relaxing trading frictions creates more gains from trade, it may nevertheless reduce welfare by allowing the shareholder base to become more extreme, so that the views of more extreme shareholders prevail over those with more moderate attitudes. We also provide insights on several actively debated governance issues, such

[1] Cremers and Sepe (2016) make the same observation and review the large legal literature on the subject (see also Hayden and Bodie (2008)). The finance literature has assembled a wealth of empirical evidence on this shift, including the discussion on the effectiveness of say-on-pay votes (surveyed by Ferri and Göx (2018)), reforms to disclose mutual fund votes in the United States (e.g., Davis and Kim (2007), Cvijanovic, Dasgupta, and Zachariadis (2016)), and the introduction of mandatory voting on some takeover proposals in the United Kingdom (Becht, Polo, and Rossi (2016)).

[2] See, for example, the speech by SEC Commissioner Aguilar, https://www.sec.gov/news/speech/2009/spch102909laa.htm.

as the role of index investors and the growing importance of environmental and social (E&S) proposals.

We consider a model in which a continuum of shareholders first trade their shares in a competitive market and then vote on a proposal. Each shareholder's valuation of the proposal depends on an uncertain common value that all shareholders share, but also on a private value that reflects shareholders' different attitudes toward the proposal. After shareholders trade but before they vote, they observe a signal on the common value of the proposal; the signal is public and there is no asymmetric information. Because of private values, some shareholders are biased toward the proposal and vote to accept it even if the common value is expected to be low; we refer to these shareholders as *activist* shareholders because they want to change the status quo. By contrast, other shareholders are biased against the proposal and have a higher bar for accepting it; we refer to these shareholders as *conservative* shareholders, since they are biased in favor of the status quo. We develop a generic model of heterogeneous preferences and show that it nests a range of specific applications. In particular, shareholders can differ in their time horizons, that is, they disagree about the choice between a long-term and a short-term investment strategy (e.g., in a proxy fight involving a short-termist dissident). They can also differ in their attitudes to a dividend payout if they have different tax rates, differ in their ability to extract private benefits, or differ in their E&S preferences.[3] Finally, our model also covers the case in which shareholders have different beliefs.

We start by analyzing the setting in which shareholders can trade but cannot vote, for example, if the decision on the proposal is taken by the board of directors. Shareholders differ in their views and, accordingly, in their valuation of the firm, which creates gains from trade. The equilibrium is unique and can be of two types: if the probability of proposal adoption is above a certain threshold, then activist shareholders value the firm more than conservative shareholders and buy shares from them; in the opposite case, conservatives buy and activists sell. Trading therefore allows matching between shareholders and firms. For example, if the proposal is to adopt a more short-term investment strategy but the board is expected to adopt the long-term strategy, shareholders with longer time horizons would buy shares, whereas those with shorter time horizons would disagree with the firm's strategy and sell.

[3] The literature documents these and other dimensions of heterogeneous preferences. Bushee (1998) and Gaspar, Massa, and Matos (2005) analyze the implications of differences in time horizons between investors. Desai and Jin (2011) study differences in shareholder tax characteristics, and Allen and Michaely (2003) review the literature on tax clienteles and payout policy. Private benefits have been attributed to specific interests that family shareholders or founders may have (Villalonga and Amit (2006), Mullins and Schoar (2016)). The literature also documents substantial variation in the voting behavior of mutual funds (e.g., Matvos and Ostrovsky (2010), Cvijanovic, Dasgupta, and Zachariadis (2016), He, Huang, and Zhao (2019)), and more recently also regarding E&S proposals (Michaely, Ordonez-Calafi, and Rubio (2021)). Bolton et al. (2020) and Bubb and Catan (2022) develop different classifications of shareholders' attitudes to corporate governance proposals. Hayden and Bodie (2008) provide a comprehensive overview of the sources of shareholder heterogeneity.

By contrast, if the decision on the proposal is made by a shareholder vote, then multiple equilibria can arise. An *activist* equilibrium, in which the proposal is accepted with a relatively high probability, can coexist with a *conservative* equilibrium, in which the proposal is likely to be rejected. Multiplicity arises because of a feedback loop between trading and voting: shareholders' trading decisions depend on expected voting outcomes, and voting outcomes depend on how trading changes the shareholder base. In the example with heterogeneous investor horizons, if shareholders expect a high likelihood that the short-termist proposal will be adopted, long-termist shareholders will sell to the short-termist shareholders. As a result, the shareholder base after trading will be more short-termist and approve the proposal more often, confirming ex ante expectations. Likewise, if the proposal is expected to be rejected, the post-trade shareholder base will be long-termist and tend to reject the proposal. The evidence is consistent with the existence of such a feedback loop (e.g., Cox, Mondino, and Thomas (2019), Li, Maug, and Schwartz-Ziv (2022), see Section VI for more details). Multiplicity of equilibria is especially likely when disagreement among shareholders is more extreme or when there are fewer trading frictions, which give rise to larger swings in the shareholder base. The resulting fundamental indeterminacy highlights potential empirical challenges in analyzing shareholder voting, since firms with the same fundamental characteristics can have different ownership structures and adopt different policies. In addition, it shows that outcomes can be inefficient, for example, shareholders may coordinate on the short-termist equilibrium even if the long-term investment strategy would lead to higher shareholder welfare.

We next explore prices and shareholder welfare, and show that they are different and can even move in opposite directions. We first note that the decision on the proposal depends on the identity of the median voter, that is, the investor with median preferences among those who hold shares post-trade.[4] The share price, however, depends on how the decision on the proposal affects the valuation of the marginal shareholder, who is just indifferent between buying and selling shares. The marginal shareholder is the least extreme among investors who hold shares post-trade and, in particular, is less extreme than the median voter. Hence, if the gap between the median voter and the marginal shareholder widens, the share price decreases. Finally, we show that shareholder welfare, which we define as the average valuation of the initial shareholders, depends on how the decision on the proposal affects the valuation of the average shareholder who holds shares after trading. If the gap between the median voter and the average post-trade shareholder widens, ex ante shareholder welfare declines.

The share price and shareholder welfare can react very differently to policy changes because the price is determined by the valuation of the marginal shareholder, whereas welfare is determined by the valuation of the average

[4] We adapt this label from the political science literature and note that we use the term in a generalized way. Specifically, the voter who agrees with the decision is at the median of all voters only under a simple majority rule, whereas our model features a general majority rule.

post-trade shareholder, who is more extreme. In particular, suppose that the median voter is located somewhere between the less extreme marginal shareholder and the more extreme average shareholder. Then, a governance change, such as a change in the majority requirement, shifts the median voter toward the average shareholder but farther away from the marginal shareholder, or the opposite. Hence, shareholder welfare increases when prices decrease, and vice versa. In the heterogeneous horizon example, suppose that the median voter is less short-termist than the average post-trade shareholder. Then, a reduction in the majority requirement, which lowers the bar for accepting the short-termist proposal and makes the decision more short-termist, benefits the average post-trade shareholder and thus increases welfare. However, it also hurts the marginal shareholder, who is the least short-termist of all post-trade shareholders, and thus reduces the share price. Moreover, in an extension of the model that adds a post-vote trading phase, we show that stock price reactions to voting outcomes and the corresponding welfare changes can move in opposite directions. We conclude that the price is not a good aggregator of shareholders' heterogeneous preferences. This result challenges the notion that there is a close connection between shareholder welfare and prices. It also casts doubt on the common interpretation of event studies, which are prevalent in empirical work on shareholder voting.[5]

Our analysis uncovers a novel effect of financial markets on shareholder welfare: in our model, relaxing trading frictions is not always beneficial for shareholders. This result is surprising because fewer frictions increase gains from trade and unequivocally increase shareholder welfare in the model without voting, for example, if decisions are made by the board. In the model with voting, this is no longer true because relaxing trading frictions may change the composition of the shareholder base and make the median voter more extreme. This may, in turn, widen the gap between the median voter and the average shareholder and thereby reduce welfare. In the example, proposals to implement short-term policies may now be much more likely to win, which benefits the most short-termist shareholders but may hurt more moderate investors who hold the firm after trading. In particular, it may hurt the marginal shareholder, thereby decreasing the share price and also hurting investors with longer horizons who sell their shares. Hence, rather than alleviating the shortcomings of the voting process, more trading opportunities in voting shares may actually exacerbate them. By highlighting this effect, our paper contributes to the literature on the real effects of financial markets (see Bond, Edmans, and Goldstein (2012) for a survey).

The above logic implies that voting generates an externality if shareholders can trade before they vote, with potentially negative implications for

[5] The divergence of shareholder welfare from the share price also emerges in the context of sales of control transactions (e.g., Bebchuk (1994)); due to private benefits of control, a controlling stake can be sold at a premium to the market price while imposing negative externalities on the welfare of minority shareholders. Bernhardt, Liu, and Marquez (2018) show that the combined acquirer-target return could be a poor proxy for the welfare consequences of mergers when shareholders have heterogeneous valuations.

shareholder welfare. We therefore ask whether shareholders would be better off if decisions were instead delegated to the board of directors. In this analysis, we abstract from other benefits of delegation (e.g., specialized knowledge) or costs of delegation (e.g., agency problems) to facilitate a more direct comparison with the voting process. We show that for delegation to increase the welfare of the initial shareholders relative to voting, the board must cater to the preferences of the post-trade shareholders rather than to those of the initial shareholders. In the example, even if the initial shareholder base includes many investors with long horizons, the board can improve on voting only if it is sufficiently short-termist and aligns its decisions with those of the more short-termist post-trade shareholders. Such a board also benefits investors with long horizons because they can now sell their shares for a higher price.

Overall, we strike a cautious note on the general movement to "shareholder democracy," since voting may lead to suboptimal outcomes when shareholders can trade. As such, we echo the critical stance of Easterbrook and Fischel (1983) in the opening vignette.

The paper proceeds as follows. Section I discusses related literature. Section II introduces the setup and presents several applications of the model. Section III characterizes the equilibrium. Section IV derives our main results. Section V considers several extensions, and Section VI summarizes the implications for empirical research. Finally, Section VII concludes.

I. Discussion of the Literature

Our paper is related to the theoretical literature on shareholder voting (e.g., Maug and Rydqvist (2009), Levit and Malenko (2011), Van Wesep (2014), Malenko and Malenko (2019), Bar-Isaac and Shapiro (2020), Cvijanovic, Groen-Xu, and Zachariadis (2020), Matsusaka and Shu (2021)). These papers all assume an exogenous shareholder base and discuss strategic interactions between shareholders based on heterogeneous information (building on the strategic voting literature, e.g., Austen-Smith and Banks (1996) and Feddersen and Pesendorfer (1996)), heterogeneous preferences, or both. Different from these papers, our analysis endogenizes the shareholder base by studying how the voting equilibrium changes if shareholders can trade in anticipation of voting outcomes. Musto and Yilmaz (2003) analyze how adding a financial market changes political voting outcomes. However, in their model, voters trade financial claims but not votes, which is different from the corporate context. Overall, our paper contributes to this literature by overcoming an important theoretical challenge when analyzing shareholder voting: shareholders' valuations and their trading decisions depend on expected voting outcomes, but voting outcomes depend, in turn, on the composition of the shareholder base, which is endogenous and changes through trading.

We are aware of three strands of literature that integrate the analysis of shareholder voting with trading. The first is the literature on general equilibrium economies with incomplete markets, which recognizes that shareholders with different preferences will be unanimous and production decisions can be separated from consumption decisions (Fisher separation) only if markets are complete and perfectly competitive.[6] With incomplete or imperfectly competitive markets, shareholders will generally disagree about the optimal production plans of the firm, since they are interested not only in profit maximization but also in the effect of firms' decisions on product prices (e.g., Kelsey and Milne (1996)). Conflicts of interest then arise, governance mechanisms become necessary, and the objective of the firm becomes undefined. The models in this literature introduce mechanisms such as voting, blockholders, or boards of directors to close this gap. Compared to this earlier literature, we analyze a less general model, which allows us to characterize equilibria beyond existence, analyze the way in which voting and trading interact, derive implications for shareholder welfare, and characterize delegation decisions and their properties. Meirowitz and Pi (2022) also study the interaction between trading and voting, but examine how shareholders' ability to trade *after* voting affects information aggregation, whereas we focus on the endogeneity of the shareholder base and the feedback loop between trading and voting. In contemporaneous work, Gollier and Pouget (2021) analyze trading before voting on E&S proposals and show that the choice of a responsible strategy by the firm is fragile in that it depends on investors' self-fulfilling beliefs, which is related to our result on multiple equilibria.

The second literature analyzes the issues that arise when financial markets allow traders to exercise voting rights without exposure to the firm's cash flows. Blair, Golbe, and Gerard (1989), Neeman and Orosel (2006), and Kalay and Pant (2010) show that vote-buying can enhance the efficiency of contests for corporate control, while Speit and Voss (2020) show that it can enable a hostile activist to destroy value. Brav and Mathews (2011) conclude that the implications of such empty voting for efficiency are ambiguous and depend on transaction costs and shareholders' ability to evaluate proposals. Esö, Hansen, and White (2014) argue that empty voting may improve information aggregation. The political science literature investigates vote-trading as a mechanism to address a limitation of standard voting rules, which fail to reflect the intensity of preferences; this limitation manifests in our model through the wedge between the median voter and the average post-trade shareholder (see Casella, Llorente-Saguer, and Palfrey (2012), Lalley and Weyl (2018), and references therein).[7] Our paper is complementary to the above papers, since we abstract from vote-trading and assume one-share-one-vote throughout.[8]

[6] See Gevers (1974), Drèze (1985), DeMarzo (1993), and Kelsey and Milne (1996) on incomplete markets and Demichelis and Ritzberger (2011) on imperfect competition. Hirshleifer (1966) shows that Fisher separation obtains in an intertemporal production economy with complete markets in a state-preference framework.

[7] The endogeneity of the voter base in our model also connects our paper to the literature on voter participation and voluntary voting (e.g., Palfrey and Rosenthal (1985), Krishna and Morgan (2011, 2012)) and to the literature on sorting based on voters' preferences for public goods (e.g., Tiebout (1956)).

[8] Burkart and Lee (2008) provide a survey of the theoretical literature on the one-share-one-vote structure.

The third literature analyzes blockholders who form large blocks endogenously through trading and affect governance through voice or exit (see Edmans (2014) and Edmans and Holderness (2017) for surveys). However, this literature does not focus on the complementarities and collective action problems that arise in our model, as the majority of this literature focuses on models with a single blockholder. Relative to existing governance models of multiple blockholders, our paper analyzes the feedback loop between voting and trading and how this affects the choice between delegation to a board and shareholder voting.[9],[10]

Our model also has similarities to models of takeovers (see Betton, Eckbo, and Thorburn (2008) for a survey): it features a stage in which shares change hands, followed by a stage in which a decision is made by the party in control. Different from models of takeovers, decisions are not dictated by a controlling shareholder but rather are determined by aggregating the preferences of a heterogenous shareholder base. However, as in models of tender offers (e.g., Grossman and Hart (1980)), coordination problems in trading prior to decision-making introduce inefficiencies and equilibrium multiplicity. The key to our analysis is the interaction between the inefficiencies in trading and the inefficiencies in voting.

Finally, our paper contributes to the literature on the allocation of control between shareholders and management (e.g., Burkart, Gromb, and Panunzi (1997), Harris and Raviv (2010), and Chakraborty and Yilmaz (2017)) by showing how the optimal balance of power depends on the firm's trading environment.

II. Model

In this section, we first introduce the general model. We then develop a number of examples and show how they map into this model.

Consider a firm with a continuum of measure one of risk-neutral shareholders. Each shareholder is endowed with $e > 0$ shares. Shareholders choose between two different policies by voting on a proposal; the baseline policy is implemented if the proposal is rejected ($d = 0$), while an alternative policy is implemented if it is accepted ($d = 1$).

Preferences. Shareholders' preferences over the two policies depend on a common value component and on shareholders' private values. The common value is determined by an unknown state $\theta \in \{-1, 1\}$: if $\theta = -1$ ($\theta = 1$), rejecting the proposal and implementing the baseline policy is value-increasing

[9] See Zwiebel (1995), Noe (2002), Edmans and Manso (2011), Dhillon and Rossetto (2015), and Brav, Dasgupta, and Mathews (2021).

[10] Garlappi, Giammarino, and Lazrak (2017, 2022) analyze group decision-making about investment projects and show how trade among group members may overcome inefficiencies from differences in beliefs. Kakhbod et al. (2023) study how shareholders with heterogeneous beliefs trade prior to communicating their views to management. These papers focus, respectively, on the dynamics of group decision-making and externalities in communication, and thus, do not feature the mechanisms and results that arise in our model.

(decreasing); conversely, if $\theta = 1$ ($\theta = -1$), accepting the proposal and implementing the alternative policy is value-increasing (decreasing). Thus, for the common value, it is critical that the policy matches the state, that is, that the proposal is accepted if and only if $\theta = 1$. Similar setups are employed in the strategic voting literature, for example, Austen-Smith and Banks (1996) and Feddersen and Pesendorfer (1996).

In addition to the common value component, shareholders have private values, which reflect the heterogeneity in their preferences. For brevity, we refer to these private values as biases and denote them by b. A shareholder with bias $b > 0$ ($b < 0$) receives additional (dis)utility if the proposal is accepted and the alternative policy is adopted, and experiences an additional loss (gain) if the proposal is rejected and the baseline policy is adopted. We assume that shareholders' private values are tied to their ownership in the firm. This assumption is key to our analysis and holds in a number of applications discussed in Section II.A.

In particular, suppose that the value of a share from the perspective of shareholder b is

$$v(d,\theta,b) = v_0 + (\theta + b)(d - \phi) = v_0 + \begin{cases} \phi(-\theta - b) & \text{if } d = 0, \\ (1-\phi)(\theta + b) & \text{if } d = 1, \end{cases} \tag{1}$$

where $v_0 \geq 0$ captures the part of the valuation that is not affected by the decision between the two policies and is sufficiently large to ensure that shareholder value is always nonnegative. In Section II.A of the Internet Appendix, we show that our main results are robust to a more general specification of preferences.[11]

Parameter $\phi \in [0, 1]$ captures the extent of shareholder disagreement about each of the policies. For intermediate values of ϕ (e.g., the symmetric case of $\phi = 0.5$), investors differ in their valuations of shares under both the baseline and the alternative policy, whereas for ϕ close to zero (one), investors disagree in their assessment of only the alternative (baseline) policy. Most of our results hold for any ϕ; we highlight the specific results for which this parameter plays a more important role below.

Because of private values, shareholders apply different hurdle rates for accepting the proposal. Specifically, a shareholder with bias b would like the proposal to be accepted if and only if his expectation of $\theta + b$ is positive. To facilitate the exposition, we refer to high (low) b shareholders as "activist" ("conservative") because a high b is associated with a bias against (toward) the status quo.

Suppose that the cross section of shareholders' biases b is given by a differentiable cumulative distribution function (cdf) G, which is publicly known and has full support with positive density g on $[-\overline{b}, \overline{b}]$. The cdf G describes the composition of the initial shareholder base regarding preferences for the proposal. The economic environment of the firm is in constant flux from changes

[11] The Internet Appendix is available in the online version of the article on *The Journal of Finance* website.

in regulation, technology, and consumer tastes, which warrant adaptations and new decisions. As such, the model captures a snapshot of the firm at the point in time when a new proposal is put on the agenda following some unexpected shock.

Timeline, trading, and information. The game has two stages: first trading and then voting. This timing allows us to focus on the endogeneity of the voter base, which is crucial for our analysis. At the outset, all shareholders are uninformed about the value of θ; they all have the same prior on its distribution, which we specify below. Trading then takes place. Short sales are not allowed. In the baseline model, shareholders can sell any number of shares up to their entire endowment e, buy any number of shares up to a fixed finite quantity $x > 0$, or not trade. The quantity x captures trading frictions or ownership restrictions, which limit shareholders' ability to build large positions in the firm.[12]

In equilibrium, the market must clear; we denote the market-clearing share price by p. We assume that shareholders do not trade if they are indifferent between trading at the market price p and not trading at all. This tie-breaking rule allows us to exclude equilibria that exist only in knife-edge cases and could be rationalized by adding arbitrarily small transaction costs.

After the market clears, but before voting takes place, all shareholders observe a public signal about the state θ. Let $q = \mathbb{E}[\theta|\textit{public signal}]$ be shareholders' posterior expectation of the state following the signal. For simplicity and ease of exposition, we assume that the public signal is q itself, and that q is distributed according to a differentiable cdf F with mean zero and full support with positive density f on $[-\Delta, \Delta]$, where $\Delta \in (0, 1)$. Thus, the ex ante expectation of θ is zero. The symmetry of the support of q around zero is not necessary for any of the main results. To simplify the exposition, it is useful to introduce

$$H(q) \equiv 1 - F(q). \tag{2}$$

At the second stage, after observing the public signal q, each shareholder votes the shares he owns after the trading stage based on his preferences and the realization of q. Shareholders vote either in favor of or against the proposal. Each share has one vote. If more than $\tau \in (0, 1)$ of all shares are cast in favor of the proposal, the proposal is accepted. Otherwise, the proposal is rejected. Parameter τ captures not only the statutory majority requirement, but also the

[12] Allowing for multiple rounds of trade prior to the vote would not change the properties of the equilibrium if we keep the same restriction on the aggregate number of shares that can be bought, x. In Sections II.B and II.C of the Internet Appendix, we allow shareholders' ability to trade x and endowment e to vary with their bias b, and we introduce partial sales of endowments by assuming that shareholders cannot sell more than $y < e$ shares. In Section V.A, we introduce index investors, who do not trade at all and only vote. Our main results continue to hold in all of these extensions. Finally, Levit, Malenko, and Maug (2023) study blockholders and the voting premium by analyzing a similar specification but without an upper limit on purchases of shares, in which a shareholder incurs a trading cost that is a quadratic function of the shares traded. Our main results would also obtain under this alternative specification.

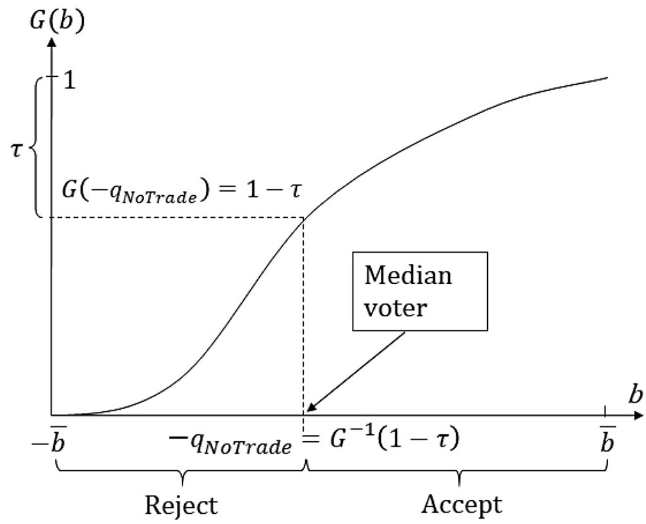

Figure 1. Equilibrium characterization of the no-trade benchmark. The figure plots function $G(b)$, which is the cdf of shareholders' biases at the voting stage in the no-trade benchmark. The x-axis shows the location of the median voter.

power of the CEO, the independence of the board, and shareholder rights: the combination of these factors determines how much effective power shareholder votes have to change corporate policies, especially for nonbinding proposals.[13]

This timeline aligns well with observed practice. In the model, trading determines the voter base, which puts the record date, that is, the date that determines who is eligible to vote, after the trading stage. This sequence of events applies to all votes on important issues such as mergers and acquisitions (M&As), proxy fights, special meetings, and high-profile shareholder proposals, which are known well ahead of the record date. If the record date were prior to the trading stage, then shareholders who sell their shares during trading could still vote—we do not analyze such "empty voting." We also assume that shareholders observe the signal q after the record date. Examples of such signals include proxy advisors' recommendations, which are released about one month after the record date on average (see Figure 1 in Li, Maug, and Schwartz-Ziv (2022)) as well as managements' responses to these recommendations.[14]

[13] Levit and Malenko (2011) show that voting on nonbinding proposals is effectively binding with an endogenously determined voting threshold that depends on the firm's governance characteristics. For binding proposals, there is heterogeneity across firms with respect to the statutory majority requirement used in shareholder voting. While a large fraction of firms use a simple majority rule, many firms still have supermajority voting for issues such as mergers or bylaw and charter amendments, and supermajority requirements are often a subject of debate (see Papadopoulos (2019) and Maug and Rydqvist (2009)).

[14] In Section V.C, we discuss an extension to a second round of trade after information is revealed. Our main results continue to hold.

Finally, we analyze subgame-perfect Nash equilibria in undominated strategies of the induced voting game. The restriction to undominated strategies is common in voting games, which typically impose the equivalent restriction that agents vote as if pivotal.[15] This restriction implies that shareholder b votes his shares in favor of the proposal if and only if

$$b + q > 0. \tag{3}$$

For simplicity, we assume that $\bar{b} < \Delta$, which implies that even the most extreme shareholders condition their vote on the signal.

A. Applications of the Model

As we note in the introduction, the evidence for preference heterogeneity is pervasive. In this section, we discuss several examples of heterogeneity that illustrate our general setup.

Heterogeneous time horizons. Differences in investors' horizons could lead investors to disagree over the choice between a short-term and a long-term investment strategy. Several types of important proposals can reflect such a choice. First, the firm could be going through a proxy contest in which the proposal is to approve the activist's board nominees, who advocate short-term projects such as selling part of the assets. Second, shareholders of the target firm may vote on a merger proposal and face a trade-off between selling the firm now for a large premium and keeping it independent, that is, waiting until its long-term potential realizes. Finally, the proposal could be related to governance practices, such as tying CEO compensation to the short-term stock price or removing antitakeover defenses (e.g., Stein (1988)). For simplicity, we focus on the proxy fight example.

Suppose that the activist is promoting a short-term project, which, if successful, will pay off at time t_S. In contrast, the incumbent is promoting a long-term project, which, if successful, will pay off at time $t_L > t_S$. Which of the two projects is successful depends on the unknown state. If the state is good, the short-term project is successful: it pays one per share at t_S and zero at t_L, whereas the long-term project pays zero in both periods. If the state is bad, the long-term project is successful: it pays zero at t_S and one per share at t_L, whereas the short-term project pays zero in both periods. All shareholders would like to choose the project that is successful (common value). However, shareholders have different horizons and a shareholder's bias b captures the relative weight he puts on time t_S versus time t_L cash flows.

We formally develop this application in Section III.A of the Internet Appendix. There we show that the valuation of a share by an investor b is given by the same expression (up to a constant) as in the baseline model.

[15] See, for example, Baron and Ferejohn (1989) and Austen-Smith and Banks (1996). This restriction helps rule out trivial equilibria, in which shareholders are indifferent between voting for and against since they are never pivotal.

This application also illustrates the intuition behind parameter ϕ, which is the probability of the state in which the long-term project is better. Hence, intermediate values of ϕ correspond to the case in which the state is uncertain and investors disagree over the valuation of shares under both policies.

Heterogeneous taxes. Our model can also accommodate differences in investors' tax rates. For example, suppose that the manager faces pressure from an activist to distribute a dividend I to shareholders. If shareholders support the activist's suggestion by voting for his slate of directors, shareholder b faces a dividend tax rate b, so he receives $I(1-b)$. If, instead, shareholders vote for the manager's proposed strategy, no dividend is paid, and I is reinvested in the firm. In this case, the payoff of all shareholders is the firm's liquidation value, which is denoted by θ and is unknown. We develop this application in Section III.B of the Internet Appendix.

Private benefits. Heterogeneous private values could also arise from private benefits of control. The baseline specification (1) then implies that the overall private benefits an investor extracts grow linearly with his stake. In general, however, the relationship between private benefits and ownership can be more nuanced. For example, an investor's ability to extract private benefits may not be linear in his stake and may even be discontinuous at some critical levels of ownership. In addition, an investor's incentives to extract private benefits may decrease with ownership if such extraction is inefficient. While some relationship between ownership and private values is necessary for our model, our results are consistent with other, nonlinear, forms of private benefits. To show this, we analyze a variation of the model in which an investor can extract private benefits only if his ownership stake is above some critical level; beyond that level, the investor's total private benefit remains fixed. See Section III.C of the Internet Appendix.

E&S preferences. Another application of the model is voting on an E&S proposal or in a proxy fight involving an environmentally conscious hedge fund activist.[16] For example, the baseline (alternative) policy could correspond to a "dirty" ("green") production technology, θ could reflect the effect of the two technologies on profits (common value), and a higher b could capture stronger environmental preferences. This example would correspond to intermediate values of ϕ because environmentally conscious investors are likely to derive extra utility (disutility) from the green (dirty) technology compared to investors who focus only on profit maximization, which creates disagreement on both alternatives subject to a vote. The fact that private values in our model increase with investors' ownership stakes would be consistent with growing evidence that the extent of investors' E&S preferences depends on their holdings. For example, Bonnefon et al. (2019) conclude that the behavior of participants in their experiment is "compatible with a utility model where nonpecuniary benefits of firms' externalities only accrue through stock ownership," that is, a

[16] The proxy fight at Exxon is a recent high-profile example. See "Activist Wins Exxon Board Seats After Questioning Oil Giant's Climate Strategy," *The Wall Street Journal*, May 26, 2021.

utility model like the one we adopt in our paper.[17] In Section V.B below, we capture a more general form of E&S preferences by assuming that the firm's policies affect investors' utility beyond their ownership in the firm.

Multidimensional preferences. Our model is stylized and represents shareholders' preferences by one parameter, b, which describes attitudes regarding only one proposal, whereas voting at shareholder meetings typically involves voting on multiple proposals. This raises the question of whether shareholders' attitudes to different proposals may be better represented by assuming multidimensional preferences. Some studies investigate this question empirically. Interestingly, shareholders' preferences seem to be correlated across proposals in such a way that it is possible to represent them by one or two factors (Bolton et al. (2020), Bubb and Catan (2022)). Hence, mapping shareholders' preferences on one dimension and analyzing only one representative proposal appear to be legitimate abstractions in view of these findings. Typically, one proposal dominates others on the meeting agenda and is perceived to be most important. Therefore, the variation in shareholders' preferences in our model can be interpreted with respect to the dominant item on the agenda.

Heterogeneous beliefs. Instead of heterogeneous preferences, the model can be recast in terms of heterogeneous beliefs. For example, suppose that shareholders have homogeneous preferences, so that (1) becomes $v(d, \theta) = v_0 + \theta(d - \phi)$. Suppose also that $\theta = \theta_1 + \theta_2$, where θ_1 and θ_2 are independent of each other. Shareholders receive no information about θ_1 but have heterogeneous prior beliefs about its distribution: shareholder b's prior expectation is $\mathbb{E}_b[\theta_1] = b$. In addition, all shareholders receive a public signal about θ_2 after trading and before voting, such that $q = \mathbb{E}[\theta_2|\text{ public signal}]$. In this model, shareholder b votes for the proposal if and only if $b + q > 0$, which coincides with (3). Section III.D of the Internet Appendix shows that our main results continue to hold. (The welfare analysis requires some adjustments, since models with heterogeneous beliefs lack objectively correct probability distributions.) Similarly, we obtain the same conclusion if we assume that shareholders interpret the same public signal differently and have heterogeneous posteriors instead of heterogeneous priors.

III. Analysis of Equilibrium

We solve the model by backward induction. Before analyzing the full model with trading and voting, we first analyze two benchmark cases to build intuition, namely, one in which shareholders vote but do not trade (Section III.A) and one in which they trade but do not vote (Section III.B).

We start by showing that, regardless of trading, proposal approval at the voting stage takes the form of a simple cutoff rule.

[17] The evidence in Hong and Kacperczyk (2009), Riedl and Smeets (2017), and Hartzmark and Sussman (2019) is also consistent with the hypothesis that investors' E&S preferences are tied to their ownership. Accordingly, several theory papers assume that the effect of a firm's E&S policies on investors' utility increases with their holdings (e.g., Baron (2007), Pástor, Stambaugh, and Taylor (2021), Pedersen, Fitzgibbons, and Pomorski (2021)).

LEMMA 1: *If the proposal is decided by a shareholder vote, then in any equilibrium, there exists q^* such that the proposal is approved by shareholders if and only if $q > q^*$.*

Intuitively, this result follows because all shareholders, regardless of their biases, value the proposal more if it is more likely to increase value, that is, if $\theta = 1$ is more likely.

A. Voting without Trading

To begin, we develop the benchmark case in which shareholders vote but do not trade. Lemma 1 also applies in this case. The shareholder base at the voting stage is characterized by the pre-trade distribution G, and the proposal is approved if and only if a fraction of at least τ of initial shareholders vote in favor. Since shareholders with a larger bias value the proposal more, it is approved if and only if the $(1-\tau)$th shareholder, who has a bias of $G^{-1}(1-\tau)$, votes for the proposal. Hence, the cutoff q^* is given by the expression in the following proposition.

PROPOSITION 1 (Voting without trading): *If the proposal is decided by a shareholder vote but shareholders do not trade, there always exists a unique equilibrium. In this equilibrium, the proposal is approved by shareholders if and only if $q > q_{NoTrade}$, where*

$$q_{NoTrade} \equiv -G^{-1}(1-\tau). \tag{4}$$

Figure 1 illustrates the equilibrium of Proposition 1 and plots the cdf G against the private values (biases) b. The shareholder with bias $b = -q_{NoTrade}$ is the *median voter*. The identity of this shareholder is crucial for the decision on the proposal because his vote always coincides with the voting outcome. If $q = q_{NoTrade}$, there are $G(-q_{NoTrade}) = 1-\tau$ shareholders for whom $b + q < 0$ who vote against ("Reject" region of the figure), and τ shareholders who vote in favor ("Accept" region). Thus, the median voter is the shareholder who is indifferent between accepting and rejecting the proposal if exactly τ shareholders vote to accept it.

B. Trading without Voting

Next, we consider the complementary benchmark case, in which we have trading without voting. In this case, trading occurs as in the general model, but after the public signal q is revealed, the decision on the proposal is exogenous. For concreteness, and to prepare for our later discussion of delegation in Section IV.D, we assume that the decision is made by the board of directors.[18]

[18] We can also think about this setting as a dual-class firm, in which a small number of insiders control the majority of the votes.

We abstract from collective decision-making within the board and treat it as one single agent who acts like a shareholder with bias $b_m \in [-\bar{b}, \bar{b}]$ and valuation $v(d, \theta, b_m)$, so that it approves the proposal if and only if $b_m + q > 0$. Motivated by Lemma 1, we cast the following discussion in terms of a general exogenous decision rule q^*; for the decision rule of the board, we have $q^* = -b_m$.

Denote by $v(b, q^*)$ the valuation of a shareholder with bias b prior to the realization of q as a function of the cutoff q^*. Then,

$$v(b, q^*) = \mathbb{E}\big[v(\mathbf{1}_{q>q^*}, \theta, b)\big], \tag{5}$$

where the indicator function $\mathbf{1}_{q>q^*}$ takes a value of 1 if $q > q^*$ and 0 otherwise, and $v(d, \theta, b)$ is defined by (1). Notice that $v(b, q^*)$ can be rewritten as

$$v(b, q^*) = v_0 + b\big(H(q^*) - \phi\big) + H(q^*)\mathbb{E}\big[\theta | q > q^*\big], \tag{6}$$

and that it increases in b if and only if the probability of proposal approval, $H(q^*) = \Pr[q > q^*]$, is greater than ϕ. In words, activist shareholders with a large bias toward the proposal value the firm more than do conservative shareholders with a small bias if and only if the proposal is sufficiently likely to be approved. At the trading stage, a shareholder optimally buys x shares if his valuation exceeds the market price, $v(b, q^*) > p$, sells his endowment of e shares if $v(b, q^*) < p$, and does not trade otherwise. These observations lead to the following result.

PROPOSITION 2 (Trading without voting): *There always exists a unique equilibrium of the game in which the proposal is decided by a board with decision rule q^*.*

(i) If $H(q^*) > \phi$, the equilibrium is "activist:" a shareholder with bias b buys x shares if $b > b_a$ and sells his entire endowment e if $b < b_a$, where

$$b_a \equiv G^{-1}(\delta) \tag{7}$$

and

$$\delta \equiv \frac{x}{x+e}. \tag{8}$$

The share price is given by $p = v(b_a, q^*)$.

(ii) If $H(q^*) < \phi$, the equilibrium is "conservative:" a shareholder with bias b buys x shares if $b < b_c$ and sells his entire endowment e if $b > b_c$, where

$$b_c \equiv G^{-1}(1-\delta). \tag{9}$$

The share price is given by $p = v(b_c, q^*)$.

(iii) If $H(q^*) = \phi$, no shareholder trades, and the price is $p = v_0 + \phi E[\theta | q > q^*]$.

In equilibrium, the firm is always owned by investors who value it most, which gives rise to two different types of equilibria. In part (i) of Proposition 2, the proposal is approved with a relatively high probability, $H(q^*) > \phi$, so activist shareholders value the firm more than conservatives. Hence, the equilibrium is "activist" in the sense that activist shareholders buy shares from conservatives, and the post-trade shareholder base has a high preference b for the proposal. In part (ii), the proposal is approved with a relatively low probability. Hence, the equilibrium is "conservative" in the sense that conservative shareholders buy from activists, creating a post-trade shareholder base that has a low preference b for the proposal. Overall, trading allows matching between firms and shareholders: Shareholders who like the firm's policies end up holding the firm, while other shareholders sell, so that the post-trade shareholder base becomes more homogeneous.

Parameter ϕ determines how high the likelihood of proposal approval must be for activists or for conservatives to have the highest valuation. For example, if ϕ takes intermediate values, shareholders disagree about the value of both the baseline and the alternative policies. Then, activist (conservative) shareholders have the highest valuation if and only if the likelihood of adopting the alternative policy is high (low) enough. In contrast, if ϕ is close to zero, shareholders agree about the baseline policy and disagree only about the alternative policy. Then shareholders who favor the alternative policy (i.e., activists) have the highest valuation for any positive probability that it is adopted.

In the activist (conservative) equilibrium, the market-clearing condition determines the "marginal shareholder" with bias b_a (b_c). For example, in the activist equilibrium, the $1 - G(b_a)$ more activist shareholders with $b > b_a$ buy x shares each, the $G(b_a)$ more conservative shareholders with $b < b_a$ sell e shares each, and the marginal shareholder b_a is indifferent between buying and selling given the market price. Hence, market-clearing requires $x(1 - G(b_a)) = eG(b_a)$, or $G(b_a) = \delta$ from (8), which gives the marginal shareholder b_a as in (7). Since $\delta = \frac{x}{x+e}$ measures the relative strength with which shareholders can buy shares, it captures shareholders' opportunities to trade. We refer to δ as market depth or simply as depth, and we refer to an increase in δ as relaxing trading frictions.

The equilibrium share price $p = v(b_a, q^*)$ is determined by the identity of the marginal shareholder and equals his valuation of the firm, which depends on the decision rule q^*. Any investor with $b \neq b_a$ values the firm differently from the marginal shareholder, so his valuation is either higher or lower than the market price, creating gains from trade. This equilibrium is illustrated in the left panel of Figure 2. The conservative equilibrium is derived similarly and is displayed in the right panel. In what follows, we ignore the knife-edge case (iii), in which $H(q^*) = \phi$ and no shareholder trades.[19]

The identity of the marginal shareholder depends on market depth, as summarized in the next result.

[19] In Section III.C, we show that when trade is allowed, this knife-edge equilibrium does not exist.

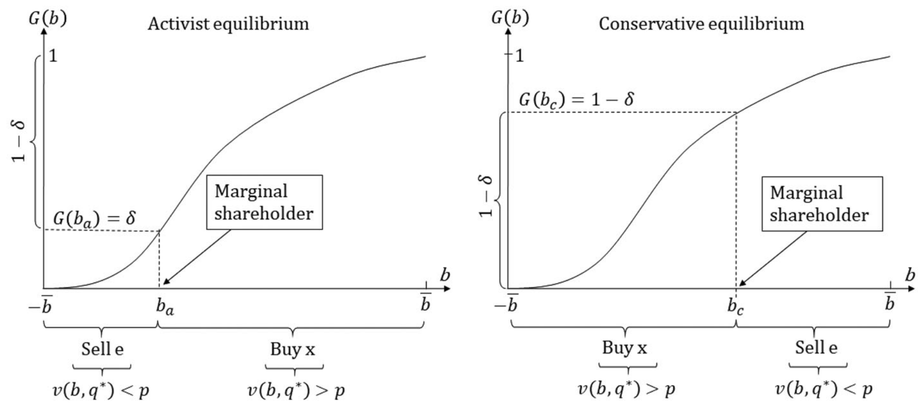

Figure 2. Equilibrium characterization of the no-vote benchmark. The two panels illustrate the two possible equilibria in the no-vote benchmark, when the proposal is approved based on an exogenous cutoff q^*. Each panel plots function $G(b)$, which is the cdf function of shareholders' biases pre-trade. The x-axis in each panel shows the location of the marginal shareholder (b_a and b_c, respectively). If the proposal is likely to be approved (q^* is small), the equilibrium is activist and is presented on the left. If the proposal is likely to be rejected (q^* is large), the equilibrium is conservative and is presented on the right.

COROLLARY 1: *The marginal shareholder becomes more extreme when market depth is higher, that is, b_a increases in δ and b_c decreases in δ. In addition, $b_c < b_a$ if and only if $\delta > 0.5$.*

Corollary 1 follows directly from expressions (7) and (9). To see this, notice that when depth δ is high, shareholders with the strongest preference for the likely outcome, that is, those with a large bias in the activist equilibrium and those with a small bias in the conservative equilibrium, have the highest willingness to pay and buy the maximum number of shares. We sometimes refer to these shareholders as "extremists." Other shareholders with more moderate views (i.e., $b \in (b_c, b_a)$) take advantage of this opportunity and sell their shares to shareholders with extreme views. In the limit, when there are no trading frictions ($\delta \to 1$), the firm is held by a single type of shareholder ($\bar{b}$ or $-\bar{b}$). In contrast, when market depth is low, only shareholders with the most extreme view *against* the likely outcome find it beneficial to sell their shares at a low price, while moderate shareholders (i.e., $b \in (b_a, b_c)$) always buy shares. This explains why the marginal shareholder in an activist equilibrium is more activist than in the conservative equilibrium if and only if depth is sufficiently high ($\delta > 0.5$).

Overall, if market depth is high, the post-trade ownership structure is dominated by extremists, who can translate their strong views on the proposal into large positions in the firm. In contrast, when depth is low, the post-trade shareholder base is relatively moderate and closer to the initial shareholder base. Below we show that this feature has significant implications for prices and welfare when the decision on the proposal is made by a shareholder vote.

C. Trading and Voting

We now analyze the general model, in which shareholders trade their shares, and those who own shares after the trading stage vote those shares at the voting stage. According to Lemma 1, the decision rule on the proposal takes the form of an endogenous cutoff q^*, and the proposal is approved if and only if $q > q^*$, that is, with probability $H(q^*)$. The value of the firm for shareholder b as a function of q^* is again given by (6). As in the no-vote benchmark, $v(b, q^*)$ is increasing in b if and only if $H(q^*) > \phi$. At the trading stage, a shareholder with bias b buys x shares if $v(b, q^*) > p$, sells his endowment of e shares if $v(b, q^*) < p$, and does not trade otherwise. However, different from the no-vote benchmark, the decision rule is now tightly linked to the trading outcome. In particular, the trading stage determines the composition of the shareholder base at the voting stage, which, in turn, determines the cutoff q^* and the probability that the proposal is approved. Therefore, there is a feedback loop between trading and voting: shareholders' trading decisions depend on expected voting outcomes, and voting outcomes depend on how trading changes the shareholder base.

The next result fully characterizes the equilibria of the game.

PROPOSITION 3 (Trading and voting): *An equilibrium of the game with trading and voting always exists.*

(i) An activist equilibrium exists if and only if $H(q_a) > \phi$, where

$$q_a \equiv -G^{-1}(1 - \tau(1 - \delta)). \tag{10}$$

In this equilibrium, a shareholder with bias b buys x shares if $b > b_a$ and sells his entire endowment e if $b < b_a$, where $b_a \equiv G^{-1}(\delta)$. The proposal is accepted if and only if $q > q_a$, and the share price is given by $p_a = v(b_a, q_a)$.

(ii) A conservative equilibrium exists if and only if $H(q_c) < \phi$, where

$$q_c \equiv -G^{-1}((1 - \delta)(1 - \tau)). \tag{11}$$

In this equilibrium, a shareholder with bias b buys x shares if $b < b_c$ and sells his entire endowment e if $b > b_c$, where $b_c = G^{-1}(1 - \delta)$. The proposal is accepted if and only if $q > q_c$, and the share price is given by $p_c = v(b_c, q_c)$.

(iii) Other equilibria do not exist.

Note that $q_c > q_a$: the cutoff for accepting the proposal is higher in the conservative equilibrium than in the activist equilibrium. Accordingly, the probability of accepting the proposal is higher in the activist equilibrium, that is, $H(q_a) > H(q_c)$. Figure 3 illustrates both equilibria and combines the respective elements from Figures 1 and 2.

The logic behind both equilibria is the same as in the no-vote benchmark in Proposition 2. In the activist equilibrium displayed in the left panel of Figure 3, the cutoff q_a is relatively low ($-q_a$, the bias of the median voter, is high) and the

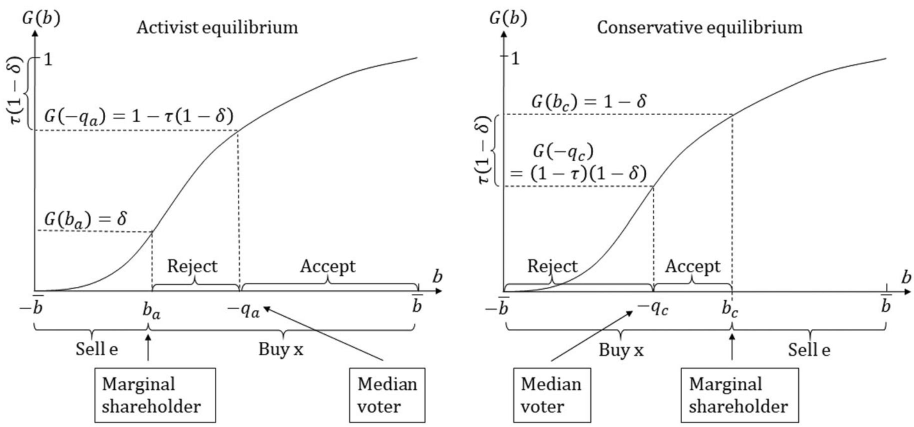

Figure 3. Equilibrium characterization of the model with trading and voting. The two panels illustrate the two possible equilibria in the model with trading and voting. In the activist (conservative) equilibrium, depicted on the left (right), the post-trade shareholder base has mass $1 - \delta$ and consists of shareholders with bias larger (smaller) than that of the marginal shareholder b_a (b_c). Each panel also plots the median voter ($-q_a$ in the activist equilibrium and $-q_c$ in the conservative equilibrium), who is more extreme than the marginal shareholder.

proposal is likely to be approved. Hence, the term $H(q_a) - \phi$ in (6) is positive, so conservative shareholders who are biased against the proposal, $b < b_a$, sell their endowment to shareholders who are biased toward the proposal, $b > b_a$. The marginal shareholder b_a is determined by the exact same market clearing condition described in Proposition 2. Hence, $1 - G(b_a) = 1 - \delta$ shareholders own the firm after trading, and of these, at least $\tau(1 - \delta)$ need to approve the proposal to satisfy the majority requirement, so that $1 - G(-q_a)$ shareholders vote in favor, with q_a defined by (10). Importantly, and different from the no-vote benchmark, the cutoff q_a is now *endogenously* low: the fact that the post-trade shareholder base consists of shareholders who are biased toward the proposal, $b > b_a$, implies that the post-trade shareholders will optimally vote in favor of the proposal unless their expectation q is sufficiently low to offset their bias. Hence, the expectations about the high likelihood of proposal approval become self-fulfilling. The conservative equilibrium displayed in the right panel of Figure 3 is constructed similarly.

Figure 3 also illustrates that the median voter is always more extreme than the marginal shareholder, that is, in the activist (conservative) equilibrium, the median voter is more activist (conservative) than the marginal shareholder: $-q_a > b_a$ ($-q_c < b_c$). These relationships follow from Proposition 3 and play an important role in the analysis of welfare and prices in Section IV.B.

Similar to Corollary 1, the marginal shareholder becomes more extreme as market depth increases. In addition, (10) and (11) imply that the median voter also becomes more extreme: $-q_a$ ($-q_c$) increases (decreases) in δ. The extreme to which the marginal shareholder and the median voter converge as market depth increases depends on the type of equilibrium.

COROLLARY 2: *The median voter becomes more extreme as market depth increases. In the activist (conservative) equilibrium, $-q_a$, increases in δ, and both $-q_a$ and b_a converge to $\overline{b}$ as $\delta \to 1$ ($-q_c$ decreases in δ, and both $-q_c$ and b_c converge to $-\overline{b}$ as $\delta \to 1$).*

Intuitively, when market depth is high, the post-trade shareholder base is dominated by extremists, and their more extreme preferences push the firm's decision-making to the extreme. Our analysis therefore uncovers a new effect of market depth on governance through voice.

D. Welfare

We conclude the analysis by characterizing shareholder welfare. We define shareholder welfare as the average welfare of all pre-trade (initial) shareholders, which, as shown in Lemma 2 below, also equals the average welfare of the post-trade shareholders. Specifically, in the activist equilibrium, the expected value of initial shareholders is

$$W_a = ep_a \Pr\left[b < b_a\right] + \mathbb{E}\left[(e+x)v\left(b, q_a\right) - xp_a | b > b_a\right] \Pr\left[b > b_a\right]. \tag{12}$$

Similarly, in the conservative equilibrium, the expected value of initial shareholders is

$$W_c = ep_c \Pr\left[b > b_c\right] + \mathbb{E}\left[(e+x)v\left(b, q_c\right) - xp_c | b < b_c\right] \Pr\left[b < b_c\right]. \tag{13}$$

In both expressions, the first term captures the value of shareholders who sell their endowment e, whereas the second term is the expected value of shareholders who buy shares: it equals the value of their post-trade stake in the firm minus the price paid for the additional shares acquired through trading. The welfare functions (12) and (13) can be motivated in one of two ways. First, they can be regarded as utilitarian social welfare functions, in which all shareholders of the firm have equal weights. Second, we could assess each shareholder's valuation from a prior position, for example, at the time of the IPO, such that they do not yet know their preferences b but they do know the cdf G. Then W_a and W_c would represent, respectively, the valuation and the objective of each individual shareholder.[20]

To simplify notation, we define

$$\beta_a \equiv \mathbb{E}\left[b | b > b_a\right] \text{ and } \beta_c \equiv \mathbb{E}\left[b | b < b_c\right], \tag{14}$$

which denote the average bias of the post-trade shareholder base for, respectively, the activist and the conservative equilibrium. The average bias of the

[20] Rawls (1971) (chapter 1) and Hayek (1976) (chapter 8) both endorse analyzing welfare from the perspective of such an initial position, in which each individual (here, shareholder) acts from behind a "veil of ignorance." In Section II.D of the Internet Appendix, we discuss why our results hold for arbitrary weights of shareholders in the welfare function, and why they hold if we define welfare as the valuation of the median, rather than average, initial shareholder.

post-trade shareholder base plays a critical role in the following welfare analysis. Indeed, while the share price is determined by the valuation of the *marginal* shareholder, the next result shows that shareholder welfare is determined by the valuation of the *average* post-trade shareholder.

LEMMA 2: *In any equilibrium, the expected welfare of the pre-trade shareholder base is equal to the valuation of the average post-trade shareholder. In particular,*

$$W_a = e \cdot v(\beta_a, q_a) \text{ and } W_c = e \cdot v(\beta_c, q_c). \tag{15}$$

Intuitively, market-clearing implies that all of the gains of the shareholders who sell shares are offset by the losses of the shareholders who buy shares. Since selling shareholders sell their entire endowment, their valuations are fully captured by the transfers from buying shareholders. Thus, the welfare of the pre-trade shareholder base equals the welfare of the shareholder base post-trade, that is, $\mathbb{E}[v(b, q_a)|b > b_a]$ in the activist equilibrium and $\mathbb{E}[v(b, q_c)|b < b_c]$ in the conservative equilibrium. The linearity of $v(b, q^*)$ in b, in turn, implies that the welfare of the shareholder base post-trade is equal to the valuation of the average post-trade shareholder.

Lemma 2 highlights that while shareholder welfare reflects the valuation of the average post-trade shareholder, the collective decision on the proposal is determined by the identity of the median voter. In general, the median voter is different from the average post-trade shareholder, which reflects the well-known fact that voting outcomes capture the ordering of voters' preferences but not the intensity of those preferences. This difference has important positive and normative implications, which we discuss below.

IV. Main Results

In this section, we discuss the implications of the model for shareholder welfare and prices. We do so by identifying the main frictions of the model and then showing how they interact.

The key friction in the model is the *trading friction*, which manifests via our assumption of limited market depth ($\delta < 1$): shareholders can purchase only up to x shares and can sell no more than their endowment e. This friction has three implications.

IMPLICATION 1: *The post-trade ownership base is inefficient: shares are not held by those who value them the most and thus potential gains from trade are not fully realized.*

IMPLICATION 2: *Preferences remain heterogeneous after trading, which gives rise to the voting friction: the median voter is different from the average shareholder.*

IMPLICATION 3: *Prices do not fully aggregate preferences, that is, the share price reflects the valuation of the marginal shareholder and not that of the average shareholder.*

We begin by analyzing what happens if we completely remove the trading friction and assume that $x \to \infty$ and $\delta \to 1$. Proposition 3 implies that if an activist (conservative) equilibrium exists for some $\delta < 1$, then it also exists if $\delta \to 1$. The next result shows that this activist (conservative) equilibrium without trading frictions always dominates the corresponding equilibrium with trading frictions.

PROPOSITION 4: *(No trading frictions): For any activist (conservative) equilibrium with trading frictions ($\delta < 1$), shareholder welfare and the share price are smaller than in the activist (conservative) equilibrium without trading frictions ($\delta \to 1$).*

In the limit, the shareholder with the most extreme preferences and the highest willingness to pay buys all of the shares, which removes the ownership friction (Implication 1). This shareholder then becomes the median voter, the average shareholder, and the marginal shareholder, thus also removing Implications 2 and 3.

In the remainder of this section, we explore how the trading friction and the three implications above influence share prices and shareholder welfare. Section IV.A shows conditions under which multiple equilibria, another source of coordination failure in our model, obtain. Section IV.B explores Implication 3 and shows conditions under which prices and welfare may move in opposite directions. Section IV.C analyzes the consequences of relaxing the trading friction. Section IV.D introduces the board of directors, which can overcome the voting friction.

A. Multiple Equilibria

The interaction between voting and trading creates self-fulfilling expectations: shareholders with a preference for the expected outcome buy shares, which, in turn, makes their preferred outcome more likely. The presence of self-fulfilling expectations suggests that the two equilibria—conservative and activist—can coexist.[21] Indeed, according to Proposition 3, both equilibria exist whenever

$$H(q_c) < \phi < H(q_a). \tag{16}$$

Classic examples of multiple equilibrium models in financial economics include Diamond and Dybvig (1983) on bank runs, Calvo (1988) on debt repudiation, and Obstfeld (1996) on currency crises. Unlike these models, in

[21] Multiple equilibria may also arise in voting if preferences are not single-peaked, which may lead to Condorcet cycles. In our model, preferences are single-peaked, so multiple equilibria arise for a very different reason. See Section II.A for a discussion of multidimensional preferences.

which different equilibria (e.g., with versus without a bank run) have different properties and policy implications, the activist and conservative equilibria in our model are mirror images of each other and have similar policy implications.

The multiplicity of equilibria can be interpreted as an additional source of volatility: if agents change expectations for exogenous reasons and therefore coordinate on a different equilibrium, then prices and voting outcomes may change without any change in the fundamentals of the firm. We thus treat multiple equilibria as a source of nonfundamental indeterminacy: the same proposal voted on at two firms with similar characteristics and fundamentals could have very different voting outcomes and valuation effects. This indeterminacy underscores potential empirical challenges in analyzing shareholder voting and could explain the mixed evidence on how voting on proposals affects shareholder value.[22] The next result highlights the factors that contribute to the multiplicity of equilibria.

PROPOSITION 5: *The conservative and the activist equilibria coexist if the market is liquid (sufficiently high δ), if the voting requirement is in an intermediate interval ($\tau \in (\underline{\tau}, \overline{\tau})$), if the heterogeneity of the initial shareholder base is not too small, and only if the expected voting outcome is critical for whether activists or conservatives value the firm more ($\phi \in (H(q_c), H(q_a))$).*

Intuitively, if depth δ is large, then the firm experiences large shifts in the shareholder base, and the direction of these shifts depends on the expected proposal outcome, so the interval in (16) in which the two equilibria coexist expands. Multiple equilibria are less likely if the governance structure requires very large or very small majorities to approve a decision, in which case an activist (conservative) equilibrium is unlikely to exist because approval (rejection) of the proposal requires almost all shareholders to vote in its favor (against). Since most firms have simple majority voting rules, the nonfundamental indeterminacy that we highlight seems important. The heterogeneity among shareholders (in the sense of a mean-preserving spread) cannot be too small either; otherwise, there are not enough shareholders with extreme views who can give rise to both types of equilibria. Finally, multiple equilibria are less likely for extreme values of ϕ. When ϕ is extreme, shareholders disagree about the value of only one of the policies (e.g., only about the alternative policy if $\phi = 0$). Shareholders who favor the policy over which there is disagreement (activists for $\phi = 0$) always have the highest valuation and buy shares, so equilibrium is unique. Intermediate values of ϕ imply that shareholders disagree about both policies, so who buys shares depends on the likelihood of proposal approval, and hence multiple equilibria arise.

[22] Karpoff (2001) surveys the earlier literature, and Yermack (2010) and Ferri and Göx (2018) review some of the later studies. Cuñat, Giné, and Guadalupe (2012) observe that "(…) the range of results in the existing literature varies widely, from negative effects of increased shareholder rights (…) to very large and positive effects on firm performance (…)" (pp. 1943–1944).

Multiplicity implies that shareholders may not always coordinate on the welfare-maximizing equilibrium.[23] Thus, shareholders may not achieve the first-best outcome, even absent any of the frictions in the model. To see this, suppose that both the activist and conservative equilibrium exist when $\delta \to 1$, that is, $H(-\bar{b}) > \phi > H(\bar{b})$, and that the activist equilibrium features higher welfare. Then shareholders may still coordinate on the conservative equilibrium, for example, if the status quo represents a focal equilibrium. Hence, removing both the trading friction and the voting friction does not assure the first-best outcome.

Moreover, with multiple equilibria, it is also not true that any equilibrium without trading frictions dominates any equilibrium with trading frictions. Again, suppose that shareholder welfare in the conservative equilibrium is lower than in the activist equilibrium for $\delta \to 1$. Then, by continuity, the conservative equilibrium without trading frictions has lower welfare than an activist equilibrium with trading frictions for δ smaller than but sufficiently close to one.

B. Divergence of Share Price and Shareholder Welfare

The literature in financial economics often draws a parallel between shareholder welfare and prices and uses stock returns to approximate the effects on shareholder welfare. This parallel is natural if shareholders have homogeneous preferences but may no longer be valid if they are heterogeneous. Accordingly, we compare the price and shareholder welfare at the same point in time and show that they can move in opposite directions in response to exogenous changes to the firm's governance structure.

Recall that the share price is the valuation of the marginal shareholder, and shareholder welfare is the valuation of the average post-trade shareholder. Importantly, both the price and welfare depend on the identity of the median voter, since it determines the firm's decision rule regarding the proposal. Before deriving the main result of this section, we analyze the conditions under which shareholder welfare and the price are maximized. For this purpose, we consider the following thought experiment: holding everything else equal, when does $v(b, q^*)$ obtain its maximum as a function of the median voter's bias $-q^*$? Expression (6) implies

$$\frac{\partial v\big(b, q^*\big)}{\partial q^*} > 0 \Leftrightarrow -q^* > b. \tag{17}$$

[23] Multiple potential sources in the economic environment may influence expectation formation about the voting outcome and hence equilibrium selection. For example, some shareholders may be more visible or have better access to the media, putting them in a position to influence the expectations of other shareholders. Proxy advisory firms may perform a similar function and may have an influence on voting outcomes by coordinating shareholders' expectations.

Therefore, the valuation $v(b, q^*)$ of a shareholder with bias b is maximized if $-q^* = b$, that is, if the choice of the shareholder coincides with that of the median voter.

Since in the activist equilibrium $p_a = v(b_a, q_a)$ and $W_a = e \cdot v(\beta_a, q_a)$, and in the conservative equilibrium $p_c = v(b_c, q_c)$ and $W_c = e \cdot v(\beta_c, q_c)$, this insight yields the following result, which plays a central role in the analysis below.

LEMMA 3:

(i) The share price obtains its maximum when the bias of the median voter equals the bias of the marginal shareholder (b_a in the activist equilibrium and b_c in the conservative equilibrium).
(ii) Shareholder welfare obtains its maximum when the bias of the median voter equals the bias of the average post-trade shareholder (β_a in the activist equilibrium and β_c in the conservative equilibrium).

By implication, the share price increases (decreases) if the median voter moves toward (away from) the position of the marginal shareholder.[24] Similarly, shareholder welfare increases (decreases) if the median voter moves toward (away from) the position of the average post-trade shareholder. The next result uses these insights to derive our main implication about the opposing price and welfare effects.

PROPOSITION 6: *Suppose that the median voter is less extreme than the average post-trade shareholder (i.e., $-q_a < \beta_a$ in the activist equilibrium and $-q_c > \beta_c$ in the conservative equilibrium), and consider a small exogenous change in parameters that affects the position of the median voter without affecting the marginal shareholder or the average post-trade shareholder. Then if such a change in parameters increases (decreases) the share price, it also necessarily decreases (increases) shareholder welfare.*

A change to the majority requirement τ is an example of a parameter change in our setting that affects the median voter without affecting the marginal shareholder or the average post-trade shareholder. Indeed, based on (10) and (11), an increase in τ makes the median voter more conservative (i.e., $-q_a$ and $-q_c$ decrease) because it requires more conservative shareholders to vote for the proposal for it to be approved. At the same time, τ has no effect on the marginal shareholder (b_a and b_c), and hence on the average post-trade shareholder (β_a and β_c). The next corollary follows directly from Proposition 6.

COROLLARY 3: *Suppose that the median voter is less extreme than the average post-trade shareholder. Then a small change in the majority requirement τ that increases (decreases) the share price necessarily decreases (increases) shareholder welfare.*

[24] In an empirical study of proxy contests, Listokin (2009) also observes the difference between the valuations of marginal shareholders, who set prices, and median voters, who determine voting outcomes, and concludes that median voters value management control more than marginal shareholders in his sample.

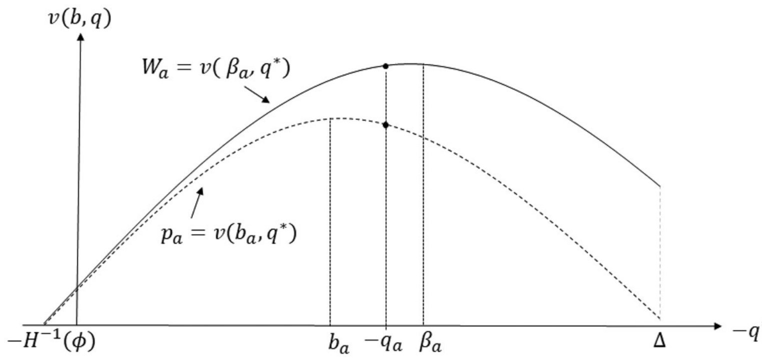

Figure 4. Opposing effects on shareholder welfare and prices in the activist equilibrium. The figure plots the share price p_a and shareholder welfare W_a as functions of the median voter $(-q^*)$ in the activist equilibrium. It shows that price (shareholder welfare) is maximized when the median voter coincides with the marginal shareholder b_a (the average post-trade shareholder β_a). The figure considers the case in which the equilibrium median voter $(-q_a)$ is located between b_a and β_a. The arrows illustrate that if a change in parameters makes the median voter less activist ($-q_a$ moves to the left) without changing the marginal and average shareholders b_a and β_a, then the share price increases whereas shareholder welfare decreases.

The intuition for Proposition 6 and Corollary 3 is explained with the help of Figure 4, which focuses on the activist equilibrium.

Figure 4 displays the share price and shareholder welfare for any given decision rule q^* as functions $p_a = v(b_a, q^*)$ and $W_a = v(\beta_a, q^*)$, respectively. From Lemma 3, shareholder welfare is maximized if the decision rule equals that of the average post-trade shareholder $-\beta_a$, whereas the price is maximized if the decision rule equals that of the marginal shareholder $-b_a$. The marginal shareholder benefits from an increase in τ since it makes the median voter more conservative, and thus, moves him closer to the marginal shareholder himself. This effect increases the stock price. However, if the median voter is more conservative than the average shareholder, then an increase in τ moves the median voter even further away from the average shareholder, which decreases welfare. Overall, if the median voter is located between the marginal shareholder and the average post-trade shareholder, then any change that moves the median closer to one of them also moves him farther from the other, as shown in Figure 4. As a result, prices and shareholder welfare move in opposite directions.

Proposition 6 and Corollary 3 follow from Implication 3: the price does not fully aggregate preferences because it reflects the valuation of the marginal shareholder and not that of the average post-trade shareholder. As long as there are some frictions in trading such that shareholders' post-trade preferences remain heterogeneous, this divergence of prices and welfare persists and, under the conditions discussed above, opposing effects on welfare and prices result.

The opposing effects are not unique to changes in the majority requirement. For example, in Sections V.A and V.B, we show that prices and shareholder welfare could react in opposite directions to changes in index investor ownership and the social concerns of shareholders, respectively. Moreover, in Section V.C, we analyze an extension with an additional round of trade post-voting, and show that the logic above also implies that price and welfare reactions to voting outcomes can have opposite signs.

Overall, Proposition 6 highlights a potential limitation to prices as a measure of shareholder welfare in the context of shareholder voting. By using prices as a proxy for shareholder welfare, the researcher may sometimes not only obtain a biased estimate of the real effect of the proposal, but even get the wrong sign of the effect. In Section VI, we discuss conditions under which the discrepancy between prices and shareholder welfare is less likely to exist.

C. Relaxing Trading Frictions Promotes Extreme Views

In this section, we show that relaxing the trading friction may aggravate the voting friction by giving more weight to shareholders with extreme views. We begin by isolating the effect of the trading friction and removing the voting friction from the model. In particular, we focus on the case in which decisions are made by a board with an exogenous decision rule q^*, as in the no-vote benchmark in Section III.B.

LEMMA 4: *Suppose that the proposal is decided by a board with decision rule q^*. Then, the equilibrium is constrained efficient, and shareholder welfare increases with market depth δ.*

Hence, in a model without voting, the equilibrium ownership structure gives the highest shareholder welfare subject to the trading friction, which limits the maximum number of shares an investor can accumulate to $e + x$. Relaxing this trading friction increases gains from trade and thus shareholder welfare (Implication 1). Therefore, without voting, the accumulation of shares in the hands of the more extreme shareholders has an unequivocally positive effect.

In contrast, when decisions are made by a shareholder vote instead, the concentration of ownership among the more extreme shareholders also makes the median voter $-q_a$ more extreme. This is detrimental to welfare if the average shareholder is more moderate than the median voter (i.e., if $\beta_a < -q_a$, then $W_a = v(\beta_a, q_a)$ decreases as $-q_a$ increases). Whether the positive effect of higher gains from trade or the negative effect from a more extreme median voter dominates depends on whether more trading mitigates or exacerbates the voting friction, that is, whether it narrows or widens the wedge between the average shareholder and the median voter. The next result shows that there are conditions under which the voting friction increases sufficiently to outweigh the gains from trade.

PROPOSITION 7: *Suppose that the proposal is decided by a shareholder vote and the median voter in the no-trade benchmark is more extreme than the* *average shareholder. If* $|H(q_{NoTrade}) - \phi|$ *is sufficiently small, then there exists* $\underline{\delta} > 0$ *such that shareholder welfare decreases with* δ *for* $\delta < \underline{\delta}$.

The wedge between the average post-trade shareholder and the median voter widens if the median voter is already more extreme than the average shareholder, and becomes more extreme at a faster rate as market depth increases. The term $|H(q_{NoTrade}) - \phi|$ measures the sensitivity of a shareholder's valuation to his bias, and if this sensitivity is small, the average shareholder's valuation does not increase much with δ. The reason δ cannot be too large for this effect to occur is that for large δ, both the median voter and the average shareholder converge to the most extreme shareholder, so the wedge between them shrinks to zero (see Proposition 4). Hence, completely removing the trading friction also removes the voting friction (Implication 2). However, the two frictions interact in such a way that relaxing but not completely removing the trading friction can actually exacerbate the voting friction, which happens under the conditions of Proposition 7. Put differently, the inability of voting to reflect the intensity of preferences can be exacerbated by trading when traded securities combine cash flow rights and voting rights. This conclusion is different from that in the political economy literature, which highlights that *separately* trading the voting rights can alleviate this limitation of standard voting rules (e.g., Casella, Llorente-Saguer, and Palfrey (2012)).

To further illustrate this point, we analyze a benchmark in which shareholders can coordinate at the voting stage, so that their decision maximizes post-trade shareholder welfare (see Section IV.A of the Internet Appendix). Such coordination helps overcome the collective action problem in voting—it removes the voting friction and the associated externalities, but keeps the decision rule endogenous to the shareholder base. We show that the new equilibrium is constrained efficient, and relaxing the trading friction is again beneficial for shareholder welfare, as in Lemma 4 and unlike in Proposition 7. Thus, the critical reason for the inefficiency that we uncover in Proposition 7 is that under voting, shareholders impose externalities on each other, not that the decision rule is endogenous to the composition of the shareholder base.

Proposition 7 reveals a new force through which financial markets have real effects. In our setting, financial markets do not aggregate or transmit investors' information to decision-makers. Instead, they allow extreme investors to accumulate large positions and then use their votes to implement their preferred decisions. This effect can be detrimental to ex ante shareholder value, both to shareholders who buy shares and to shareholders who sell. Intuitively, if more trade makes the median voter too extreme, then even shareholders who buy shares are worse off if their bias is moderate. Since the willingness to pay of these shareholders decreases, the price at which other shareholders sell their shares decreases as well. Thus, both shareholders who sell and the moderate shareholders who buy may be worse off if δ is higher. Only the most extreme shareholders are always better off if δ increases. In the proof of Proposition 7, we show that a similar logic may lead the share price to decrease with market depth.

D. Delegation

A long-standing and important debate in corporate governance asks when decisions should be delegated to the board of directors and when they should be determined by a shareholder vote. The answer is not obvious and hinges on trade-offs such as the benefits of board expertise versus costs from managerial agency problems. Our model abstracts from these issues and instead emphasizes a friction that may present a clear case for shareholder voting, namely, the aggregation of heterogeneous shareholder preferences. However, as the preceding analysis shows, the voting friction may lead to inefficiencies. Hence, it is legitimate to ask when delegation to a board is superior to preference aggregation through voting.

Reconsider the game from Section III.B in which the decision is made unilaterally by a board of directors with bias b_m and decision rule $q^* = -b_m$. We consider a board optimal if it maximizes shareholder welfare, that is, the average expected valuation of the initial shareholders as defined in Section III.D. Denote the bias of the optimal board by b_m^*. Note that Lemma 2 holds in this context as well, so the welfare of the initial shareholders equals the welfare of the post-trade shareholders. We ask whether the optimal board caters to the average initial shareholder $\mathbb{E}[b]$ and show that the answer is negative.

PROPOSITION 8: *The optimal board is always biased ($b_m^* \neq \mathbb{E}[b]$). Delegation to the optimal board is strictly beneficial unless the average post-trade shareholder coincides with the median voter in the voting equilibrium.*

Intuitively, the welfare of the initial shareholders equals the welfare of the post-trade shareholders, which is maximized by a biased board: from Lemma 3, the bias of the optimal board equals the average bias of *post-trade* shareholders (β_a or β_c). By catering to the preferences of these more extreme shareholders with a higher willingness to pay, such a board also benefits shareholders with more moderate views who sell their shares, since they can now sell for a higher price. Shareholders are strictly better off with delegation to an optimal board, except for the knife-edge case in which the voting equilibrium already yields the highest welfare, that is, if the average post-trade shareholder coincides with the median voter. And, given the continuity of the welfare function at b_m^*, the board does not have to be optimally biased to increase welfare relative to decision-making via voting—it just has to be good enough in the sense of being close to b_m^*. The reason is that the voting friction presents a sufficiently strong impediment to efficient preference aggregation. Hence, we conclude that the case for shareholder democracy is not clear-cut, even if we abstract from other benefits of delegation that are outside of our model, such as the board's informational advantage.

In Section I.D of the Internet Appendix, we analyze an extension of the model to further investigate how the trading friction interacts with the voting friction. We ask whether the initial shareholders would be willing to give up their right to vote and would delegate the decision on the proposal to the optimal board, that is, the board that maximizes shareholder welfare. We show that the optimal board cannot always garner support from the majority of the initial shareholders. The reason behind this collective action problem is short-term trading considerations. In particular, shareholders who expect to buy shares may support outcomes that are more extreme than they are, if such extreme outcomes substantially decrease the price at which other shareholders would sell shares to them. In other words, the failure of share prices to aggregate preferences efficiently (Implication 3) amplifies the voting friction and results in an inefficient outcome in the decision on delegation. Therefore, the fact that shareholders vote to retain decision rights for themselves does not imply that delegation to a board would not be optimal.

V. Extensions

In this section, we discuss several extensions of the model. The complete analysis of these extensions is in the Internet Appendix. We summarize the key conclusions here.

A. Index Investors

An important trend in recent decades has been the growth of passively managed index funds. For example, the Big-3 index fund families alone collectively cast about 25% of the votes at S&P 500 firms (Bebchuk and Hirst (2019)). Accordingly, there is an active academic and policy debate about their role for corporate governance.[25] Since index funds do not trade actively but do vote actively, our paper provides a natural setting to study their role for shareholder voting. In particular, it allows us to examine how changes in the trading friction for a subset of shareholders affect the voting friction.

In Section I.A of the Internet Appendix, we extend the model to two groups of investors: a fraction μ are indexers, which do not trade but do vote, and a fraction $1-\mu$ are actively trading investors, as in the baseline model. The distribution of biases across both investor groups is the same and given by cdf G. Because the marginal shareholder is determined by the relative demand and supply of nonindex shares, his identity is unaffected by the fraction of index investors. In contrast, since index investors participate in the vote, their presence affects the identity of the median voter: as index ownership μ increases, the median voter becomes less extreme, that is, less activist (conservative) in the activist (conservative) equilibrium. Intuitively, while the trading of nonindex investors aligns the shareholder base with the expected outcome and makes the median voter more extreme, the presence of index investors who do not trade has a moderating effect and makes the median voter less

[25] See, for example, "Vanguard, Trian and the problem with 'passive' index funds," *Forbes*, February 15, 2017. See also Appel, Gormley, and Keim (2016) and Heath et al. (2022).

extreme. This implies, in particular, that the equilibrium is unique if μ is sufficiently large, that is, the presence of index investors mitigates nonfundamental uncertainty.

We show that index ownership has a nonmonotonic effect on the share price. Intuitively, in our baseline model, the median voter is always more extreme than the marginal shareholder—for example, more activist in the activist equilibrium. Since the presence of index investors makes the median voter more conservative, it aligns decisions with the marginal shareholder's preferences and thereby increases the price. However, if index ownership is sufficiently large, the median voter becomes even more conservative than the marginal shareholder, and hence, an increase in index ownership widens the gap between them, which decreases the price.

In addition, we find support for our conclusion about the opposing price and welfare effects. In particular, we show that an increase in index ownership can have a positive effect on the share price but a negative effect on shareholder welfare. Intuitively, if the median voter is between the marginal shareholder and the average post-trade nonindex shareholder, an increase in index ownership makes the median voter more moderate and thus moves him closer to the marginal shareholder but farther from the average shareholder.

B. Social Concerns

E&S issues are becoming increasingly important for shareholders and gaining prominence in voting: about 30% of shareholder proposals in recent years are related to E&S issues (Bolton et al. (2020), Bubb and Catan (2022)). If a proposal has environmental or social implications, shareholders may care about it beyond its impact on the value of their shares. In Section I.B of the Internet Appendix, we analyze a variation of the model that accounts for such preferences: we assume that the preferences of a shareholder with bias b who trades $t \in [-e, x]$ shares and owns $e + t$ shares after trading are given by

$$(e+t)\big[v_0 + \big(\theta + b\big)\big(d - \phi\big)\big] + \gamma b d. \tag{18}$$

Parameter $\gamma \geq 0$ captures the weight shareholders assign to the proposal beyond their ownership in the firm, and thus measures shareholders' social concerns. The case $\gamma = 0$ is the baseline model.[26]

As in the existing literature (e.g., Hart and Zingales (2017)), our focus is on the implications of voting and trading on shareholder welfare, which here includes shareholders' concerns for the welfare of other stakeholders. The presence of shareholders' social concerns affects the welfare functions W_a and W_c, which now represent the valuation of investors with attitudes $\beta_a + (\gamma/e)\mathbb{E}[b]$ and $\beta_c + (\gamma/e)\mathbb{E}[b]$, respectively. Intuitively, because investors are now affected

[26] Note that we introduce a component of shareholders' preferences that is independent of their ownership (if $\gamma > 0$), but we do not allow for the extreme case in which preferences are completely independent of ownership.

by the proposal even if they sell their shares, the welfare function must put some weight on $\mathbb{E}[b]$, the average bias of the pre-trade shareholder base. However, and for the same reasons as in the baseline model, we show that our main results extend to this setting (e.g., opposing price and welfare effects, a biased optimal board, and shareholders' collective failure to delegate authority to the optimal board). Interestingly, new insights also emerge from this extension.

First, social concerns amplify shareholders' attitudes to the proposal: a shareholder votes in favor if and only if $q > -b(1 + (\gamma/e)(1 - \delta))$. Hence, conservative shareholders ($b < 0$) become even more conservative in that they apply an even higher hurdle toward accepting the proposal, whereas activist shareholders ($b > 0$) become even more activist. We show that this amplification makes multiple equilibria more likely, since larger social concerns reinforce the self-fulfilling property of voting outcomes. In addition, the amplification effect implies that the share price can be negatively affected by social concerns: since investors buy and sell shares to maximize their trading profits rather than to affect the voting outcome, social concerns make the median voter's preferences even more extreme, but they do not change the identity of the marginal shareholder. As a result, social concerns widen the gap between the marginal shareholder and the median voter, and thereby decrease the price.

C. Post-Vote Trading

The baseline model features one round of trade *prior* to the vote. In a further modification in Section I.C of the Internet Appendix, we introduce a second round of trade *after* the vote. The purpose of this extension is twofold: to show the robustness of our insights to a dynamic trading environment and to analyze the price and welfare reactions to the voting outcome.[27]

One question we explore is whether, for any given shareholder base, voting maximizes shareholder welfare if shareholders can trade after the vote. In other words, does post-vote trading remove the voting friction? The answer is no, for two reasons. First, shareholders who expect to sell their shares vote to maximize the share price, that is, the value of the marginal post-vote buyer, rather than the value of the average post-vote buyer. (This inefficiency is similar to Implication 3.) Second, the more extreme shareholders who expect to buy may vote for policies that hurt the more moderate buyers, and also hurt the sellers by decreasing the share price. As in Proposition 4, the only case in which voting maximizes welfare is when there is no trading friction, that is, shareholders can accumulate unlimited positions in post-vote trading.

Since the voting friction is not removed by the possibility of post-vote trading, our results continue to hold once we consider both pre- and post-vote trading. In particular, the pre-vote trading stage is similar to that in the baseline

[27] In the same section, we also discuss an alternative game in which the second round of trading occurs between the public signal and the vote. We show that the trading patterns are similar to those characterized by the extension in this section.

model, although additional trading now also takes place after the vote. Moreover, given two rounds of trade, we can analyze the price reaction to the vote. The anticipation of post-vote trading implies that the pre-vote share price is the expected post-vote price, that is, the expected valuation of the post-vote marginal shareholder. Thus, the price reaction to proposal approval is positive if and only if proposal approval benefits the post-vote marginal shareholder.

We show that the average price and welfare reactions to proposal approval can have opposite signs. The intuition is similar to the intuition for opposing price and welfare effects in Section IV.B. If the median voter is more activist than the post-vote marginal shareholder, then, on average, this marginal shareholder's valuation, and hence the share price, react negatively to proposal approval. In contrast, shareholder welfare can on average react positively to proposal approval if the median voter is less activist than the *average* shareholder after the post-vote trading stage. Overall, this extension further supports our conclusion in Section IV.B that price reactions may be imperfect proxies for welfare effects of shareholder votes.

VI. Implications for Empirical Research

In this section, we discuss the implications of our analysis for empirical research. These implications are most relevant for votes that are sufficiently important to affect shareholders' trading decisions. One prediction of our model is that we should expect an abnormal volume of trade and large turnover in the shareholder base before important votes. Cox, Mondino, and Thomas (2019) support this prediction. They find that targets in M&A deals experience substantial ownership changes after the deal is announced, and the extent of these ownership changes is positively associated with the likelihood that the deal later garners shareholder approval. The authors conclude that investors who buy shares prior to the vote would like the deal to go through and thus push for its completion by voting in favor, which is consistent with our model. Similarly, Li, Maug, and Schwartz-Ziv (2022) document a large increase in trading volume before and after shareholder votes, especially for important votes such as proxy contests or mergers. Their finding that shareholders whose vote was opposed to the voting outcome are more likely to reduce their holdings after the vote, and that this makes the shareholder base more homogeneous, is also consistent with our predictions from Section V.C, where we analyze an extension to a post-vote round of trading.

Our observation that shareholder welfare and share prices may move in opposite directions indicates an important limitation to conventional inferences from event studies of shareholder votes (see Section IV.B). We therefore ask under which conditions this discrepancy between prices and welfare is less likely and, accordingly, when the common interpretation of event studies of voting would be more appropriate. This discrepancy is likely to be smaller if the average post-trade shareholder is closer to the marginal shareholder, that is, if the post-trade shareholder base is less heterogeneous. This, in turn, is more likely when the firm's shares are sufficiently liquid: if there are few barriers to trade, post-trade ownership is more concentrated and homogeneous. Shareholder heterogeneity is also less likely for issues that involve a clear conflict between shareholders and management, rather than issues that typically cause disagreements among shareholders, such as E&S policies (e.g., Bolton et al. (2020)).

Building on the analysis in Section V.C, we can predict whether prices and welfare are likely to react in the same direction to the approval of a proposal based on the vote tally. Intuitively, overwhelming shareholder support of the proposal implies that both the marginal and the average shareholder likely voted in its favor, and hence benefited from its approval. In contrast, approval of the proposal for which the vote was close implies a significant level of shareholder disagreement, so the marginal and average shareholders are more likely to be affected by this outcome differently. Hence, event-study returns are less reliable as indicators of shareholder welfare when voting results are close. This conclusion and our results in Section V.C on opposing price and welfare reactions to voting outcomes hold even if the abnormal reaction is measured in a short interval around the voting outcome, in particular, if the pre-vote round of trade takes place after the record date, that is, after the allocation of votes is determined (see Section I.C of the Internet Appendix for details).

Finally, the prediction of multiple equilibria in Section IV.A is consistent with evidence on investor behavior, which shows that investors gravitate towards firms whose policies match their preferences, and that firms, in turn, implement the policies that match their investors' preferences.[28] Multiplicity implies that similar proposals in similar firms could have very different levels of shareholder support and valuation effects. Since this nonfundamental indeterminacy presents potential challenges in studying shareholder voting, it is worth discussing when it is more or less likely. As follows from the analysis in Sections IV.A, V.A, and V.B, nonfundamental indeterminacy is less likely in firms that have a large proportion of long-term, nontransient shareholders (e.g., firms with high index fund ownership, or with high insider ownership) and is more likely in firms with liquid shares, which can experience large swings in the shareholder base. Across proposals, nonfundamental indeterminacy is relatively more likely for proposals on E&S issues, both because they may affect investors' utility beyond their direct impact on their valuations, and because such proposals can create substantial heterogeneity in investors' preferences.

VII. Conclusion

In this paper, we study the effectiveness of shareholder voting in a context in which shareholders disagree about the value of the proposal and the

[28] See, for example, Desai and Jin (2011) in the context of dividend policies, Hartzmark and Sussman (2019), Ceccarelli, Ramelli, and Wagner (2019), Bolton et al. (2020), and Michaely, Ordonez-Calafi, and Rubio (2021) in the context of E&S policies, and Cox, Mondino, and Thomas (2019) in the context of M&As.

shareholder base forms endogenously through trading. We show that share prices do not aggregate shareholders' divergent views of firm value, and thus prices differ from shareholder welfare. As a consequence, changes in governance policies, variation in index fund ownership, or a strengthening of shareholders' social concerns may reduce the share price but increase shareholder welfare. Thus, when disagreements between shareholders are substantial, prices and price reactions may offer poor guidance to evaluate measures that affect shareholder welfare, especially for illiquid shares and close voting outcomes.

Another important conclusion of our analysis is that when shareholders can trade, shareholder voting may not lead to optimal outcomes. First, shareholders with extreme views can accumulate large positions and use their voting power to implement their preferred policies, which can be detrimental to moderate shareholders and to shareholder welfare. Second, the feedback loop between trading and voting gives rise to multiple equilibria, and there is no guarantee that shareholders can coordinate on the equilibrium that maximizes their welfare. Multiplicity is more likely if there are fewer trading frictions and disagreement among investors is large, which is exacerbated if investors also have social concerns, but it is less likely in the presence of index investors, who vote but do not trade.

Overall, our paper suggests caution in the move to more shareholder democracy. The parallelism to political democracy breaks down in one important respect: shareholders can trade, and trading may exacerbate, rather than alleviate, the collective action problems of the shareholder voting process.

Initial submission: January 21, 2021; Accepted: March 11, 2022
Editors: Stefan Nagel, Philip Bond, Amit Seru, and Wei Xiong

Appendix: Proofs

The appendix contains proofs of the main results. Proofs of the supplementary results and extensions are in the Internet Appendix.

PROOF OF LEMMA 1: Given the realization of q, a shareholder indexed by b votes his shares for the proposal if and only if $q > -b$. Denote the fraction of post-trade shares voted to approve the proposal by $\Lambda(q)$. Note that $\Lambda(q)$ is weakly increasing (everyone who votes "for" given a smaller q will also vote "for" given a larger q, and there might be a nonnegative mass of new shareholders who start voting "for"). If for the highest possible $q = \Delta$, we have $\Lambda(\Delta) \leq \tau$, then q^* in the statement of the lemma is equal to Δ (because the proposal is never approved). Similarly, if for the lowest possible $q = -\Delta$, we have $\Lambda(-\Delta) > \tau$, then q^* in the statement of the lemma is equal to $-\Delta$ (because the proposal is always approved). Finally, if $\Lambda(-\Delta) \leq \tau < \Lambda(\Delta)$, then there exists $q^* \in [-\Delta, \Delta)$ such that the fraction of votes voted in favor of the proposal is greater than τ if and only if $q > q^*$. Hence, the proposal is approved if and only if $q > q^*$. □

PROOF OF PROPOSITION 1: The proof is provided in the main text. □

PROOF OF PROPOSITION 2: We consider three cases. First, suppose $H(q^*) > \phi$. In this case, $v(b, q^*)$ increases in b, and a shareholder with bias b buys x shares if

$$v\big(b, q^*\big) > p \Leftrightarrow b > b_a \equiv \frac{p - v_0 - H(q^*)\mathbb{E}[\theta|q > q^*]}{H(q^*) - \phi}$$

and sells e shares if $v(b, q^*) < p$. Therefore, the total demand for shares is $D(p) = x\,\Pr[b > b_a]$ and the total supply of shares is $S(p) = e\,\Pr[b < b_a]$. The market clears if and only if $D(p) = S(p) \Leftrightarrow$

$$\Pr\big[b < b_a\big] = \frac{x}{x+e} = \delta \Leftrightarrow b_a = G^{-1}(\delta).$$

Since $\delta \in (0, 1)$, we have $b_a \in (-\bar{b}, \bar{b})$. The price that clears the market is the valuation of the marginal shareholder b_a, and therefore, $p = v(b_a, q^*)$, as required.

Second, suppose $H(q^*) < \phi$. In this case, $v(b, q^*)$ decreases in b, and a shareholder with bias b buys x shares if

$$v\big(b, q^*\big) > p \Leftrightarrow b < b_c \equiv \frac{p - v_0 - H(q^*)\mathbb{E}[\theta|q > q^*]}{H(q^*) - \phi}$$

and sells e shares if $v(b, q^*) < p$. Therefore, the total demand for shares is $D(p) = x\,\Pr[b < b_c]$ and the total supply of shares is $S(p) = e\,\Pr[b > b_c]$. The market clears if and only if $D(p) = S(p) \Leftrightarrow$

$$\Pr\big[b < b_c\big] = \frac{e}{x+e} = 1 - \delta \Leftrightarrow b_c = G^{-1}(1 - \delta).$$

Since $\delta \in (0, 1)$, we have $b_c \in (-\bar{b}, \bar{b})$. The price that clears the market is the valuation of the marginal shareholder b_c, and therefore $p = v(b_c, q^*)$, as required.

Finally, suppose $H(q^*) = \phi$. In this case, the expected value of each shareholder is

$$v\big(b, q^*\big) = v_0 + H\big(q^*\big)\mathbb{E}\big[\theta|q > q^*\big] = v_0 + \phi\mathbb{E}\big[\theta|q > q^*\big].$$

The market can clear only if $p = v_0 + \phi\mathbb{E}[\theta|q > q^*]$, since otherwise all shareholders would want to buy shares or all shareholders would want to sell their shares. Notice that shareholder value does not depend on b, and that market-clearing implies that all shareholders are indifferent between buying and selling shares. Based on the tie-breaking rule we adopt, shareholders will not trade. □

PROOF OF PROPOSITION 3: According to Lemma 1, any equilibrium is characterized by some cutoff q^* at the voting stage. We consider three cases.

First, suppose that $H(q^*) > \phi$ (activist equilibrium). The arguments in the proof of Proposition 2 can again be repeated word for word. In particular, the marginal shareholder is b_a as given by (7), and after the trading stage, the shareholder base consists entirely of shareholders with $b > b_a$. Consider a realization of q. If $q > -b_a$, the proposal is accepted ($b > b_a > -q$ for all shareholders of the firm). If $q < -b_a$, then shareholders who vote in favor are those with $b \in (-q, \overline{b}]$ out of $b \in (b_a, \overline{b}]$, which gives a fraction of $\Pr[-q < b|b_a < b]$ affirmative votes. Hence, the proposal is accepted if and only if either (i) $q > -b_a$ or (ii) $q < -b_a$ and $\Pr[-q < b|b_a < b] > \tau$, where the condition in (i) is equivalent to $q > -G^{-1}(\delta)$, and the conditions in (ii) are together equivalent to

$$\Pr\left[-q < b|b_a < b, q < -b_a\right] > \tau \Leftrightarrow 1 - G(-q) > \tau\big(1 - G\big(b_a\big)\big) = \tau(1-\delta)$$
$$\Leftrightarrow q > -G^{-1}(1 - \tau(1-\delta)).$$

Hence, the proposal is accepted if and only if $q > q_a = \min\{-G^{-1}(\delta), -G^{-1}(1-\tau(1-\delta))\}$, and since $\delta < 1 - \tau(1-\delta)$, the cutoff in this "activist" equilibrium is q_a as given by (10). Similar to the proof of Proposition 2, the share price is $p_a = v(b_a, q_a)$.

Second, suppose that $H(q^*) < \phi$ (conservative equilibrium). The arguments in the proof of Proposition 2 can again be repeated here. In particular, the marginal shareholder is b_c as given by (9), and after the trading stage, the shareholder base consists entirely of shareholders with $b < b_c$. Consider a realization of q. Recall that shareholder b votes for the proposal if and only if $q > -b$. Hence, if $q < -b_c$, all shareholders of the firm vote against ($b < b_c < -q$), so the proposal is rejected. If $q > -b_c$, then shareholders who vote in favor are those with $b \in (-q, b_c)$ out of $b \in [-\overline{b}, b_c)$, which gives a fraction of $\Pr[-q < b < b_c|b < b_c]$ affirmative votes. Hence, the proposal is accepted if and only if $-q < b_c$ and $\tau < \Pr[-q < b < b_c|b < b_c]$, which are together equivalent to

$$\tau < \frac{\Pr\left[b < b_c\right] - \Pr\left[b < -q\right]}{\Pr\left[b < b_c\right]} \Leftrightarrow \Pr\left[b < -q\right] < (1-\tau)\Pr\left[b < b_c\right]$$
$$\Leftrightarrow G(-q) < (1-\tau)(1-\delta) \Leftrightarrow q > -G^{-1}((1-\tau)(1-\delta)).$$

Hence, the cutoff in this "conservative" equilibrium is q_c, given by (11). Similar to the proof of Proposition 2, the share price is $p_c = v(b_c, q_c)$.

Third, suppose $H(q^*) = \phi$. In this case, the value of each shareholder is

$$v\big(b, q^*\big) = v_0 + H\big(q^*\big)\mathbb{E}\big[\theta|q > q^*\big] = v_0 + \phi\mathbb{E}\big[\theta|q > q^*\big].$$

Therefore, the market can clear only if $p = v_0 + \phi\mathbb{E}[\theta|q > q^*]$. Notice that shareholder value does not depend on b, and that market-clearing implies that all shareholders are indifferent between buying and selling shares. Based on the tie-breaking rule we adopt, shareholders will not trade. Therefore, the post-trade shareholder base is identical to the pre-trade shareholder base. Next, note that $H(q^*) = \phi$ implies that the proposal is accepted if and only if $q > F^{-1}(1-\phi)$. Since a shareholder votes for the proposal if and only if $q > -b$, it must be the case that the fraction of initial shareholders with

$F^{-1}(1-\phi) > -b$ is exactly τ, which is equivalent to $1 - G(-F^{-1}(1-\phi)) = \tau$, or $G^{-1}(1-\tau) = -F^{-1}(1-\phi)$. This is a knife-edge case that we ignore, since it does not hold generically.

Finally, notice that $q_a < q_c$, and therefore $H(q_c) < \phi$, $H(q_a) > \phi$, or both. Therefore, an equilibrium always exists (but may be nonunique if $H(q_c) < \phi < H(q_a)$). This completes the proof.

As a side note, notice that many other tie-breaking rules—those in which all shareholders follow the same strategy upon indifference (e.g., buy $r \in [-e, x]$ shares)—would also eliminate this type of equilibrium. Indeed, if all shareholders buy or sell a certain amount (the same across shareholders) of shares upon indifference, the market is unlikely to clear. For the market to clear, shareholders with different biases would need to behave differently when they are indifferent between buying and selling shares, that is, the tie-breaking rule has to differ across shareholders in a particular way. Since such a tie-breaking rule is somewhat arbitrary, we ruled it out as an unlikely outcome. □

PROOF OF LEMMA 2: Recall that in the activist equilibrium, market-clearing implies $\Pr[b < b_a]e = \Pr[b > b_a]x$, where $\Pr[b > b_a] = 1 - \delta = \frac{e}{x+\varepsilon}$. Therefore,

$$\begin{aligned} W_a &= \Pr\left[b < b_a\right]ep_a + \Pr\left[b > b_a\right]\mathbb{E}\left[(e+x)v\big(b, q_a\big) - xp_a|b > b_a\right] \\ &= \Pr\left[b > b_a\right]xp_a + \Pr\left[b > b_a\right]\mathbb{E}\left[(e+x)v\big(b, q_a\big) - xp_a|b > b_a\right] \\ &= \Pr\left[b > b_a\right]\mathbb{E}\left[(e+x)v\big(b, q_a\big)|b > b_a\right] = (1-\delta)(e+x)\mathbb{E}\left[v\big(b, q_a\big)|b > b_a\right] \\ &= e\mathbb{E}\left[v\big(b, q_a\big)|b > b_a\right] = ev\big(\mathbb{E}\left[b|b > b_a\right], q_a\big) = ev(\beta_a, q_a), \end{aligned}$$

where the second to last equality follows from the linearity of $v(b, q_a)$ in b. The proof for the conservative equilibrium is similar and for brevity is presented in Section IV.B of the Internet Appendix. □

PROOF OF PROPOSITION 4: Suppose that an activist equilibrium exists for some $\delta < 1$, with b_a, β_a, and $-q_a$, where $\beta_a > b_a$ and $-q_a > b_a$. Note that

$$\begin{aligned} v(\beta_a, -q_a) &= v_0 + \beta_a(H(-q_a) - \phi) + H(-q_a)\mathbb{E}[\theta|q > -q_a] \\ &< v_0 + \bar{b}(H(-q_a) - \phi) + H(-q_a)\mathbb{E}[\theta|q > -q_a] = v\big(\bar{b}, -q_a\big), \end{aligned}$$

where we use the fact that since the activist equilibrium exists, we have $H(-q_a) > \phi$. Since $v(\bar{b}, -q_a)$ is maximized at $v(\bar{b}, -\bar{b})$ from Lemma 2, we get $v(\beta_a, -q_a) < v(\bar{b}, -\bar{b})$, which implies that shareholder welfare in the activist equilibrium for $\delta < 1$ is smaller than in the activist equilibrium without trading frictions, if both exist. The same logic implies that $v(b_a, -q_a) < v(\bar{b}, -\bar{b})$, and hence, the share price in the activist equilibrium for $\delta < 1$ is smaller than in the activist equilibrium without trading frictions. The proof for the conservative equilibrium is identical. □

PROOF OF PROPOSITION 5: Note that condition (16) can be written as

$$(1-\delta)(1-\tau) < G\big(-F^{-1}(1-\phi)\big) < 1 - \tau(1-\delta). \tag{A1}$$

To see the point about δ, note that (A1) is equivalent to

$$\delta > \max\left\{1 - \frac{G\big(-F^{-1}(1-\phi)\big)}{1-\tau}, 1 - \frac{1 - G\big(-F^{-1}(1-\phi)\big)}{\tau}\right\}.$$

To see the point about τ, note that (A1) is equivalent to

$$1 - \frac{G\big(-F^{-1}(1-\phi)\big)}{1-\delta} < \tau < \frac{1 - G\big(-F^{-1}(1-\phi)\big)}{1-\delta}.$$

To see the point about ϕ, note that (A1) is equivalent to

$$1 - F\big(-G^{-1}((1-\delta)(1-\tau))\big) < \phi < 1 - F\big(-G^{-1}(1-\tau(1-\delta))\big).$$

Finally, let us parameterize the cdf G with σ, where higher values of σ indicate a ranking in terms of the mean-preserving spread, such that as $\sigma \to 0$, the distribution converges to a mass point at $\mathbb{E}[b]$. Then as $\sigma \to 0$, the median voter converges to $\mathbb{E}[b]$. This implies that $\lim_{\sigma\to 0} q^* = -\mathbb{E}[b]$ in any equilibrium, and thus, the voting equilibrium must be unique: it is an activist equilibrium if and only if $H(-\mathbb{E}[b]) < \phi$. Therefore, (16) can be satisfied only if σ is sufficiently large, that is, the shareholder base is sufficiently heterogeneous. □

PROOF OF PROPOSITION 6: First, consider the activist equilibrium. Recall that in this equilibrium, $W_a = e \cdot v(\beta_a, q_a)$ and $p_a = v(b_a, q_a)$. Then, a change in parameters that affects the median voter (q_a) without changing the marginal shareholder only affects W_a and p_a through its effect on q_a. Also recall that based on (17), $v(\beta_a, q^*)$ is a hump-shaped function in q^* with a maximum at $q^* = -\beta_a$, and $v(b_a, q^*)$ is a hump-shaped function in q^* with a maximum at $q^* = -b_a$. Since $-b_a < q_a - \beta_a$ by assumption of the proposition, any small enough change in parameters that leaves this order unchanged ($-b_a < q_a - \beta_a$) increases the distance to $-\beta_a$ but decreases the distance to $-b_a$ or vice versa. Hence, this change of parameters necessarily moves prices and welfare in opposite directions. The proof for the conservative equilibrium is similar and for brevity is presented in Section IV.B of the Internet Appendix. □

PROOF OF LEMMA 4: First, we prove that if the proposal is decided by a board with decision rule q^*, then the (unique) trading equilibrium is constrained efficient, that is, it maximizes shareholder welfare subject to the ownership restriction $s(b) \in [0, e + x]$ and $\int_{-\bar{b}}^{\bar{b}} s(b)g(b)db = e$, where $s(b)$ is the number of shares owned by a shareholder with bias b post-trade. To see why, suppose $H(q^*) - \phi > 0$ (the case $H(q^*) - \phi < 0$ is similar). The value of shares from the perspective of shareholder b is given by (6) and is increasing in b. From Proposition 2, we know that the equilibrium at the trading stage is unique and leads to the following ownership structure: $s^*(b) = e + x$ for $b > b_a$ and $s^*(b) = 0$ otherwise. Recall that $\int_{b_a}^{\bar{b}} [e + x]g(b)db = e$. We prove that this ownership structure is constrained efficient, that is, it maximizes $\int_{-\bar{b}}^{\bar{b}} s(b)v(b, q^*)g(b)db$. Consider any other ownership structure $\{s^{**}\}$ such that $\int_{-\bar{b}}^{\bar{b}} |s^*(b) - s^{**}(b)|g(b)db \neq 0$.

Then, we have either $\int_{b_a}^{\bar{b}}[e+x-s^{**}(b)]g(b)db \neq 0$ or $\int_{-\bar{b}}^{b_a} s^{**}(b)g(b)db \neq 0$. Define

$$\Delta W \equiv \int_{-\bar{b}}^{\bar{b}} s^*(b)v(b,q^*)g(b)db - \int_{-\bar{b}}^{\bar{b}} s^{**}(b)v(b,q^*)g(b)db.$$

We next prove that $\Delta W > 0$. Indeed,

$$\begin{aligned}
\Delta W &= \int_{b_a}^{\bar{b}} [e+x-s^{**}(b)]v(b,q^*)g(b)db - \int_{-\bar{b}}^{b_a} s^{**}(b)v(b,q^*)g(b)db \\
&> v(b_a,q^*)\int_{b_a}^{\bar{b}} [e+x-s^{**}(b)]g(b)db - v(b_a,q^*)\int_{-\bar{b}}^{b_a} s^{**}(b)g(b)db \\
&= v(b_a,q^*)\left(\int_{b_a}^{\bar{b}} [e+x-s^{**}(b)]g(b)db - \int_{-\bar{b}}^{b_a} s^{**}(b)g(b)db\right) \\
&= v(b_a,q^*)\left(\int_{b_a}^{\bar{b}} [e+x]g(b)db - \int_{-\bar{b}}^{\bar{b}} s^{**}(b)g(b)db\right) = v(b_a,q^*)(e-e) = 0,
\end{aligned}$$

where the first inequality follows from $v(b,q^*)$ being increasing in b, and it is a strict (rather than weak) inequality since either $\int_{b_a}^{\bar{b}}[e+x-s^{**}(b)]g(b)db \neq 0$ or $\int_{-\bar{b}}^{b_a} s^{**}(b)g(b)db \neq 0$.

Next, we prove that both shareholder welfare and the share price increase with δ. Indeed, based on Proposition 2, expected shareholder welfare is

$$W_{NoVote}(q^*) = e \cdot \left[v_0 + H(q^*)\mathbb{E}[q|q>q^*] + \begin{cases} \beta_c(H(q^*)-\phi) & \text{if } H(q^*) < \phi \\ \beta_a(H(q^*)-\phi) & \text{if } H(q^*) > \phi \end{cases} \right],$$

and the share price is

$$p_{NoVote}(q^*) = v_0 + H(q^*)\mathbb{E}[q|q>q^*] + \begin{cases} b_c(H(q^*)-\phi) & \text{if } H(q^*) < \phi \\ b_a(H(q^*)-\phi) & \text{if } H(q^*) > \phi. \end{cases}$$

Recall that $b_c = G^{-1}(1-\delta)$, $\beta_c = \mathbb{E}[b|b<b_c]$, $b_a = G^{-1}(\delta)$, and $\beta_a = \mathbb{E}[b|b > b_a]$. Thus, $p_{NoVote}(q^*)$ and $W_{NoVote}(q^*)$ depend on δ only through their effect on b_c and b_a. Since, by Corollary 1, b_c and β_c are decreasing in δ, and b_a and β_a are increasing in δ, both $W_{NoVote}(q^*)$ and $p_{NoVote}(q^*)$ increase in δ. □

PROOF OF PROPOSITION 7: To prove the proposition, we prove the following more general statement, which characterizes the conditions under which shareholder welfare and the share price increase or decrease in δ. We show that there exist $\underline{\delta}$ and $\overline{\delta}$, $0 < \underline{\delta} < \overline{\delta} < 1$, such that:

(i) The share price increases in δ if $\delta > \overline{\delta}$, and decreases in δ if $\delta < \underline{\delta}$ and $|H(q_{NoTrade}) - \phi|$ is sufficiently small.

(ii) Shareholder welfare increases in δ if $\delta > \bar{\delta}$, and decreases in δ if $\delta < \underline{\delta}$, $|H(q_{NoTrade}) - \phi|$ is sufficiently small, and the median voter in the no-trade benchmark is more extreme than the average shareholder.

To prove this statement, we first consider the activist equilibrium, which exists if and only if $H(q_a) - \phi > 0$. Recall that $p_a = v(b_a, q_a)$ and $W_a = e \cdot v(\beta_a, q_a)$, where $b_a = G^{-1}(\delta)$, $\beta_a = \mathbb{E}[b|b > b_a] = \frac{1}{G(1-b_a)} \int_{b_a}^{\bar{b}} b dG(b)$, and $q_a = -G^{-1}(1 - \tau(1-\delta))$. Using (6),

$$\frac{\partial p_a}{\partial \delta} = \frac{\partial b_a}{\partial \delta}(H(q_a) - \phi) - (b_a + q_a)\frac{\partial q_a}{\partial \delta} f(q_a) \tag{A2}$$

and

$$\frac{1}{e}\frac{\partial W_a}{\partial \delta} = \frac{\partial \beta_a}{\partial \delta}(H(q_a) - \phi) - (\beta_a + q_a)\frac{\partial q_a}{\partial \delta} f(q_a). \tag{A3}$$

Using (10) and (7), we get $\frac{\partial q_a}{\partial \delta} = -\frac{\tau}{g(-q_a)} < 0$, $\frac{\partial b_a}{\partial \delta} = \frac{1}{g(b_a)} > 0$, and

$$\begin{aligned}
\frac{\partial \beta_a}{\partial \delta} &= \frac{-\frac{\partial b_a}{\partial \delta} b_a g(b_a)[1 - G(b_a)] + \left[\int_{b_a}^{\bar{b}} b g(b) db\right] g(b_a)\frac{\partial b_a}{\partial \delta}}{[1 - G(b_a)]^2} \\
&= \frac{\partial b_a}{\partial \delta}\frac{g(b_a)}{1 - G(b_a)}(\beta_a - b_a) = \frac{\beta_a - b_a}{1 - G(b_a)} > 0.
\end{aligned}$$

Plugging into (A2) and (A3), we get

$$\begin{aligned}
\frac{\partial p_a}{\partial \delta} &= \frac{H(q_a) - \phi}{g(b_a)} + \tau(b_a + q_a)\frac{f(q_a)}{g(-q_a)}, \\
\frac{1}{e}\frac{\partial W_a}{\partial \delta} &= \frac{H(q_a) - \phi}{1 - G(b_a)}(\beta_a - b_a) + \tau(\beta_a + q_a)\frac{f(q_a)}{g(-q_a)}.
\end{aligned}$$

Notice that as $\delta \to 1$, b_a, β_a, and $-q_a$ all converge to $\bar{b}$, and $H(q_a) - \phi \to H(-\bar{b}) - \phi$. Suppose that the activist equilibrium exists in the limit (which is the case if $H(-\bar{b}) > \phi$). Since g is positive on $[-\bar{b}, \bar{b}]$, $\lim_{\delta \to 1} \frac{\partial p_a}{\partial \delta} = \frac{H(-\bar{b}) - \phi}{g(\bar{b})} > 0$.

In addition, $\lim_{\delta \to 1} \frac{1}{e}\frac{\partial W_a}{\partial \delta} = (H(-\bar{b}) - \phi)\lim_{\delta \to 1} \frac{\beta_a - b_a}{1 - G(b_a)}$. Using l'Hopital's rule,

$$\lim_{\delta \to 1} \frac{\beta_a - b_a}{1 - G(b_a)} = \lim_{\delta \to 1} \frac{\frac{\partial \beta_a}{\partial \delta} - \frac{\partial b_a}{\partial \delta}}{-g(b_a)\frac{\partial b_a}{\partial \delta}} = \frac{1}{g(\bar{b})} - \lim_{\delta \to 1} \frac{\beta_a - b_a}{1 - G(b_a)},$$

which implies $\lim_{\delta \to 1} \frac{\beta_a - b_a}{1 - G(b_a)} = \frac{1}{2}\frac{1}{g(\bar{b})} > 0$. Therefore, $\lim_{\delta \to 1} \frac{\partial W_a}{\partial \delta} > 0$.

Also notice that as $\delta \to 0$, we have $b_a \to -\bar{b}$, $\beta_a \to \mathbb{E}[b]$, and $q_a \to q_{NoTrade} = -G^{-1}(1-\tau) < \bar{b}$. Suppose the activist equilibrium exists in this limit (which is the case if $H(q_{NoTrade}) > \phi$). Then

$$\lim_{\delta\to 0}\frac{\partial p_a}{\partial\delta} = \frac{H(q_{NoTrade}) - \phi}{g\left(-\bar{b}\right)} + \tau\left(-\bar{b} + q_{NoTrade}\right)\frac{f(q_{NoTrade})}{g(-q_{NoTrade})},$$

where the second term is strictly negative because $-\bar{b} + q_{NoTrade} < 0$ and the density f is positive. Hence, $\lim_{\delta\to 0}\frac{\partial p_a}{\partial\delta} < 0$ if $|H(q_{NoTrade}) - \phi|$ is sufficiently small. Also notice that

$$\lim_{\delta\to 0}\frac{1}{e}\frac{\partial W_a}{\partial\delta} = (H(q_{NoTrade}) - \phi)\left(\mathbb{E}[b] + \bar{b}\right) + \tau\left(\mathbb{E}[b] + q_{NoTrade}\right)\frac{f(q_{NoTrade})}{g(-q_{NoTrade})}. \tag{A4}$$

Thus, if $\mathbb{E}[b] + q_{NoTrade} < 0$ (i.e., the median voter in the no-trade benchmark is more extreme (activist) than the average shareholder) and $|H(q_{NoTrade}) - \phi|$ is small enough, then $\lim_{\delta\to 0}\frac{\partial W_a}{\partial\delta} < 0$.

The analysis for the conservative equilibrium is similar and for brevity is presented in Section IV.B of the Internet Appendix. It shows that (i) $\lim_{\delta\to 1}\frac{\partial W_c}{\partial\delta} > 0$ and that (ii) if $\mathbb{E}[b] + q_{NoTrade} > 0$ (i.e., the median voter is more extreme (conservative) than the average post-trade shareholder) and $|H(q_{NoTrade}) - \phi|$ is small enough, then $\lim_{\delta\to 0}\frac{\partial W_c}{\partial\delta} < 0$.

Given the strictly positive (negative) limits of $\frac{\partial p}{\partial\delta}$ and $\frac{\partial W}{\partial\delta}$ as $\delta\to 1$ ($\delta\to 0$) for any equilibrium as long as it exists, it follows that under the conditions of the proposition, there exist $\underline{\delta}$ and $\bar{\delta}$, $0 < \underline{\delta} < \bar{\delta} < 1$, such that both the share price and welfare in any equilibrium that exists increase (decrease) in δ for $\delta > \bar{\delta}$ ($\delta < \underline{\delta}$), as required. □

PROOF OF PROPOSITION 8: We first prove that the optimal board is biased—we show that $b_m^* = \beta_a$ if $v(\beta_a, -\beta_a) > v(\beta_c, -\beta_c)$, and $b_m^* = \beta_c$ otherwise. The choice of the optimal board is equivalent to choosing the cutoff q^* that maximizes expected shareholder welfare. Recall from Section IV.B and (17) that $v(b, q^*)$ is a hump-shaped function in q^* with a maximum at $q^* = -b$. Thus, within the range of q^* that generate a conservative equilibrium or the equilibrium in which shareholders are indifferent and do not trade ($H(q^*) \le \phi \Leftrightarrow q^* \ge H^{-1}(\phi)$), (15) implies that the optimal cutoff q^* is the point closest to $-\beta_c$ in this range, that is, $\max\{-\beta_c, H^{-1}(\phi)\}$. Similarly, within the range of q^* that generate an activist equilibrium or the equilibrium in which shareholders are indifferent and do not trade ($H(q^*) \ge \phi \Leftrightarrow q^* \le H^{-1}(\phi)$), the optimal cutoff q^* is the point closest to $-\beta_a$ in this range, that is, $\min\{-\beta_a, H^{-1}(\phi)\}$. Since $\beta_c < \beta_a$, there are three cases to consider:

Case 1: If $H^{-1}(\phi) \le -\beta_a$, then any $q^* < H^{-1}(\phi)$ generates an activist equilibrium, and it is welfare inferior to the equilibrium with $q^* = H^{-1}(\phi)$. At the same time, setting $q^* = -\beta_c$ would generate a conservative equilibrium that is superior to an equilibrium with $q^* = H^{-1}(\phi)$ because $-\beta_c > -\beta_a \ge H^{-1}(\phi)$. Therefore, in this case, $b_m^* = \beta_c$.

Case 2: If $-\beta_c \leq H^{-1}(\phi)$, then any $q^* > H^{-1}(\phi)$ generates a conservative equilibrium, and it is welfare inferior to an equilibrium with $q^* = H^{-1}(\phi)$. At the same time, setting $q^* = -\beta_a$ would generate an activist equilibrium that is superior to an equilibrium with $q^* = H^{-1}(\phi)$ because $-\beta_a < -\beta_c \leq H^{-1}(\phi)$. Therefore, in this case, $b_m^* = \beta_a$.

Case 3: If $-\beta_a < H^{-1}(\phi) < -\beta_c$, then the optimal cutoff among those that generate a conservative equilibrium is $-\beta_c$, and the optimal cutoff among those that generate an activist equilibrium is $-\beta_a$, and both generate higher welfare than $q^* = H^{-1}(\phi)$. It follows that $b_m^* = \beta_a$ if $v(\beta_a, -\beta_a) > v(\beta_c, -\beta_c)$, and $b_m^* = \beta_c$ otherwise. Notice that

$$v(\beta_a, -\beta_a) > v(\beta_c, -\beta_c) \Leftrightarrow H^{-1}(\phi) > H^{-1}(\Phi) \Leftrightarrow \phi < \Phi, \tag{A5}$$

where

$$\begin{aligned}\Phi &\equiv H(-\beta_c) + \mathbb{E}[\beta_a + q| - \beta_a < q < -\beta_c]\frac{H(-\beta_a) - H(-\beta_c)}{\beta_a - \beta_c} \\ &= H(-\beta_a) + \mathbb{E}[\beta_c + q| - \beta_a < q < -\beta_c]\frac{H(-\beta_a) - H(-\beta_c)}{\beta_a - \beta_c}.\end{aligned} \tag{A6}$$

Thus, $b_m^* = \beta_a$ if $\phi < \Phi \Leftrightarrow H^{-1}(\phi) > H^{-1}(\Phi)$ and $b_m^* = \beta_c$ if $\phi > \Phi \Leftrightarrow H^{-1}(\phi) < H^{-1}(\Phi)$. Also notice that $H(-\beta_a) > \Phi > H(-\beta_c)$, which implies $-\beta_a < H^{-1}(\Phi) < -\beta_c$.

Taken together, the three cases above imply that $b_m^* = \beta_c$ if either $H^{-1}(\phi) \leq -\beta_a$ or $-\beta_a < H^{-1}(\phi)$ and $H^{-1}(\phi) < H^{-1}(\Phi)$. Since $-\beta_a < H^{-1}(\Phi)$, these two conditions together imply that $b_m^* = \beta_c$ if $H^{-1}(\phi) < H^{-1}(\Phi) \Leftrightarrow \phi > \Phi$. Further, the three cases above imply that $b_m^* = \beta_a$ if either $-\beta_c \leq H^{-1}(\phi)$ or $H^{-1}(\phi) < -\beta_c$ and $H^{-1}(\Phi) < H^{-1}(\phi)$. Since $H^{-1}(\Phi) < -\beta_c$, these two conditions together imply that $b_m^* = \beta_a$ if $H^{-1}(\phi) > H^{-1}(\Phi) \Leftrightarrow \phi < \Phi$. If $\phi = \Phi$, both β_a and β_c give the highest possible shareholder welfare. We conclude that $b_m^* = \beta_a$ if $\phi < \Phi \Leftrightarrow v(\beta_a, -\beta_a) > v(\beta_c, -\beta_c)$, and $b_m^* = \beta_c$ otherwise. Notice that in both cases, $b_m^* \neq \mathbb{E}[b]$, that is, the optimal board is biased.

We next prove that delegation to a board with bias b_m close enough to b_m^* is strictly beneficial to voting except in knife-edge cases. Notice that the delegation equilibrium can replicate any conservative (activist) voting equilibrium if we set $b_m = -q_c$ ($b_m = -q_a$). Therefore, delegation to the optimal board always weakly dominates the voting equilibrium and strictly dominates it except the knife-edge cases when $q_c = -b_m^*$ or $q_a = -b_m^*$. Moreover, except for these knife-edge cases, given the continuity of the expected welfare function around b_m^* and a strictly possible benefit of delegation at b_m^*, it follows that there is a neighborhood around b_m^* such that if the board's bias is in that neighborhood, then the delegation equilibrium features strictly higher shareholder welfare than the voting equilibrium. □

Acknowledgement

Open access funding enabled and organized by Projekt DEAL.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1: Internet Appendix.