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Shareholder Heterogeneity and Shareholder Democracy

Bachelor's thesis

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Abstract

This thesis examines the impact of shareholder heterogeneity on decision-making outcomes within firms. Furthermore, the goal of the study is to show how voting and trading intersect. The thesis extends the fundamental model (Levit *et al.* (2024)) of shareholder trading and voting by incorporating various scenarios with different initial conditions. The study demonstrates that even minor adjustments to these initial conditions can significantly influence the voting outcomes, potentially leading to divergent equilibrium states.

The core finding is that the trading and voting game often reaches equilibria that are heavily dependent on the initial composition of the shareholder base. Additionally, the research reveals that self-fulfilling expectations persist across diverse settings. The thesis also highlights a notable discrepancy: while equilibria may be achieved, the objectives of profit maximization and shareholder welfare can diverge, indicating that profit maximization does not always align with welfare maximization.

These insights advance the understanding of corporate governance by underscoring the critical interaction between shareholder trading and voting processes.

JEL Classification	D71, D72, G30, G34, Q50, Q56, M14
Keywords	corporate governance, collective decision-making, ESG
Title	Shareholder Heterogeneity and Shareholder Democracy

Abstrakt

Tato práce zkoumá vliv vlastnické demokracie na výsledky rozhodování ve firmách. Navíc je cílem této studie ukázat, jak se prolínají hlasování a obchodování. Práce rozšiřuje základní model (Levit *et al.* (2024)) obchodování a hlasování akcionářů o různé scénáře s různými počátečními podmínkami. Studie ukazuje, že i drobné úpravy těchto počátečních podmínek mohou významně ovlivnit výsledky hlasování, což může vést k různým rovnovážným stavům.

Hlavním výsledkem je, že obchodování a hlasovací hra často dosahuje rovnovážných stavů, které jsou silně závislé na počátečním složení akcionářské základny. Dále výzkum odhaluje, že seberealizující očekávání přetrvávají i v různých nastaveních. Práce rovněž zdůrazňuje významnou nesrovnalost: zatímco rovnováha může být dosažena, cíle maximalizace zisku a blahobytu akcionářů se mohou rozcházet, což naznačuje, že maximalizace zisku nemusí vždy souviset s maximalizací blahobytu.

Tyto poznatky přispívají k porozumění podnikové správě tím, že zdůrazňují klíčovou interakci mezi obchodováním a hlasováním akcionářů.

Klasifikace JEL	D71, D72, G30, G34, Q50, Q56, M14
Klíèová slova	správa podniků, kolektivní rozhodování, ESG
Název práce	Rozdíly mezi vlastníky firem a vlastnická demokracie

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Chapter 1

Introduction

In the current world, where the importance of corporate governance and decision-making is on the rise (Zingales & Hart (2022)), shareholders must balance their interests and ESG (Environmental, Social, and Governance) considerations to form a sustainable environment. Understanding shareholder decisions and the influence of common and private values on these decisions becomes crucial. As highlighted by Hart and Zingales (Hart & Zingales (2017)), the objective function for firms should align with shareholder welfare rather than merely market value, suggesting that shareholder voting can play a pivotal role in achieving this alignment. Additionally, research by Broccardo, Hart, and Zingales (Broccardo *et al.* (2022)) reveals that the effectiveness of shareholder strategies like exit and voice in managing externalities and social impact depends significantly on the social responsibility of the majority of investors.

This research addresses the underlying issue of aligning corporate decisions with shareholder valuations. In light of the evolving nature of corporate goals, as discussed by Rajan et al. (Rajan *et al.* (2023)), there has been a significant shift in how firms respond to changes in management, stakeholder preferences, and the increasing emphasis on social and environmental objectives alongside traditional financial metrics.

The objective of this thesis is to examine the processes of shareholder decision-making and their impact on corporate policies, which in turn influence trading and ownership structure. By analyzing scenarios such as the timing of information release and diverse shareholder preferences, this research aims to provide a comprehensive understanding of how these factors affect trading and voting outcomes. The analysis follows a two-phase framework, with shareholders first trading their shares and then voting on proposals. This framework allows us to examine the specific effects of altering the initial conditions and the resulting existence of equilibria.

The thesis is structured as follows: Chapter 2 presents the baseline model provided by Levit *et al.* (2024) and summarizes the most important results impacting my subsequent research. In Chapter 3, I introduce the framework for a detailed analysis of various scenarios by adjusting the initial conditions of the baseline model. This chapter highlights key contributions and insights by focusing on the impact of information timing and diverse shareholder preferences. It sets the stage for understanding how different conditions influence shareholder behavior and voting outcomes. Chapters 4 through 7 delve into specific scenarios: Chapter 4 examines the impact of zero policy uncertainty, Chapter 5 explores the relationship between company lovers and company haters, Chapter 6 analyzes the balance between common and private values, and Chapter 7 investigates asymmetric private values. Each of these chapters includes motivation, detailed analysis, and conclusions relevant to the specific scenario. Chapter 8 concludes the thesis by synthesizing the main findings from the previous chapters and discussing their significance and relevance in the context of contemporary corporate governance.

Chapter 2

Baseline model

In this chapter, I will mainly go through the model of Levit et al. (2024)Levit *et al.* (2024). First by introducing the main model idea and it's further applications and later by analysing the model's equilibrium. Finally, I will interpret the main results and discuss potential extensions mentioned by the researchers.

2.1 Main model and applications

We start by considering a firm with risk-neutral shareholders where each shareholder is endowed with $e > 0$ shares. Shareholders then choose between 2 policies by a vote on proposal. In case proposal is rejected ($d = 0$), baseline policy is implemented, otherwise ($d = 1$) alternative policy is implemented.

2.1.1 Preferences

Moving on to the 2 parts of the shareholders' preferences. First part is a common value, which is determined by an unknown state θ and takes on values $\theta \in \{-1, 1\}$. If θ is negative, rejection of the proposal is value-increasing and vice-versa. This leads to result that for a common value, it is essential that the policy matches the real situation.

Second part of the preferences is a private value of a shareholder expressing the heterogeneity of valuations. We denote this values b as biases. The acceptance of the proposal would enhance the utility for a shareholder with a positive bias, while a rejection would lead to a greater loss for them.

Specifically, we describe the value of a share of the shareholder b as:

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

where $v_0 \geq 0$ is a valuation not affected by the decision.

Parameter $\phi \in [0,1]$ describes the disagreement among shareholders between each of the policies. For intermediate values of ϕ shareholders disagree on share valuations for both policies. Conversely, if ϕ is close to 1, investors disagree on the valuation of the baseline policy only.

Due to differing private biases, shareholders set varying acceptance thresholds for the proposal. Shareholders with bias b, called "activist" or "conservative" for high or low b respectively, favor the proposal only if $\theta + b$ is positive. The distribution of shareholders' biases is described by a known cumulative distribution function (cdf) G, with full support and positive density g on the interval $[-b, b]$. This distribution reflects the initial composition of shareholders' base.

2.1.2 Game rules

There are 2 stages of the game: first trading and then voting. Thanks to this separation, we can focus solely on the voter base. The value of θ is unknown, when trading takes place. Additionally, no short sales are allowed and everyone can either sell their endowment e, or buy a finite number of shares $x > 0$ (this captures trading frictions). Lastly, we know, that in equilibrium market must clear, and we denote the market-clearing price by p, where shareholders, indifferent between trading at p or not trading, do not trade.

After the market clears, shareholders observe a public signal, q, regarding the state θ. The expectation of θ after signal, denoted as $E[\theta|\text{public signal}]$, is q. For simplicity, we assume q follows a continuous distribution with mean zero, denoted as F, with full support on the interval $[-T, T]$, where $T \in [0,1]$. The ex-ante expectation of T is zero. Further simplification introduces

$$H(q) \equiv 1 - F(q)$$

During the second stage, shareholders vote according to their preferences b and the value q, with each share having one vote. If more than $\tau \in (0,1)$ of all shares are in favor, the proposal is accepted. The parameter τ captures both the statutory majority requirement and other factors, such as the power of the CEO or the independence of the board.

This sequence of stages reflects the observed practice. Trading in the model also determines the voter base therefore sets the record date. All votes on important proposals, such as proxy fights, $M\&As$, or special meetings, follows this sequence of events. Another assumption is that shareholders observe the signal q after the record date.

Final part is the analysis of the subgame-perfect Nash equilibria in undominated strategies of the presented voting game. Such restriction (undominated strategy) leads to the fact, that shareholder b votes in favor of the proposal if

$$b + q > 0$$

Assumption $\bar{b} < T$ ensures that even the extremists base their vote on q.

2.1.3 Applications of the model

As there is ample evidence of heterogeneity in preferences, we explore some applications of the model presented by Levit et al.

Heterogeneous time horizons

Numerous scenarios illustrate the clash between short-term and long-term strategies within corporate decision-making. These include proxy contests aimed at altering board compositions, voting processes regarding mergers, and instances where CEO compensations are linked to short-term stock prices. These diverse situations reflect the different preferences of shareholders and their influence on decision-making. We can show the result on the proxy fight example.

The activist supports a short-term project with a payoff at time t_s., while the incumbent favors long-term project with a payoff at time $t_l > t_s$ (assuming success). However, the success depends on an unknown state. In a good state (where the short-term project succeeds), there's a payoff of one per share at t_s and zero at t_l for short-term project, and zero payoff for long-term project in both periods. Vice-versa for a bad state. Despite shareholders aiming for the successful project, their varying horizons lead to different preferences regarding cash flows in the two periods.

Heterogeneous taxes

We can account for varying tax rates among shareholders. For instance, suppose that the CEO faces a decision whether to distribute a dividend I to shareholders. If an activist's proposal is approved, it could result in shareholder b facing a dividend tax rate b, which leads to gain $I * (1 - b)$. On the other hand, if manager's strategy is approved, I is reinvested in the firm. This results in the payoff equal to the firm's common value θ, which is unknown.

Private benefits

Heterogeneous private benefits may stem from various sources, including control-related benefits. Therefore, the approval condition $b + q > 0$ would suggest, that the control-related benefits extracted by an individual from the company increase linearly. The true relationship between private benefits and preferences may, in reality, be more complicated. The shareholder's ability to extract private benefits could even exhibit discontinuities at certain critical ownership levels. Moreover, the motivation to extract those benefits may diminish with higher ownership if it is inefficient.

E&S preferences

Another application of the model involves voting on an $E\&S$ proposal or engaging in a proxy fight with a hedge fund activist advocating for environmentally conscious policies. For instance, the alternative policy could reflect a "green" production technology where θ represents the common value (the impact of technologies on profits), and a higher b could capture a stronger environmental inclination. The intermediate values of ϕ align perfectly with this scenario because environmentally conscious investors place higher value on the adoption of "green" production technology compared to investors solely focused on profit maximization.

This disparity leads to disagreement over both alternatives during voting. Furthermore, the fact that an increase in shareholders' ownership stakes corresponds to higher private values is consistent with the growing evidence suggesting that the extent of investors' $E\&S$ preferences is influenced by their holdings.

Multi-dimensional preferences and Heterogeneous beliefs

Both of these topics are mentioned as additional applications of our model:

Multi-dimensional preferences are explored in light of the statement: "Shareholders typically vote on multiple proposals during a single meeting." Although this is generally the case, Bolton et al.(2020)Bolton *et al.* (2020) demonstrate that shareholders' preferences are often correlated across proposals, allowing us to represent their preferences using one or two factors. Hence, representing them by a single proposal appears to be a valid abstraction.

Heterogeneous beliefs, on the other hand, involve the concept that $\theta = \theta_1 + \theta_2$, where θ_1 and θ_2 are independent of each other. In this scenario, instead of having heterogeneous preferences, shareholders hold different prior expectations about the distribution of θ_1. Subsequently, shareholders receive a public signal about θ_2, denoted as q. Levit et al. demonstrate that the approval condition $b + q > 0$ still applies in this case.

2.2 Analysis of Equilibrium

This part presents the analysis of the equilibrium, where we use backward induction to solve the model. This section also comes with many claims introduced by Levit et al. in the form of Lemmas, Propositions and Corollaries, which make important assumptions and statements about the analysis. The solution is divided into 4 parts, where we first analyse 2 benchmark cases $Voting$ $without$ $Trading$ and $Trading$ $without$ $Voting$, and then we look into $Trading$ and $Voting$ and $Welfare$.

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 $q > q*$

This comes naturally as all shareholders favor the proposal more with higher chance of increasing value.

2.2.1 Voting without Trading

Most importantly, Lemma 1 remains applicable within this scenario. A pre-trade distribution G defines the composition of the shareholder base at the voting stage. If at least τ shareholders vote in favor, proposal is approved. Given that shareholders with larger b values the proposal more, its approval depends on the vote of the $(1-\tau)$-th shareholder, characterized by a bias of $G^{-1}(1-\tau)$. This leads us to a cutoff $q*$, specified in the next 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:

$$q_{NoTrade} = -G^{-1}(1-\tau)$$

In Figure 1, cdf G is plot against biases b. The identity of *median voter*, with bias $b = -q_{NoTrade}$, is essential as his vote aligns with the voting result. If $q = q_{NoTrade}$, there are $G(-q_{NoTrade}) = 1-\tau$ shareholders for whom $b + q < 0$ who are against the proposal ("Reject" part), and τ shareholders who favor the proposal ("Accept" part). Therefore, the *median voter* is the shareholder who remains indifferent between both options if precisely τ shareholders vote in favor.

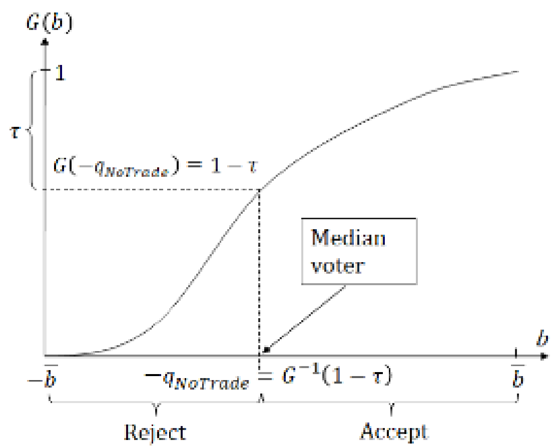

Figure 2.1: EQ: No Trade (Levit *et al.* (2024))

2.2.2 Trading without Voting

Trading follows the general model, but the decision becomes exogenous after the signal q is revealed and is made by a board of directors. We treat the board as a single entity acting like a shareholder with bias $b_m \in [-\bar{b}, \bar{b}]$ and valuation $v(d;\theta;b_m)$. The board approves the proposal if $b_m + q > 0$. We explore general decision rule $q*$, where $q* = -b_m$ guides the board decision.

We mark the valuation of a shareholder with bias b before realization of q as $v(b, q*)$. Then

$$v(b, q*) = E[v(1_{q>q*}, \theta, b)]$$

where $1_{q>q*}$ is an indicator function with value 1 if $q > q*$ and 0 otherwise. We can rewrite $v(b, q*)$ as

$$v(b, q*) = v_0 + b\ (H(q*) - \phi) + H(q*)E[\theta \mid q > q*]$$

We observe that the value increases with b if the probability that the proposal is approved ($H(q*) = Pr[q > q*]$), exceeds ϕ. This implies that activist shareholders have higher valuations if and only if the probability of approval success is sufficiently high. During trading, a shareholder buys x shares if their valuation exceeds p, sells their entire endowment e if their valuation is lower than p, and refrains from trading otherwise, leading 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 $q*$.

1. 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

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

   and

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

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

2. 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

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

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

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

In equilibrium, the firm is always owned by shareholders with the highest valuations, leading to two equilibria. Proposition 2 demonstrates that in scenario 1, where the approval probability $H(q*) > \phi$ is high, activist shareholders hold higher valuations than conservatives, resulting in an "activist" equilibrium where they purchase shares from conservatives. Conversely, in scenario 2, with a low approval probability, a "conservative" equilibrium arises. Trading enhances alignment between the firm's decisions and shareholders, with those favoring firm's policies holding their positions in firm.

The market-clearing condition for both equilibria identifies the "marginal shareholder" with bias $b_a(b_c)$, for instance, in an "activist" equilibrium, $1-G(b_a)$ represents the number of activists purchasing x shares each, while $G(b_a)$ denotes the number of conservatives selling e shares each. The marginal shareholder b_a remains indifferent between buying and selling regarding the market price. Thus, the condition for clearing a market necessitates $x \cdot (1-G(b_a)) = e \cdot G(b_a)$, or $G(b_a) = \delta$ as given in proposition 2. Increase in δ signifies reduced market frictions, as it reflects the relative strength of shareholders in purchasing shares. We refer to δ as depth.

The equilibrium share price, $p = v(b_a, q*)$, is determined by the marginal shareholder's valuation. Shareholders with different biases $(b = b_a)$ value the firm differently, creating opportunities for gains from trade. The left (right) panel of Figure 2 illustrates an "activist" ("conservative") equilibrium. It is shown in the section about Voting and Trading that the knife-edge equilibrium described in Proposition 2 part 3 does not occur when trading is allowed.

The next result summarizes the identity of the marginal shareholder and their dependence on market depth.

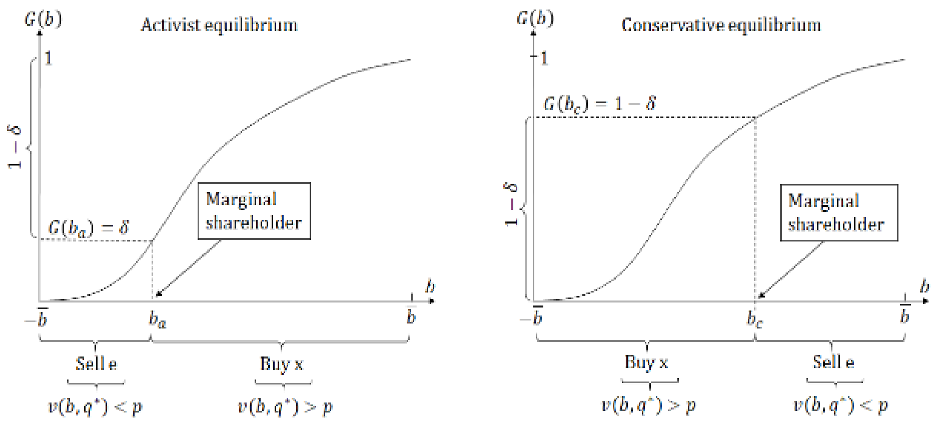

Figure 2.2: EQ: No Vote (Levit *et al.* (2024))

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 $\delta > 0.5$.

This result arises from the definitions of b_a and b_c in proposition 2. With high market depth, shareholders with extreme preferences, termed "extremists", dominate the ownership structure by purchasing maximum shares. More moderate shareholders ($b \in (b_c, b_a)$) take advantage of this and sell their shares to extremists. Conversely, in scenarios with low market depth, only extremists against the likely outcome benefit from selling at a low price, while moderate shareholders ($b \in (b_a, b_c)$) consistently buy shares. This results in the fact that marginal shareholder in an activist equilibrium is more extreme than in the conservative equilibrium only if depth is sufficiently high ($\delta > 0.5$). Therefore, high market depth is associated with a more extremist ownership structure, while low depth leads to a structure more similar to the initial shareholder base.

2.2.3 Trading and Voting

We now move to the analysis of general model that combines trading and voting. Initially, shareholders trade their shares, and subsequently, those who retain shares receive signal q and engage in voting. According to Lemma 1, the decision rule is defined by an endogenous cutoff $q*$, meaning the proposal is approved only if $q > q*$, which occurs with probability $H(q*)$. The value of a share for shareholder b remains as in no-vote benchmark, implying it increases with b if and only if $H(q*) > \phi$. We observe that shareholder b buys x shares if $v(b, q*) > p$, sells their entire endowment e if $v(b, q*) < p$, and neither buy nor sell otherwise. Unlike the benchmark case, the decision rule is now connected to the trading outcome, as trading alters the composition of the shareholder base at the voting stage. The new base results in a different cutoff $q*$ and consequently a different probability of proposal approval $H(q*)$. This establishes a feedback loop between the two stages: trading results influence expected voting outcomes, and voting outcomes depend on the structure of shareholder base. The following result provides a complete characterization of the game's equilibria.

Proposition 3 (Trading and voting)

An equilibrium of the game with trading and voting always exists.

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

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

   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 $b_a = G^{-1}(\delta)$. The proposal is accepted if and only if $q > q_a$, and the share price is given by $p_a = v(b_a, q_a)$.

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

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

   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 $p_c = v(b_c, q_c)$.

3. Other equilibria do not exist.

Note that $q_c > q_a$: the cutoff for accepting the proposal is higher in the conservative equilibrium or alternatively the probability of proposal approval 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 the first 2 figures.

Both equilibria follow the same logic as in the no-vote benchmark. In the activist equilibrium (depicted in the left panel of Figure 3), probability of proposal approval $H(q_a)$ is relatively high due to the low cutoff q_a. Consequently, the term $H(q_a) - \phi$ from the valuation function is positive. This leads more conservative shareholders ($b < b_a$), who have lower valuations, to sell their endowment to more activist shareholders ($b > b_a$), who value the firm more. The marginal shareholder b_a is determined by the same market-clearing condition as in the no-vote benchmark. As the marginal shareholder is indifferent between selling and buying, they represent the least activist shareholders in the firm, implying $1 - G(b_a) = 1 - \delta$ shareholders own the firm. Of these, at least τ must approve the proposal for it to meet the majority requirement, requiring $1 - G(-q_a)$ shareholders to vote in favor.

Importantly, unlike in the no-vote benchmark, the cutoff q_a is now endogenously low.Since the post-trade shareholder base consists of shareholders with biases higher than marginal shareholder $b > b_a$, they are inclined to vote in favor of the proposal unless their expectation of the signal q is sufficiently low to counterbalance their bias. This creates a self-fulfilling expectation of a high probability of proposal approval. Similarly, the construction of the conservative equilibrium depicted in the right panel of Figure 3 follows a similar logic.

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: $-q_a > b_a (-q_c < b_c)$.

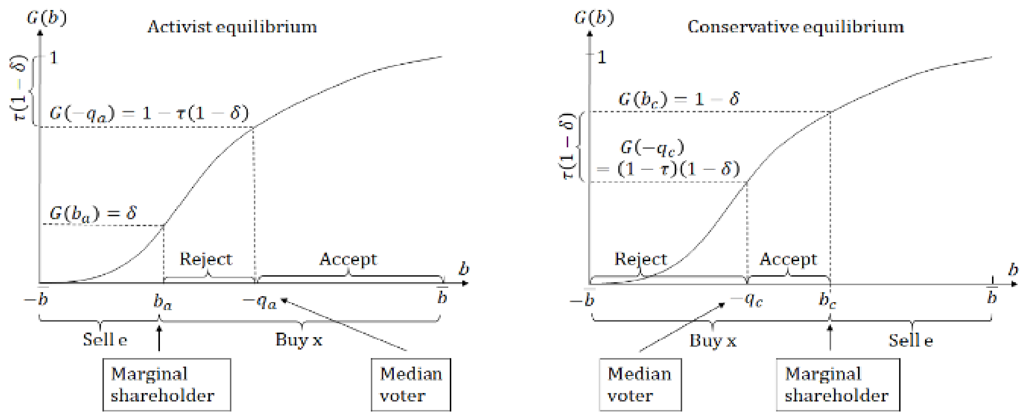

Figure 2.3: EQ: Trade and Vote (Levit *et al.* (2024))

Similar to Corollary 1, the marginal shareholder becomes more extreme as market depth increases. Additionally, the definition of median voters suggest they also become more extreme: $-q_a(-q_c)$ increases (decreases) in δ. The extent to which the marginal shareholder and the median voter converge depends on the equilibrium type.

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 $\bar{b}$ as $\delta \to 1$ ($-q_c$ decreases in δ, and both $-q_c$ and b_c converge to $-\bar{b}$ as $\delta \to 1$).

With increasing market depth, the shareholder base naturally becomes more radical, and their more extreme views push the firm towards more radical decisions. Therefore, the analysis reveals a new force (market depth δ) influencing the governance via shareholder voice.

2.2.4 Welfare

The final part of the analysis is devoted to shareholder welfare. In our analysis, shareholder welfare is defined as the average welfare of all pre-trade (initial) shareholders, which, according to Lemma 2 below, equals the average welfare of the post-trade shareholders. Specifically, in the activist equilibrium, the expected value of initial shareholders is:

$$W_a = ep_a \cdot Pr[b < b_a] + E[(e + x) \cdot v(b, q_a) - xp_a[b > b_a]]Pr[b > b_a]$$

In the conservative equilibrium, the expected value of welfare of initial shareholders is:

$$W_c = ep_c \cdot Pr[b > b_c] + E[(e + x) \cdot v(b, q_c) - xp_c[b < b_c]]Pr[b < b_c a]$$

The first part of both equations represents the value of shareholders who sell their endowment e, while the second part captures the expected value of shareholders who retain their stake in the firm and acquire additional shares through trading. Specifically, the second part equals the value of their post-trade stake minus the price paid for the additional shares acquired.

The motivation for such definition of welfare functions arises from two possible explanations: Firstly, as utilitarian social welfare functions where all shareholders have equal weights, and secondly, as evaluations of each shareholder's valuation from a prior position, such as at the time of the IPO, where the cumulative distribution function G is known, but private preferences b are unknown. Here, W_a *and* W_c would represent each shareholder's valuation and objective, respectively.

For simplification, we define

$$\beta_a \equiv E[b \mid b > b_a] \text{ and } \beta_c \equiv E[b \mid b < b_c]$$

which denote the average bias of the post-trade shareholder base for, respectively, the activist and conservative equilibrium. The average bias of the post-trade shareholder base plays a crucial role in the following analysis. Specifically, while the share price hinges on the valuation of the marginal shareholder, the following result demonstrates that shareholder welfare hinges on 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,

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

Naturally, market-clearing results in a state where all gains of shareholders who sell their shares are offset by losses of shareholders who buy new shares. Since selling shareholders dispose of their entire stake e, their valuations are entirely captured in the transactions made by buying shareholders. Therefore, the welfare of the pre-trade shareholder base equals that of the post-trade shareholder base, represented respectively as $E[v(b, q_a) \,|\, b > b_a]$ in the activist equilibrium and $E[v(b, q_c) \,|\, b < b_c]$ in the conservative equilibrium. The equality between the valuation of the average post-trade shareholder and the welfare of the shareholder base is ensured by the linearity of $v(b, q*)$ with respect to b.

Lemma 2 emphasizes that shareholder welfare reflects the valuation of the average post-trade shareholder, whereas the collective decision on the proposal is determined by the identity of the median voter. Generally, the median voter and the average post-trade shareholder differ, which aligns with the well-known fact that voting outcomes capture the ordering of voters' preferences but not the intensity of those preferences.

2.3 Main Results

This last part from Levit et al. demonstrates the main frictions of the model and their implications for shareholder prices and welfare. The most prominent is the trading friction, represented in the model by market depth ($\delta < 1$), which stipulates that shareholders can buy only up to x shares and can sell only up to their endowment e, with no short sales allowed. This brings 3 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.

Firstly, we analyze the situation where trading friction is completely removed, assuming $x \to \infty$ and $\delta \to 1$. From Proposition 3, we know that if an activist (conservative) equilibrium exists for some $\delta < 1$, it also exists if $\delta \to 1$. The following result demonstrates the dominance of such frictionless equilibrium over one 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 most extreme shareholder becomes the sole owner of the firm, as his valuation of the firm is the highest, leading him to buy all the shares. This removes the ownership friction (Implication 1). Additionally, this shareholder becomes the median voter, the marginal shareholder, and the average shareholder, essentially removing Implications 2 and 3.

In the rest of this section, we examine the influence of trading friction and its three implications on the shareholder prices and welfare.

2.3.1 Multiple equilibria

Self-fulfilling expectations arise from the interaction between voting and trading: shareholders who anticipate a particular outcome purchase shares, thereby enhancing the likelihood of that outcome occurring. The existence of self-fulfilling expectations implies that both conservative and activist equilibria can coexist. Proposition 3 demonstrates that both equilibria exist whenever

$$H(q_c) < \phi < H(q_a)$$

Literature on multiple equilibrium models in finance include Diamond & Dybvig (1983), Calvo (1988) and Obstfeld (1996). In contrast to these models where different equilibria exhibit a different properties and policy implications, both of our equilibria are symmetric and share similar policy implications.

This results in yet another source of volatility arising from the potential existence of multiple equilibria. Therefore, we consider multiple equilibria as a source of nonfundamental uncertainty, where the same proposal voted on at two firms with similar characteristics and fundamentals could yield significantly different voting outcomes and valuation effects. This variability occurs when agents adjust their expectation due to exogenous factors, leading them to coordinate on different equilibria. Primary variables affecting the existence of multiple equilibria are highlighted in the next proposition.

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 ($\tau \,\epsilon\, (\underline{\tau}, \overline{\tau})$), 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 ($\phi \,\epsilon\, (H(q_c), H(q_a))$).

For higher values of δ, the shareholder base can undergo more substantial shifts toward the expected proposal outcome. Consequently, the interval $(H(q_c), H(q_a))$ widens, thereby increasing the likelihood of both equilibria coexisting.

With very high (very low) majority requirements τ for approving the proposal, the likelihood of multiple equilibria decreases significantly. In such cases, an activist (conservative) equilibrium is unlikely to exist because a high (low) tau necessitates nearly unanimous support (opposition) for the proposal.

Another critical factor is the heterogeneity of the shareholder base. For multiple equilibria to exist, is it essential that both extreme conservatives and activists are present among the shareholders, allowing both equilibria to emerge.

Lastly, extreme values of ϕ eliminate the possibility of multiple equilibria. As indicated by the valuation function, for extreme values of ϕ, shareholders only disagree about the value of one of the policies. When ϕ is high (low), shareholders disagree about the value of the alternative (baseline) policy. As a result, activist (conservative) shareholders with higher valuations purchase all shares, leading to a unique equilibrium. Multiple equilibria arise only when ϕ reaches intermediate values, where shareholder disagreement regarding valuation extends to both policies. Therefore, the probability of proposal approval determines who buys shares, thereby giving rise to multiple equilibria.

The existence of multiple equilibria suggests that shareholders may opt for an equilibrium that results in lower welfare even in a frictionless environment. For instance, consider a scenario where both equilibria exist as $\delta \to 1$, specifically when $H(-\bar{b}) > \phi > H(\bar{b})$, and the activist equilibrium yields higher welfare. However, shareholders may still settle on the conservative equilibrium if, for example, it serves as the focal equilibrium, potentially resulting in lower welfare. Therefore, a frictionless environment does not necessarily guarantee the optimal outcome. Furthermore, even in a frictionless environment, there is no guarantee that the equilibrium will dominate the equilibrium with frictions. For instance, in the scenario where welfare is lower in the conservative equilibrium as $\delta \to 1$, due of continuity, the conservative equilibrium can result in lower welfare compared to an activist equilibrium with δ close enough to 1.

2.3.2 Divergence of Share Price and Shareholder Welfare

In financial economics, it is common to draw a parallel between shareholder welfare and stock prices, often using stock returns to estimate the effects on shareholder welfare. While this parallel seems natural for a homogeneous shareholder base, it may not hold true for a heterogeneous shareholder base. We analyse this by focusing on a single point in time, comparing stock prices and shareholder welfare, and demonstrate that they can move in opposite directions in response to exogenous changes.

Recall that the valuation of the marginal shareholder is equal to the share price, whereas the valuation of the average post-trade shareholder equates to shareholder welfare. Importantly, both valuations depend on the firm's decision on the proposal, which in turn depends on the identity of median voter. To properly analyze this chapter, we must also determine when shareholder welfare and share prices reach their maximum. For this analysis, we use a though experiment: under ceteris paribus conditions, when does $v(b, q*)$ reach its maximum as a function of the median voter's bias, $-q*$? From the valuation of the no-vote benchmark case, we obtain:

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

Therefore, the valuation $v(b, q*)$ of a shareholder with bias b is maximized if $-q* = b$, meaning that the choice of the shareholder and the median voter aligns. By combining the price and welfare in activist (conservative) equilibrium, that is $p_a = v(b_a, q_a)$ and $W_a = e \cdot v(\beta_a, q_a)$ (or $p_c = v(b_c, q_c)$ and $W_c = e \cdot v(\beta_c, q_c)$, respectively), we arrive at the following result:

Lemma 3

1. 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).

2. 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).

Lemma 3 suggests that both shareholder welfare and share price increase when the median voter moves toward the position of the average post-trade shareholder and the marginal shareholder, respectively. Conversely, they decrease when the median voter moves in the opposite direction. We utilize this observation in our next proposition:

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.

As an example of such change, we demonstrate that the parameter τ solely impacts the median voter (as indicated by the equations for q_a and q_c previously), while it does not affect the marginal shareholder or the average post-trade shareholder. For instance, increasing τ makes the median voter more conservative, as it increases the threshold for approval due to more conservative shareholders supporting the proposal. Corollary 3 follows directly from these observations.

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.

The idea behind Corollary 3 and Proposition 6 is uncovered with the aid of Figure 4, depicting the activist equilibrium.

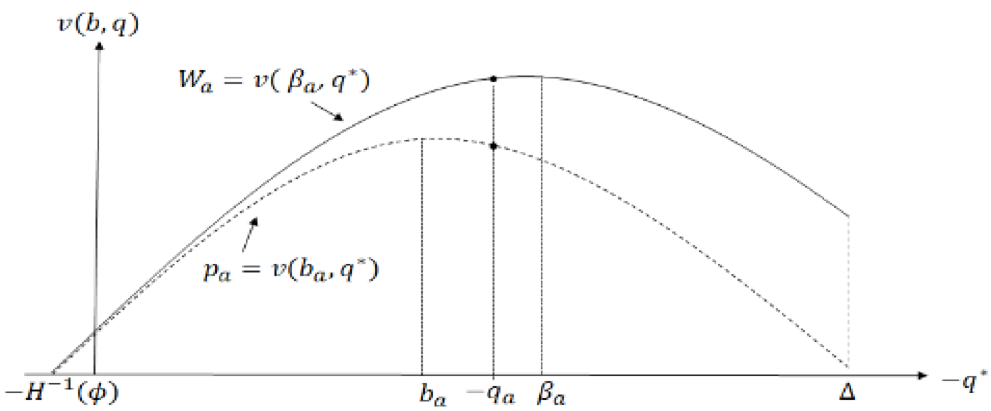

Figure 2.4: Opposing effects on price and welfare (Levit *et al.* (2024))

Figure 4 is constructed such that the functions $p_a = v(b_a, q*)$ and $W_a = v(\beta_a, q*)$ provide the share price and shareholder welfare, respectively, for any given $q*$. According to Lemma 3, the maximum shareholder welfare occurs when the decision rule aligns with that of the average post-trade shareholder, while the maximum share price occurs when the decision rule matches that of the marginal shareholder. As a result, any change in majority requirement τ, which inevitably shifts the position of the median shareholder, leads to either an increase in share price and a decrease in shareholder welfare, or vice versa.

Proposition 6 and Corollary 3 stem from Implication 3: Since price reflects the valuation of the marginal shareholder rather than that of the average post-trade shareholder or the median voter, they do not fully represent preferences. Given the presence of trading and voting frictions in our model, which result in a heterogeneous shareholder base post-trade, the opposite movement trend continues under the conditions described above. In conclusion, this analysis underscores the potential shortcomings of using share price as a proxy for shareholder welfare.

Chapter 3

Alternative models

In the following chapters, I will explore various scenarios by slightly adjusting the initial conditions of the baseline model and conducting a thorough analysis of each resulting model. While the baseline model already describes real-world situations, these new settings and examples provide further insights into specific conditions that may impact shareholder behavior and voting outcomes.

The primary focus will be on cases that highlight the diversity in shareholder motivations and their effects on decision-making processes. By examining these scenarios, we aim to understand how different initial conditions, such as the timing of information release or varying shareholder biases, influence the overall dynamics of trading and voting.

Key Contributions and Insights

1. Impact of Information Timing: We will analyze scenarios where the timing of information release affects trading and voting. For example, studying cases with minimal time between trading and voting can show how immediate market reactions shape the final vote.

2. Diverse Shareholder Preferences: By distinguishing between company lovers and company haters, we will explore how varying degrees of shareholder enthusiasm or reluctance impact market behavior and governance outcomes.

3. Market Dynamics and Equilibrium: The scenarios will reveal how slight changes in initial conditions can lead to different market equilibria, shed-

ding light on the robustness of the baseline model's predictions and providing a deeper understanding of equilibrium uniqueness.

4. Real-World Applications: Each scenario will mirror specific real-world conditions, such as expedited voting processes in mergers or regulatory approvals, helping to illustrate how theoretical models apply to practical situations.

We will maintain the two-phase analysis framework: in the first stage, shareholders engage in trading their shares, followed by the second stage, where they cast their votes after observing a public signal about the state of the world. Each scenario will specify what changes from the baseline model, allowing readers to grasp the significance of the additional analysis right from the beginning.

Chapter 4

Zero policy uncertainty

I begin the analysis with a special case of the baseline model, which I refer to as "Zero Policy Uncertainty". In this scenario, the value of any additional information received after the trading stage is effectively zero. This is implemented by aligning the pre-trade expectation of state $\theta(q_0)$ with the post-trade expectation q.

4.1 Motivation

Understanding this scenario is crucial because it helps to explore the impact of limited or no new information on the relationship between trading and voting. By examining situations where shareholders have more information at the trading stage but receive no new insights before voting, we can gain valuable insights into how trading decisions and market behavior directly influence voting outcomes. This is particularly relevant in contexts where information flow is constrained or where the timing between trading and voting is very short.

This situation reflects a condition where the feedback loop between trading and voting becomes even more pronounced. With no additional information available and everyone sharing the same prior distribution of the state θ, the voting outcome relies heavily on the results of the trading stage, which determines the price and the marginal shareholder.

In practical terms, this could mirror scenarios where the announcement of a vote occurs close to the actual voting date, leaving insufficient time for new information to emerge. For example, in a corporate merger or takeover, if the announcement is made shortly before the action, shareholders have minimal time to react, making the initial trading response crucial since little to no new information surfaces before voting.

Other instances of expedited voting include regulatory approvals, proposals for Annual General Meetings (AGMs), or any emergency situations where the interval between the announcement and the vote is brief. By studying this special case, we can better understand how trading activity and pre-vote information significantly influence the voting outcome, thus providing deeper insights into decision-making processes in high-pressure or time-constrained environments.

4.2 Analysis

We begin our analysis by identifying the changes from the baseline model and establishing our valuation function. Since we receive no additional information, we conclude that $q = q_0$, meaning our prior and posterior expectations are identical. The valuation of shareholder b is then given by:

$$v(d, \theta, b) = v_0 + (b + q_0) \cdot (d - \phi)$$

We then proceed to determine the cutoff rule for voting $q*$. A shareholder will vote in favor of the proposal if and only if:

$$\begin{aligned} v(1, \theta, b) &> v(0, \theta, b) \\ v_0 + (b + q_0) \cdot (1 - \phi) &> v_0 - (b + q_0) \cdot \phi \\ (b + q_0) \cdot (1 - \phi) &> -(b + q_0) \cdot \phi \\ (b + q_0) \cdot (1 - \phi) + (b + q_0) \cdot \phi &> 0 \\ (b + q_0) \cdot (1 - \phi + \phi) &> 0 \\ b + q_0 &> 0 \end{aligned}$$

Thus, we arrive to the same cutoff rule $q*$ as in the baseline model:

$$q* = -b$$

Now we only have to rewrite the valuation function of a shareholder with bias b and prior and posterior expectation $q = q_0$ as a function of cutoff rule $q*$:

$$v(b, q*) = E[v(1_{[q_0 > q^*]}, \theta, b)]$$
$$v(b, q*) = v_0 + b \cdot (H(q*) - \phi) + H(q*) \cdot E[\theta \mid q_0 > q*]$$

where the probability of proposal approval is defined using q_0:

$$H(q*) = Pr[q_0 > q*]$$

As we can see, the valuation increases in b if and only if $H(q*) > \phi$. We derive the rest similarly to the baseline model, using the prior expectation instead of posterior expectation, as we know that they are equal.

Proposition A (Zero policy uncertainty)

An equilibrium of the game with trading and voting always exists.

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

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

   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 $b_a = G^{-1}(\delta)$. The proposal is accepted if and only if $q_0 > q_a$, and the share price is given by $p_a = v(b_a, q_a)$.

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

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

   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 $q_0 > q_c$, and the share price is given by $p_c = v(b_c, q_c)$.

3. Other equilibria do not exist.

4.3 Conclusion

In summary, Proposition A highlights the existence of equilibria under zero policy uncertainty, distinguishing between activist and conservative scenarios based on shareholder biases.

The activist equilibrium arises when $H(q*) > \phi$, allowing shareholders with higher biases to actively participate in the market, thereby influencing the acceptance of proposals positively. Conversely, the conservative equilibrium emerges when $H(q*) < \phi$, where lower-bias shareholders dominate trading decisions, potentially leading to a rejection of proposals.

Ultimately, the analysis illustrates how shareholder biases and the state of information impact voting behavior and market dynamics. Understanding these equilibria not only enhances our comprehension of shareholder interactions but also provides valuable insights for strategic decision-making within firms.

Chapter 5

Company lovers and Company haters

Next on the list is a scenario that distinguishes between company lovers and company haters, offering a nuanced perspective on shareholder behavior. In reality, some individuals own shares in firms despite not being particularly fond of their ownership. This situation typically boils down to two types of shareholders:

Reluctant Shareholders

Inherited or Accidental Ownership: An owner might have inherited or otherwise acquired a stake in a firm they do not particularly like. Such reluctant shareholders often seek to transfer control of their shares to others who are actively engaged in decision-making or look for a buyer to sell their stake. Their main motivation is to divest from the firm, as they have little interest in participating in its governance or improving its situation.

Change in Preferences: Over time, a shareholder's preferences can shift due to lifestyle changes, personal circumstances, or evolving values. These shareholders may have initially invested in the firm for reasons that no longer hold. They are motivated by the desire to disengage from the firm entirely, preferring to sell their shares for a reasonable price rather than try to influence the firm's decisions.

Enthusiastic shareholders

Genuine Engagement: On the other hand, some shareholders are genuinely enthusiastic about their ownership. They derive satisfaction from influencing the firm's decisions and have a positive valuation of their shares that goes beyond just the immediate outcomes of proposals. For these company lovers, the joy of having a say in the firm's direction and the potential to drive positive change is a significant motivating factor, even if the firm's performance or the results of specific proposals do not align perfectly with their preferences.

5.1 Motivation

This scenario is not merely a special case but an extension of the baseline model. By distinguishing between company lovers and company haters, it enriches our understanding of shareholder behavior by capturing the diversity in motivations and preferences. This extension adds depth to the model by reflecting how different shareholder sentiments—whether enthusiastic or reluctant—impact trading and voting dynamics.

Understanding these differences is crucial for accurately predicting market behavior and firm governance. Company lovers and haters interact with the firm in fundamentally different ways, which influences decision-making processes and market outcomes. This refined approach provides valuable insights into how varying degrees of shareholder engagement affect the overall governance and performance of the firm, going beyond the uniform assumptions of the baseline model.

5.2 Analysis

At the beginning of the analysis, we must consider what has changed from the baseline model. In this case, private values are not only state-independent but also policy-independent. This leads to a different valuation for shareholder b regarding potential outcomes. We define shareholder b as having the same private payoff for every possible outcome. We refer to shareholders with lower (even negative) b as "company haters", while those with higher b are termed "company lovers". Everything else remains unchanged, i.e. it follows the same specifications as in the baseline model.

This results in a new valuation function from the perspective of shareholder b:

$$v(d, \theta, b) = v_0 + b \cdot (d + \phi - 2 \cdot d \cdot \phi) + \theta \cdot (d - \phi) = v_0 + \begin{cases} \phi \cdot (-\theta + b) & \text{if } d = 0 \\ (1 - \phi) \cdot (\theta + b) & \text{if } d = 1 \end{cases}$$

From this equation, we can clearly see that the private payoff of the shareholder b is independent on the policy decision, aligning with the initial setting. Furthermore, since the payoff associated with the bias always has the same sign as the bias itself (as the bracket multiplying the bias is nonnegative), we conclude that shareholders with higher b assign a higher valuation to the share compared to those with lower values. This is consistent with the definitions of company lovers and company haters.

Importantly, since $\bar{b} < \delta$, which indicates that even the most extreme shareholders base their vote on the signal, we can conclude that a shareholder in the voting stage will vote in favor of the proposal if and only if it increases their valuation, specifically if $q > 0$. This condition is not surprising, as shareholders aim to align the state of the world with the chosen policy. This establishes our cutoff rule for shareholder voting as $q* = 0$.

The identity of marginal shareholder is derived similarly to the no-vote benchmark case. We know that the number of shares sold must equal the number of shares bought. This implies that $1 - G(b_m)$ shareholders will buy x shares, while $G(b_m)$ shareholders will sell e shares. From this, we conclude that the marginal shareholder b_m is defined as:

$$\begin{aligned} x(1 - G(b_m)) &= e \cdot G(b_m) \\ x - x \cdot G(b_m) &= e \cdot G(b_m) \\ x &= x \cdot G(b_m) + e \cdot G(b_m) \\ x &= (x + e) \cdot G(b_m) \\ \frac{x}{x + e} &= G(b_m) \\ b_m &= G^{-1}\left(\frac{x}{x + e}\right) \end{aligned}$$

The trading price is also determined by the marginal shareholder, as they are indifferent between selling and buying. The marginal shareholder, after trading, has the lowest bias among those still holding shares. As a result, this shareholder is the most company-hating, in relative terms, compared to others who continue to hold shares. However, this does not necessarily mean that the marginal shareholder is a company hater; rather, they are simply less favorable towards the company than those with higher biases.

5.3 Conclusion

We conclude this scenario with a proposition that summarizes the information presented above:

Proposition B (Company lovers and Company haters)

There always exists a unique equilibrium with the marginal shareholder b_m, decision rule $q* > 0$ and price defined as $p = v(b_m, 0)$.

As a result, we conclude that there always exists a unique equilibrium where company lovers buy shares from company haters. This occurs naturally, as the valuation of company lovers exceeds that of company haters, allowing the latter to exit the company.

The uniqueness of the equilibrium comes from having a clear decision rule, $q > q*$, and a specific price, $p = v(b_m, 0)$. This price is determined by the marginal shareholder,b_m, whose valuation perfectly balances the market. Importantly, this equilibrium is unique and does not depend on the initial structure of the shareholder base; it is solely determined by the decision rule and the valuation of the marginal shareholder. This is because the equilibrium price and the marginal shareholder are defined by aggregate market conditions and trading behaviors, rather than by the specific biases or initial distributions of the shareholders.

However, in equilibrium, some company haters from the pre-trade shareholder base may still remain after trading occurs due to the restrictive condition of market depth (δ). With lower δ, some company haters are unable to exit because the share price does not exceed their valuation. Conversely, for sufficiently large δ, all company haters can sell their entire stake to company lovers and exit the firm, resulting in higher overall welfare. Thus, we observe that a lower δ reduces welfare.

Chapter 6

Balancing Common and Private Values

In this section, I examine the effect of both common and private values on shareholder decision making by implementing different weights for each value. This approach allows us to understand how these values can have varying impacts and differing levels of importance in the final decision.

The motivation behind this setting is straightforward. For instance, even if I am highly biased towards a proposal, a fundamental change in the state of the world may significantly impact my valuation. In such a scenario, even with a strong bias towards the proposal, an information conveyed in the signal q may lead me to choose the status quo policy instead. Conversely, imagine I am not particularly concerned about the current situation because I have another motivation driving my private benefit; in this case, I would follow my bias regardless of the state of the world.

Implementing different weights for private and common values enables me to specifically define the importance of each component. A real-life example of such a setting could be a proposal about Carbon Emission Regulations.

For the common value aspect, the weight could reflect the importance of environmental protection, such as reducing pollution and mitigating climate change. It could also address public health issues, where improved environmental conditions like better air quality lead to healthier lives, or it might focus on long-term economic stability by preventing environmental hazards and associated costs.

On the other hand, the weight influencing private value might reflect the costs borne by individuals, such as higher energy expenses or the need to invest in expensive technologies, renewable energies, or recycling machinery. It might also consider business profitability, particularly in the short term, where the immediate effects of increased regulatory compliance costs heavily impact profitability. Finally, it could include individual convenience, such as the use of public transportation versus personal cars.

Other instances where different weights might be applied include state-covered areas such as healthcare and education, or, as mentioned earlier, public transportation projects. Highly controversial issues like vaccination or gun control laws also serve as excellent examples of policies with different weights.

6.1 Analysis

While adjusting our model with different weights would be beneficial, we can achieve our desired outcomes using our current settings and variables with a slight modification. We have already incorporated ϕ as a factor that reflects shareholders' disagreement about the valuation of policies. By using the same ϕ but applying it only to one of the values, we essentially create a model where common and private values have different weights. In this modified model, ϕ influences only the common value, leaving the private value unaffected.

However, it's important to note that this approach does not cover all possible scenarios involving different weights. While this modification provides useful insights, it is limited in scope. I will address these additional scenarios and their implications in the conclusion section.

This small adjustment changes the condition for proposal approval during the voting stage, as our previous condition included ϕ as a determining factor. We will now begin with the derivation of the valuation function:

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

We then derive more useful result for the analysis by adjusting the equation:

$$v(d, \theta, b) = v_0 + (1-d) \cdot (\phi \cdot (-\theta)) + d \cdot (1-\phi) \cdot \theta + (1-d) \cdot (-b) + d \cdot b$$
$$v(d, \theta, b) = v_0 + \theta \cdot ((1-d) \cdot (-\phi) + d \cdot (1-\phi)) + b \cdot ((d-1) + d)$$
$$v(d, \theta, b) = v_0 + \theta \cdot (-\phi + d \cdot \phi + d - d \cdot \phi) + b \cdot (2d-1)$$
$$v(d, \theta, b) = v_0 + \theta \cdot (d - \phi) + b \cdot (2d-1)$$

Now we recall that according to Lemma 1, if the proposal is decided by a shareholder vote, there exists $q*$ such that for any equilibrium the proposal is approved if and only if $q > q*$. We can thus rewrite our valuation function in terms of expectation, i.e. the valuation of shareholder b prior to the realisation of q as a function of the cutoff $q*$:

$$v(b, q*) = E[v(1_{[q>q*]}, \theta, b)]$$

We utilize the same indicator function as in the baseline model, which is equal to 1 if $q > q*$ and 0 otherwise. We can express the valuation in terms of the probability of proposal approval $H(q*)$:

$$\begin{aligned}
v(b, q*) &= E[v(1_{[q>q*]}, \theta, b)] \\
v(b, q*) &= E[v_0 + \theta \cdot (1_{[q>q*]} - \phi) + b \cdot (2 \cdot 1_{[q>q*]} - 1)] \\
v(b, q*) &= v_0 + H(q*) \cdot E[\theta \mid q > q*] - \phi \cdot 0 + 2b \cdot H(q*) - b \\
v(b, q*) &= v_0 + b \cdot (2H(q*) - 1) + H(q*) \cdot E[\theta \mid q > q*]
\end{aligned}$$

We observe that $v(b, q*)$ is increasing in b if and only if $2H(q*) > 1$, which can be rewritten as $H(q*) > 0.5$. Thus, we have established a new condition for the existence of an equilibrium. This implies that activist shareholders value the firm more if the probability of proposal approval exceeds $\frac{1}{2}$.

The remaining results are derived in a manner similar to the baseline model and are summarized in the following proposition.

Proposition C (Balancing common and private values)

An equilibrium of the game with trading and voting always exists.

1. An activist equilibrium exists if and only if $H(q_a) > \frac{1}{2}$, where

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

   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 $b_a = G^{-1}(\delta)$. The proposal is accepted if and only if $q > q_a$, and the share price is given by $p_a = v(b_a, q_a)$.

2. A conservative equilibrium exists if and only if $H(q_c) < \frac{1}{2}$, where

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

   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 $p_c = v(b_c, q_c)$.

3. If and only if $H(q*) = \frac{1}{2}$, the equilibrium is neither activist nor conservative. This results in a knife-edge case where all shareholders have the same valuation and no shareholders trade.

   However, since $H(q*) = \frac{1}{2}$ represents a specific point with a probability of zero in a continuous distribution, this case is negligible and can be disregarded in practical terms.

4. Other equilibria do not exist.

6.2 Conclusion

In this chapter, we have explored how varying weights on common and private values can significantly influence shareholder decision-making. By introducing different weighting approaches, we have clarified the conditions for equilibrium and highlighted the role of proposal approval probabilities.

The model with ϕ applied only to the common value allows readers to adjust the importance of the common value while keeping the private value's weight constant. This approach illustrates how the common value's significance can range from negligible to dominant. However, it does not permit adjustments to the private value's importance beyond a fixed level, which may limit the model's applicability to scenarios where private values play a more dynamic role.

To address scenarios where both components can be weighted differently, we propose two approaches:

1. **Single Weight Approach with Unbounded ϕ**

   In this approach, the private component remains unchanged, essentially assigning it a weight of 1, while the common component is weighted by a factor ϕ, where ϕ ranges from 0 to infinity.

   Interpretation:

   - As ϕ approaches 0, the common component has negligible weight, and the model focuses almost entirely on the private component.
   - As ϕ approaches infinity, the common component dominates, and the private component becomes infinitesimally small in comparison, effectively making it negligible.

   This approach allows readers to explore how the importance of the common component can be adjusted from being nearly irrelevant to overwhelmingly dominant. However, it limits the adjustment of the private component's importance to a constant value, meaning that while the common component can be varied, the private component remains fixed and cannot be made less important than the common component.

2. **Dual Weight Approach with Finite ϕ and φ**

   Here, we implement two distinct weights, ϕ for the common component and φ for the private component, with both weights being in the range $(0, 1)$.

   Interpretation:

   - If $\phi = \varphi$, both components have equal importance, and their valuations are balanced.
   - If $\phi > \varphi$, the common component is weighted more heavily, making it more influential in the overall valuation.
   - If $\varphi > \phi$, the private component is given more weight, making it more significant in determining the valuation.
   - For extreme values where ϕ or φ approaches 0, the model essentially focuses solely on the other component, as the component with a weight of 0 becomes negligible.

> This approach provides a more nuanced framework for analyzing how varying the weights of both components influences the model's outcomes. It allows for scenarios where both components can have different levels of importance, including cases where one component can be dominant or negligible relative to the other.

Even though our analysis reveals some intriguing results, it is important to acknowledge that it remains somewhat restricted by the conditions under which it operates. Specifically, the focus has been on scenarios where the importance of the private component is held fixed and never negligible. This choice stems from a personal perspective that sees the private component as inherently more significant. Humans are not merely rational agents who act solely on objective measures; they are influenced by personal feelings and biases. In many real-world scenarios, personal values and motivations can have a substantial impact, often overshadowing common values.

This assumption, while speculative, served as a foundational anchor in our analysis, guiding the investigation and providing meaningful results within this framework. Ultimately, the goal is to explore the potential for equilibria where individuals act in specific ways, reflecting their private values alongside the common ones. Even when defined as rational agents, we cannot fully disentangle private values from their decisions. The current analysis, therefore, represents a focused exploration of these dynamics, with room for further research to address a broader range of scenarios where both components may vary in importance.

Chapter 7

Asymmetric Private Values

My last scenario is quite distinct compared to the previous cases discussed. In this scenario, I will alter the structure of private values and their impact on the shareholders' private payoffs concerning the proposal. Specifically, there are three possible outcomes for the shareholders. First, they can choose not to accept the proposal, in which case the private payoff will be zero in both states of the world. Second, they can agree to accept the proposal, where each shareholder either loses their investment I (resulting in a payoff of $-I$) if the state of the world is negative ($\theta = -1$), or earns their investment I (yielding a payoff of I) if the state of the world is positive.

This setting differs from the previous cases in that the private payoffs are asymmetric. While the rejection of the proposal remains state-independent, the approval of the proposal becomes state-dependent. This highlights the importance of aligning the decision with the actual state of the world. In the symmetric case, where payoffs can be both positive and negative, it is a specific scenario in which the revenue from the investment is double the investment itself. I analyze this symmetric case for simplicity, as the objective is to demonstrate the existence of potential equilibria rather than to confuse the reader with a more complex system.

I find this case particularly intriguing, as many real-life proposals may follow a similar path—either investing and facing potential losses or opting not to invest and avoiding any adverse consequences. Examples of such payoff structures include changes in dividend policy, where shareholders vote on whether to maintain or alter the dividend structure. They must contend with the risk of declining stock performance due to a dividend increase or choose to keep the policy unchanged. Other examples include proxy battles regarding management teams and the significant issues surrounding mergers and acquisitions, where the outcome hinges on the success or failure of the merger.

7.1 Analysis

In this scenario, we need to assess what has changed from our baseline model and adjust the specific variables accordingly. I decided to denote the private investment of each shareholder as I as it better reflects the situation. However, we need to define our investment slightly differently. It retains most of the characteristics from previous models: A shareholder with investment I receives additional utility if the proposal is accepted and the state of the world is positive, while suffering disutility when the proposal is accepted in the negative state of the world. A shareholder with investment I receives no utility if the proposal is rejected.

We also introduce the cumulative distribution function (CDF) G, which has full support with positive density g on $[0, \overline{I}]$. This function represents the cross-section of shareholders' investments. However, we need to adjust the interval for G since we only have positive investments. We refer to shareholders with lower investments I as conservatives and those with higher investments I as activists.

Now, let us examine the new valuation function:

$$
\begin{aligned}
v(d, \theta, I) &= v_0 + (1 - d) \cdot (-\theta \cdot \phi) + d\theta(1 - \phi)(1 + I) \\
v(d, \theta, I) &= v_0 + \theta(-\phi + d\phi + d - d\phi + dI - d\phi I)) \\
v(d, \theta, I) &= v_0 + d\theta I(1 - \phi) + \theta(d - \phi)
\end{aligned}
$$

Now, we recall Lemma 1, which states that if the proposal is decided by a shareholder vote, there exists a cutoff $q*$ such that the proposal is approved if and only if $q > q*$. This establishes the cutoff rule $q*$, allowing us to proceed with deriving the valuation of shareholder I prior to signal q as a function of $q*$:

$$v(I, q*) = E[v(1_{[q>q*]}, \theta, I)]$$
$$v(I, q*) = (v_0 + \theta(1-\phi)(1+I)) \cdot H(q*) + (v_0 - \theta \cdot \phi)(1 - H(q*))$$
$$v(I, q*) = v_0 H(q*) + \theta(1-\phi)(1+I)H(q*) + v_0 - v_0 H(q*) - \theta \cdot \phi + \theta \cdot \phi H(q*)$$
$$v(I, q*) = v_0 + \theta H(q*)((1-\phi)(1+I) + \phi) - \theta \cdot \phi$$
$$v(I, q*) = v_0 + H(q*)E[\theta \mid q > q*]((1-\phi)(1+I) + \phi)$$
$$v(I, q*) = v_0 + I(1-\phi)H(q*)E[\theta \mid q > q*] + H(q*)E[\theta \mid q > q*]$$

Now that we have derived the valuation as a function of the cutoff $q*$, we observe that it is increasing with respect to the investment I. This is logical, as the condition for this valuation is that we accept the proposal with sufficiently high probability, making the investment profitable.

In this specific scenario, where the valuation function is strictly increasing in the investment I, we can identify a more specific decision rule by returning to the initial valuation function. A decision rule dictates when to choose an alternative policy. For a shareholder I, it is beneficial to choose an alternative if their valuation for this policy is higher, meaning $v(1, \theta, I) > v(0, \theta, I)$. This simplifies to $q > 0$ or $q* = 0$. This condition is equivalent to the probability of proposal approval $H(q*)$ being greater than $\frac{1}{2}$, since, by definition, a probability of this magnitude implies that the signal q is positive. In the next proposition, we summarize the results:

Proposition D (Asymmetric Private Values)

An equilibrium of the game with trading and voting always exists.

1. An activist equilibrium exists if and only if $H(q*) > \frac{1}{2}$. In this equilibrium, a shareholder with investment I buys x shares if $I > I_a$ and sells his entire endowment e if $I < I_a$, where $I_a = G^{-1}(\delta)$. The proposal is accepted if and only if $q > 0$, and the share price is given by $p_a = v(I_a, 0)$.

2. A conservative equilibrium exists if and only if $H(q*) \leq \frac{1}{2}$. In this equilibrium, no shareholders trade as their valuations are all equal and by rule, shareholders indifferent between buying and selling do not trade. The proposal is accepted if and only if $q > 0$.

3. Other equilibria do not exist.

7.2 Conclusion

Although the result may seem surprising, it arises directly from the valuation function. When the probability of a positive state of the world exceeds $\frac{1}{2}$, shareholders with larger investments I place a higher value on the company, prompting them to buy shares from those who value it less. The marginal shareholder, who is indifferent between buying and selling, is the shareholder with the lowest investment I among the post-trade owners.

Conversely, if the probability of a positive state is insufficient, shareholders tend to prefer the status quo, resulting in the same valuation for all. Consequently, no trades occur. In both scenarios, the decision is unanimous, as all shareholders aim to maximize their value, which is closely tied to the state of the world.

In conclusion, this chapter has examined the complex interplay between shareholder decision-making and the varying perceptions of risk within investment proposals. By highlighting the distinct outcomes associated with different choices, we have illustrated how the dynamics of private payoffs shape the motivations of shareholders. As we navigate through these obstacles, it becomes clear that understanding risk is essential for informed decision-making.

Chapter 8

Conclusions

In this thesis, we extend the baseline model established by Levit et al. (Levit *et al.* (2024)) by analyzing alternative scenarios to explore how various shareholder dynamics influence corporate decision-making. Our analysis introduces distinct modifications to the baseline model, focusing on scenarios with zero policy uncertainty, differing shareholder biases, and variations in the weighting of common and private values.

- **Zero Policy Uncertainty:** We find that equilibria always exist under zero policy uncertainty, where shareholder biases play a critical role. Specifically, we identify two types of equilibria:

  - An activist equilibrium, where shareholders with strong positive biases engage actively in market transactions, leading to the acceptance of proposals if their biases exceed a certain threshold.
  - A conservative equilibrium, where lower-bias shareholders adopt a more cautious stance, potentially rejecting proposals.

  This result highlights how the clarity of policy and shareholder biases affect market behavior and decision-making.

- **Company Lovers vs. Company Haters:** Our analysis reveals that a unique equilibrium is always present where shareholders with strong positive views (company lovers) buy shares from those with negative views (company haters). This equilibrium is characterized by a specific market price and decision rule. The ability of company haters to exit the firm depends on market depth, with lower market depth reducing overall welfare. This finding contrasts with the baseline model by emphasizing how shareholder preferences and market conditions impact trading dynamics and firm valuation.

- **Balancing Common and Private Values:** In this section, I investigated the impact of varying weights on common and private values in shareholder decision-making. By adjusting the valuation function to apply a weight ϕ specifically to the common value while maintaining the private value constant, I explored how changes in the relative importance of these values affect proposal approval conditions. The results indicate that shareholder valuation increases when the probability of proposal approval exceeds 50%, reflecting that activist shareholders value the firm more when the likelihood of approval is higher.

  To address scenarios where both value components could dynamically vary, I proposed two solutions. These solutions aim to encompass a broader range of cases, although this study primarily emphasizes the effects of varying common value weights. This approach provides significant insights into shareholder decision-making dynamics and highlights areas for further research to fully capture the complexities of shareholder preferences and market behavior.

- **Asymmetric Private Values:** In scenarios with asymmetric private values, we observe that equilibria always exist, characterized by the extent of shareholders' investment and risk perceptions. When the probability of a positive state of the world is high, shareholders with larger investments buy shares from those with lower valuations. Conversely, when the probability is low, shareholders tend to stick with the status quo, resulting in no trades. This analysis highlights how variations in private valuations and risk perceptions influence shareholder decisions and market stability.

As a result, this thesis extends the baseline model by incorporating alternative scenarios that capture the complexities of shareholder dynamics. By examining how zero policy uncertainty, varying shareholder biases, and changes in value weights affect corporate policies and market behavior, the research provides insights into shareholder interactions and decision-making. The analyzed scenarios reveal nuanced effects on trading and voting outcomes, enhancing our understanding of corporate governance and broadening the factors considered in shareholder behavior and corporate strategies.

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