Stock selling during takeovers*

Guillem Ordóñez-Calafí
University of Bristol†

John Thanassoulis
University of Warwick & CEPR‡

November 29, 2019

Abstract

Stock sales during takeover negotiations weaken the target board's ability to recommend against the takeover, i.e., to resist. Sophisticated shareholders therefore face a coordination problem when deciding whether to sell-out early; and their actions generate a feedback loop between trading volumes and takeover outcomes. Bidding firms, anticipating the pressurising effect of future share sales on the target board, may reduce their bids. We study these tensions theoretically. We find that increasing the influence of shareholders during the bidding process lowers equilibrium bids; elongates the bidding process; but raises the overall probability of bid acceptance; and raises expected premia for unsophisticated shareholders.

JEL: C72, G34, G38.

Keywords: Takeovers, takeover resistance, shareholder coordination, market feedback, global games.

*We are grateful to the editor Bart Lambrecht, and to the review team whose comments have greatly improved this paper. We are also grateful for insightful comments to Amil Dasgupta, Thierry Foucault, Andrea Gamba, Javier Gil-Bazo, Kobi Glazer, Esa Jokivuolle, Kebin Ma, Lei Mao, Wande McCunn, Motty Perry, Herakles Polemarchakis; and to seminar audiences at the University of Warwick, the University of Oxford, the Finance Theory Group meeting at Imperial College London, Jornadas de Economía Industrial and the University of Bristol. All errors remain our own, and the views in this paper cannot be taken as being shared by the University of Bristol, the University of Warwick, or by the U.K. Competition and Markets Authority.

†Department of Accounting and Finance, University of Bristol. g.ordonez-calafi@bristol.ac.uk

‡Warwick Business School, University of Warwick; and U.K. Competition and Markets Authority. john.thanassoulis@wbs.ac.uk

1 Introduction

In 2009 Kraft Foods launched a hostile bid for Cadbury. Cadbury's managerial board declared the offer "unattractive" because it claimed the bid undervalued the company even though it offered a premium on market prices. This initial rejection led to several months of tough negotiations between the two companies which ended with a Kraft offer that won the Cadbury's Board's blessing. Some prominent board members remained of the view that the deal was bad, but nonetheless the Board's approval led to the takeover succeeding. Sir Roger Carr, Cadbury's Chairman, admitted that the selling-out of prominent long-term shareholders during the takeover negotiations led him to close the deal:[1]

> "In the final analysis of the deal, it was the *shift in the shareholder register* that lost the battle for Cadbury." Roger Carr, former Chairman of Cadbury (emphasis added).[2]

Takeover resistance is acknowledged to play an important role in the market for corporate control (e.g. Dimopoulos and Sacchetto (2014)). Resistance typically lengthens takeover negotiations and during the process shareholders at the target company sell stock to lock-up abnormal returns (Jensen and Ruback (1983)) or to hedge against the risk that negotiations fail, also known as "top-slicing".[3] Takeover resistance is nonetheless weakened by these sales for at least three reasons.

Firstly, boards' recommendations opposing takeover bids are often challenged in the courts (Armour and Skeel Jr (2007); Mathias et al. (2014)) and it is hard for Directors to argue an offer undervalues a firm when shareholders are selling at a price that is typically lower than the takeover bid.[4] Secondly, a substantial amount of stock sold during the negotiations is acquired by institutional investors such as risk-arbitrageurs (Cornelli and Li (2002)) and hedge fund activists (Jiang et al. (2018), Corum and Levit (2019)) with a declared interest in the takeover going through. Finally, as more prominent and sophisticated long-term shareholders sell, the probability that such sales become salient for unsophisticated

[1] See in particular *Sweet taste of success for Cadbury deal-maker Roger Carr*, The Telegraph, 8 February 2010, in which Carr cites as key that during the takeover process "just over 25pc of long term Cadbury investors sold". Further press coverage includes *The inside story of the Cadbury takeover*, Financial Times, 12 March 2010; and *Case Study: Kraft's takeover of Cadbury*, Financial Times, 9 January 2012.

[2] 'UK takeover threshold should be raised, says ex-Cadbury chairman Roger Carr,' Daily Telegraph, 10 February 2010.

[3] The term "top-slicing" was repeatedly used in the press coverage of the Kraft-Cadbury case. See, e.g., *Defend UK firms from foreign takeovers, says former Cadbury boss*, The Guardian, 9 February 2010.

[4] Armour and Skeel Jr (2007) argues that litigation for excessive takeover resistance is either led by the Bidder or by target shareholders. The suit typically claims that "the target managers have breached their fiduciary duties – that the managers' resistance is beyond the pale – and that the managers should be forced to remove their defenses so that the takeover can be considered by the target's shareholders."

shareholders rises (Bordalo et al. (2013)). In turn this increases the likelihood that now attentive shareholders re-assess whether the Board is indeed serving shareholders' interests, or their own. This raises the probability that such shareholders will defy the Board's advice and vote to sell, and in any case reduces the likely length of tenure of current management.

These effects cause the Board to dislike share sales during the takeover process and push the Board towards recommending the takeover. Failure to do so increases the risk of subsequent litigation and of a negative impact on the managers' career prospects (see e.g., Ferris et al. (2007)).

The impact of early share sales on takeover outcomes and the potential advantage that it grants to bidding companies has raised concerns among governments and financial regulators (see for example Hillier et al. (2012)). They worry that the market for corporate control might be driven by opportunistic investors that put long-term value creation at risk. The policy responses that have been considered often aim to insulate managerial boards from shareholder pressure by either enhancing the voting rights of long-term shareholders as compared to new holders of stock, or they strengthen managers' discretionary power to, in effect, ignore stockholders' views on a takeover (see e.g., Lipton (2005)). The impact of these measures is contentious. For instance, Takeover Panel (2010) (para 3.10) argues that if new shareholders were to have less influence on a takeover outcome, demand for shares could reduce, resulting in lower trading prices and hence potentially causing bids to succeed at lower prices than would have been the case. This in turn could benefit acquiring companies, which would have incentives to offer smaller premiums. The subtlety of these mechanisms motivates our analysis.

We study a takeover bid in a three-period game in a setting such that the target Board is inherently resistant, and in which the Board's recommendation is deterministic for the outcome. At the initial period the bidder makes an offer that is unobservable to other market participants, reflecting that takeover negotiations are often initiated confidentially to prevent distortions arising through the stock market (Betton et al. (2014)). If the Board rejects the initial offer, negotiations move to the next period. At the second period the bidder makes a new offer that is now observable to others. At the third period target shareholders can sell their shares before the Board decides whether or not to accept the offer. Importantly, stock sales during this offer period diminish the Board's ability to resist the takeover. This creates an environment of strategic substitutes for shareholders deciding whether to sell. If enough other shareholders sell, the Board will find themselves unable to reject the takeover offer, e.g. for the reasons of litigation risk described above. However in this case an individual shareholder prefers to hold her shares so as to gather the full takeover premium and free-ride on the pressure created by others' stock sales. In contrast, if many other shareholders do not sell early then the takeover will likely fail. In this case a shareholder would rather sell during takeover negotiations so as to profit from the raised market price before the stock price returns to its original value after the rejection of the takeover.

Since the seminal work of Grossman and Hart (1980) a large number of papers have studied coordination problems amongst target shareholders. Our work gives a critical role to the Board in permitting mergers, and allows for a body of naïve shareholders who are not strategic. These departures from the Grossman and Hart (1980) setting are realistic in many, and perhaps even the majority of, cases (Baker and Savasoglu (2002)). We further enrich the analysis of takeovers by recognizing that the Board's recommendation is subject to stock sales that create a coordination problem at an earlier stage, i.e. during takeover negotiations.

In equilibrium both the stock price and stock sales during takeover negotiations are determined endogenously. Thus we have a shareholder-led coordination feedback loop between stock sales, the interim stock price and the final takeover outcome. We use the information structure of a global game and characterise a unique equilibrium in which a fraction of target shareholders sell their shares during takeover negotiations. In particular, we suppose that the level of managerial resistance and entrenchment is private information about which market participants have a common prior. In our model sophisticated shareholders receive dispersed noisy signals and update their beliefs, thus determining their valuation of the stock. Any individual sophisticated shareholder can sell out of the firm by tendering their shares to a competitive market maker. We endogenise the market price by assuming the market maker observes the net order flow, which includes noise trades plus sophisticated stock holder sales, before setting a price for the shares in the offer period which reflects their expected value based on the probability of deal completion.

The bidder internalises the impact of stock sales on the takeover process, so whether negotiations are prolonged is also determined endogenously. The bidder faces the standard price-probability trade-off: a smaller offer yields a higher surplus whenever it is accepted by the target Board, but it reduces the probability of acceptance (Cuñat et al. (2017)). In addition, the dynamic nature of the takeover process leads the bidder to make sequentially higher offers. This standard process is disrupted by the effect of stock sales in the late stage of negotiations. We study whether the potential for future sales by sophisticated shareholders harms shareholders in general, as Takeover Panel (2010) warned, by inducing acquiring companies to offer smaller premiums, or whether instead these premia are more likely to be accepted by target Boards so as to benefit shareholders overall. Through comparative statics we seek to help regulators and market analysts understand the mechanisms that underpin the interaction between stock sales, shareholder influence, equilibria takeover premia, and success rates.

We first demonstrate that the model generates a unique equilibrium in threshold strategies which resolves the hold-or-sell tension faced by sophisticated shareholders. This equilibrium requires sufficient dispersion of beliefs across sophisticated shareholders, a condition that results from the information structure of a global game in a setting of strategic substitutes. Enough belief dispersion relative to the externalities of the hold-or-sell decision on other shareholders ensures that the feedback effects, though moderating the equilibrium, do not destroy it.

This model allows us to disentangle the effect on equilibrium bids of having a larger base of sophisticated shareholders, or allowing them more influence on the Board. We confirm that having shareholders with more influence lowers the bids that potential acquirers offer, both initially and after the offer period. Thus the bidder does shade her bid down as she reflects on the potential for future stock sales during the negotiation process to weaken the target Board's resistance. The lower initial bid lowers the probability that the initial bid will be accepted. But the probability that the second bid is accepted rises with the influence of sophisticated shareholders, even though the equilibrium bid is lower. The bidder is careful not to shade her bid down too far. In this sense the bidder shares some of the rents with the target's shareholders to get the deal over the line. This effect was not anticipated in Takeover Panel (2010).

Our next result formalises the new channel we propose in which early stock sales affect the Board's decision to recommend a takeover. We show that lowering the Board's exposure to shareholder pressure increases, rather than reduces, the number of existing (sophisticated) shareholders who choose to sell during takeover negotiations. The result contributes to a lively debate in corporate law that discusses the merits of respecting Boards' discretion to recommend for or against takeover offers (e.g. Lipton (2005); Roe (2013); Bebchuk (2013); Kershaw (2016)). Regulations such as the widespread "*business judgment rule*" act to protect directors from legal challenge by bidders and shareholders, whereas others like the "*non-frustration rule*" in the UK have the opposite effect. Some jurisdictions have also developed "*disenfranchisement*" rules that weaken the voting power of new shareholders and so reduce their impact on takeover outcomes; others are actively considering similar measures.[5] Our analysis highlights a perhaps unexpected consequence of such interventions: weakening the influence of new shareholders or affording the Board greater powers of court-protected discre-

[5]The Aspen Institute in the US propose that shareholders should be able to vote only after a minimum holding period. The European Commission are considering increasing the voting weight of shareholders who are long-term holders of the stock.(See *Brussels aims to reward investor loyalty*, Financial Times, Jan 23, 2013). In the UK the Takeover Panel also considered disenfranchising new shareholders following the Cadbury takeover.

tion encourages more existing shareholders to sell during the takeover negotiations, thereby increasing the turnaround in the register of the target company. Hence absent strong respect for new shareholders, or under a wide interpretation of the business judgment rule, more, not fewer, shareholders will seek to take profits early and sell out of a stock as soon as a takeover offer is received.

Our final set of results study the impact on unsophisticated shareholders of the influence wielded by the sophisticated shareholders on the Board. We have described already that when sophisticated shareholders have more influence the expected bids decline, as does the initial probability of deal acceptance. However under a wide range of settings which we characterise, the expected premium enjoyed by unsophisticated shareholders rises in the number and influence of sophisticated shareholders. The presence of these shareholders lowers the equilibrium bids, but the pressure they exert raises the probability of acceptance at the end of the offer period to such an extent that overall shareholders benefit. This then captures a further unwanted side-effect of rules designed to limit the influence of new shareholders during takeover battles. This result also suggests the Takeover Panel (2010) concern that influential shareholders buying in during the offer period works for bidders' and against shareholders' interests is misplaced.

1.1 Related Literature

We study a coordination problem among target shareholders in takeovers. Grossman and Hart (1980) began a rich research endeavour studying the returns to corporate takeovers when the target firms' shareholders are strategic. The core issue studied is that target shareholders have incentives to not tender their shares and hence free-ride on those who, by tendering, enable the takeover of a value-enhancing bidder (e.g. Marquez and Yilmaz (2008, 2012); Ekmekci and Kos (2016); Dalkir et al. (2018)). Our work departs from this literature along two dimensions. Firstly this literature has explored the decision of existing stock holders to either accept or reject a bidder's offer. The stock market during the takeover is not modelled and so the feedback effect between stock sales during prolonged negotiations and the final corporate outcome is not studied. Secondly these models focus on the shareholders and so do not to model the role of the Board of the target firm; thus managerial resistance has not been explored in this context.

We assume that there is a proportion of naïve shareholders that do not sell during takeover negotiations and follow the subsequent recommendation of their Board. Furthermore, this proportion is sufficiently large to make the Board's advice deterministic for the takeover outcome. Hence the target behaves as a unit at the time of takeover completion and the coordination problem in Grossman and Hart (1980) does not come into play. Our model captures settings in which the bidder cannot circumvent the Board and approach shareholders directly, e.g. because the Board can use poison-pills and other defences (e.g. Mathias et al. (2014)). Further our approach is in line with many modern takeovers, in which the Board's advice is pivotal (Baker and Savasoglu (2002)). Our model is also consistent with situations of friendly, that is non-hostile, takeovers (e.g., Giammarino and Heinkel (1986); Fishman (1988); Hirshleifer and Png (1989)).[6]

Our work is part of the current research effort which studies how stock markets can alter business decisions and so generate a feedback loop. The key channel explored in the existing research might be characterised as a speculator-led learning feedback loop (Edmans et al. (2015); Dow et al. (2016); Foucault and Fresard (2014); Luo (2005); Kau et al. (2008)): managers seek to infer speculators' information from the stock market variables of price and order flow. Our feedback channel is instead a shareholder-led pressure feedback loop: firm shareholders seek to coordinate on enough of them selling out of a stock that management are pressurised into following a given course of action. Our analysis concerns the impact of stock market feedback arising from stock sales after the initial announcement on the Board's resistance and so on the cost of the takeover. In a related paper, Betton et al. (2014) analyse how target price run-ups before takeover bidding announcements affect the cost of a takeover, while Thanassoulis and Somekh (2016) explore how ill-informed shareholders can lead Boards to take value-destroying actions.

We analyse the strategic interaction of target shareholders deciding whether to sell during takeover negotiations. Our setting is enriched with a stochastic number of noise traders and a competitive market maker that observes the *net* order flow and sets prices to break even in expectation (Kyle (1985)). We assume that shareholders are informed investors that can gain information rents by trading against uninformed noise traders. This is in line with the standard assumption in the literature of takeovers that shareholders, that is the supply side of the market, are better informed about the stock value (see Ekmekci and Kos (2016) and references therein). In contrast to many models in corporate finance which consider one large informed investor, we model a continuum of them by adopting the information structure of a global game as in Morris and Shin (2003). Belief dispersion generates heterogeneity of actions that provides more realistic predictions. In this aspect our paper is similar to Brav et al. (2018), where the information asymmetries about the resistance of a managerial Board provide a rationale for trading.

[6] Complementing this work, Levit (2017) studies formally the advice a Board would give to influence shareholders' tendering decisions.

2 A model of takeovers

2.1 The model

We first introduce the assumptions of the model. We then provide a discussion of our modelling choices in Section 2.2.

We consider a takeover negotiation that can develop over three periods, $t = 1, 2, 3$. The target company has market value V and is owned by a continuum of dispersed shareholders that are represented by a Board. Some of these shareholders are strategic in a manner we will introduce shortly. The potential acquirer, henceforth the Bidder, can generate synergies $W - V > 0$ if it takes control of the target. The acquirer can make an offer at both period $t = 1$ and period $t = 2$, with period $t = 2$ only reached if the offer at $t = 1$ is rejected. The target Board is inherently resistant to the takeover and it requires a sufficiently large premium to recommend acceptance to target shareholders. We assume that the Board's approval is both necessary and sufficient for the takeover to succeed. All agents are risk neutral and do not discount future values.

At date $t = 1$ the Bidder makes an initial takeover offer P_1. The Board accepts if and only if

$$P_1 - V \geq \theta. \tag{1}$$

Parameter θ represents the Board's resistance to the takeover, which can be motivated by either private rents from control, and/or privately held views of the Board as to the true value of the target's assets.[7] This captures in reduced form the key agency problem that underlies takeover defenses. We assume that resistance type θ is privately observed by the Board. Other agents share a common prior that θ is uniformly distributed over $(\underline{\theta}, \overline{\theta})$ with $W - V \geq \underline{\theta}$. If (1) holds, the takeover is completed and the game ends. Otherwise, everyone observes rejection of P_1 and the game moves to the second period.

After the initial ($t = 1$) offer is rejected, the game moves to time $t = 2$ at which the bidder makes a second offer P_2. This is now a public offer and so current shareholders can respond. They are permitted to do so at $t = 3$ at which some target shareholders sell their shares in a competitive market for shares. This affects the negotiation outcome as the Board accepts the offer if and only if

$$P_2 - V \geq \theta - \kappa\delta\gamma. \tag{2}$$

The term $-\kappa\delta\gamma$ represents the detrimental effect of target stock sales during negotiations

[7] For example, overconfident managers might over-estimate the value they can generate by θ, resulting in heterogeneous beliefs between management and the market. Such overconfidence has been widely documented (Malmendier and Tate (2015)).

on the Board's ability to resist the takeover. The product $\delta\gamma$ captures the proportion of target shareholders that strategically sell their stock during takeover negotiations: δ is the mass of target shareholders that are strategic (equivalently sophisticated) and $\gamma \in [0,1]$ is the proportion of these shareholders that sell their shares. The latter is determined in equilibrium. Parameter $\kappa > 0$ captures the strength of the mechanism. In subsequent analysis we interpret κ as a reflection of the Board's exposure to pressure from stockholders, which is often determined by the institutional and regulatory framework.

The market at $t = 3$ features informed target shareholders (a proportion δ of the overall shareholder base), liquidity traders and a competitive market maker. Liquidity traders place stochastic orders $y \sim U[-\eta, \eta]$. Each informed shareholder i receives a signal $x_i = \theta + \varepsilon_i$ and updates beliefs about the Board's type. The parameter ε_i is a noise term drawn from a uniform distribution over $[-\varepsilon, \varepsilon]$, and signals are identically and independently distributed. Upon belief updating, each informed shareholder decides whether to *sell* her stock or to *hold* it until the Board decides whether to accept or reject the final offer. Selling at $t = 3$ yields payoff M, which is the stock price set by the market maker in equilibrium. The payoff from holding is determined by the takeover outcome. If (2) is satisfied, then the takeover succeeds and all target shareholders obtain P_2. Conversely, if the takeover fails, the target's value returns to V, which becomes the payoff from holding. The market maker observes the net order flow $\rho = -\delta\gamma + y$ from informed shareholders and noise traders but not its components, and sets price M that equals the expected value of stock given ρ. The market maker breaks even in expectation as in Kyle (1985).

Figure 1 summarizes the sequence of events:

$t = 1$

- The Bidder offers P_1;
- the Board accepts if and only if $P_1 - V \geq \theta$;
- the game ends after acceptance; it moves to $t = 2$ after rejection.

$t = 2$

- The Bidder offers P_2.

$t = 3$

- Informed shareholders receive private signals of θ;
- Informed shareholders place orders $-\delta\gamma$ alongside liquidity trades y;
- Market maker observes net order flow ρ and sets price M;
- The Board accepts if and only if $P_2 - V \geq \theta - \kappa\delta\gamma$.

Figure 1: Timeline

We assume that the Board's recommendation to shareholders of accepting or rejecting the offer is deterministic for the takeover outcome. In practice, shareholders vote over a takeover offer after receiving advice from their Board. Baker and Savasoglu (2002) study 1,901 US takeover offers during the period 1981-1996 and report that, in approximately 80% of cases, the outcome was in line with the Board's advice. Hence our assumption is representative of a large fraction of modern takeovers and keeps the model tractable. Our assumption can also be microfounded by assuming that shareholders who do not receive a private signal as to the Board's resistance are naïve shareholders who follow the Board's recommendation. It would then follow that freeze-out rules make the Board's verdict deterministic given a sufficiently large proportion of uninformed shareholders $1 - \delta$. Freeze-out rules permit a majority shareholder to forcibly purchase the shares of minority holders at the tendered price.[8] Freeze-outs take place in more than 90% of U.S. and UK takeovers (Gomes (2012)) in order to eliminate free riding.

Equilibrium Concept

We look for a symmetric pure-strategy perfect Bayesian Nash equilibrium in which informed shareholders at $t = 3$ use threshold strategies, i.e., sell if and only if their signal indicates a sufficiently high resistance of the Board, $x_i > x^*$, and the takeover fails if and only if the Board is sufficiently entrenched: $\theta > \theta^*$.

Definition 1 *A symmetric pure-strategy perfect Bayesian Nash equilibrium comprises a sequence of takeover offers $\{P_1^*, P_2^*\}$, thresholds $\{x^*, \theta^*\}$ and a price function M^* such that:*

a) *At $t = 1$, offer P_1^* maximizes the Bidder's expected payoff given that a rejection of the Board would lead to the next period $t = 2$.*

b) *At $t = 2$, offer P_2^* maximizes the Bidder's expected payoff given the Board's rejection of P_1^* and given that the takeover fails if, and only if, $\theta > \theta^*$.*

c) *At $t = 3$, given P_2^* and that the takeover fails if, and only if, $\theta > \theta^*$:*

   i) *the threshold strategy x^* maximizes informed shareholders' expected payoffs given the market maker's price function M^*;*

   ii) *the market maker's price function M^* equals the expected value of the stock given shareholders' threshold strategy x^* and net order flow ρ.*

We solve recursively in three steps. First, we derive the equilibrium at the trading subgame $t = 3$, consisting of thresholds $\{x^*, \theta^*\}$ and price function M^*. Next, we derive Bidder's offers P_2^* and finally P_1^*. We focus on the *interior* equilibrium whereby the takeover outcome is uncertain for all agents until the Board's verdict.

[8] In the UK the same effect can be achieved by structuring the takeover as a 'Scheme of Arrangement'.

2.2 Model discussion

We study a three-period takeover negotiation which captures the impact that *eventual* stock sales have on key outcomes. Initial period $t = 1$ reflects that bidders typically first approach target companies privately to avoid distortions generated by stock markets (Betton et al. (2008)).[9] Once an offer is publicly made, and potentially even a little prior, price reactions develop quickly (Betton et al. (2014)). By rejecting an initial offer the target Board extends the negotiation period, facilitating stock sales that later weaken its own resistance ($t = 2, 3$ in the model). In our setting, the same offer rejected at $t = 1$ can be accepted at $t = 3$ because of the detrimental impact that stock sales have on the Board's takeover resistance. Nonetheless the target's rejection at $t = 1$ is informative about the Board's type, and this information is embedded in the Bidder's subsequent offer. We capture how the impact of stock sales in delayed negotiations determines the bidder's strategy at early stages, and how this mechanism affects takeover outcomes.

Parameter θ captures the Board's resistance to the takeover. The means and motives for takeover defences have received attention in the literature (Betton et al. (2008)); our analysis focuses on the interplay between resistance, stock sales and takeover outcomes. The detrimental impact that stock sales have on the Board's ability to resist a takeover are captured in a reduced form. As noted in the Introduction, these sales weaken Boards' arguments in support of their defences that an offer undervalues their firm, which can be key in the event of subsequent litigation (Armour and Skeel Jr (2007)). In addition, stock sales during takeovers diminish the base of shareholders that were arguably supportive of incumbent management, and typically result in the entrance into the shareholder register of risk arbitrageurs (Cornelli and Li (2002); Hillier et al. (2012)) and activist funds (Jiang et al. (2018); Corum and Levit (2019)). Such new shareholders have a strong interest in the takeover succeeding. And finally unsophisticated shareholders are more likely to find news of prominent shareholders selling-out salient, the more such sophisticated shareholders exit. Such salience would naturally lead to the shareholders reappraising their reflex to follow the Board's advice, and may cause them to support management's removal. Our parsimonious representation of these mechanisms facilitates the study of the strategic interaction between target shareholders that decide whether to sell their stock during negotiations.

The trading environment at $t = 3$ features a continuum of small informed shareholders whose trading decisions create an externality on others' payoffs and incentives to trade. This differentiates our model from most corporate finance models that feature one large trader. We seek to capture the strategic interaction amongst target shareholders, which is a key

[9] These are the so-called merger negotiations, which protect the negotiating parties against opportunistic behaviour as bargaining begins. The parties often sign a confidentiality agreement.

feature in takeovers. A large literature follows Grossman and Hart (1980) in studying the interaction at the tendering stage; we look at a prior stage in which the bidding and sale strategy are affected by stock market feedback. The information structure in our setting is such that the beliefs of informed shareholders are dispersed as in global games (Morris and Shin (2003)). This creates shareholder heterogeneity that provides interior solutions for stock prices and stock sales. We conduct comparative statics on these solutions to derive policy implications and empirical predictions.

3 Equilibrium Solution

3.1 Stock Selling

At $t = 3$ the Board follows (2) to decide whether to accept the offer P_2 after observing the fraction of shareholders that strategically sold their stock early, $\delta\gamma$. The Board has already rejected P_1. Other agents therefore share the common (updated) belief that the Board's resistance type is uniformly distributed over $(\underset{\sim}{\theta}, \overline{\theta})$, where lower bound $\underset{\sim}{\theta}$ is a function of P_1, and is determined in equilibrium at $t = 1$.

Suppose that sophisticated shareholders follow an x^*-threshold strategy: to sell if and only if they observe $x_i > x^*$. Then, for a given realisation of the Board's type θ, the proportion of sophisticated shareholders selling corresponds to the mass receiving signals above the threshold:

$$\gamma(\theta) = \Pr(x_i > x^*|\theta) = \frac{1}{2\varepsilon}(\theta + \varepsilon - x^*) \tag{3}$$

for $\theta \in [x^* - \varepsilon, x^* + \varepsilon]$. We show that in this setting the Board's decision rule is well-defined:

Lemma 2 *If sophisticated shareholders follow an x^*-threshold strategy, the Board has θ^*-threshold equilibrium behavior, for $\kappa\delta < 2\varepsilon$. Further $\theta^*(x^*)$ is uniquely defined.*

Proof. See Appendix A. ■

The condition $\kappa\delta < 2\varepsilon$ in Lemma 2 limits the influence of stock sales on the Board's decision, restraining the magnitude of the externality of shareholders' actions. This prevents situations where, for instance, a highly resistant Board incentivises a disproportionate volume of shareholders to sell during takeover negotiations, increasing the internal pressure sufficiently so as to lead the Board to accept the takeover offer.

Note that a unique threshold equilibrium must satisfy $x^* \in [\theta^* - \varepsilon, \theta^* + \varepsilon]$. Otherwise the indifferent shareholder $x_i = x^*$ would know the takeover outcome with certainty and it would be dominant to either sell or hold, a contradiction. Thus, if sophisticated shareholders follow an x^*-threshold strategy, the critical Board's type θ^* is such that

$$\theta^* = P_2 - V + \kappa\delta\gamma(\theta^*), \tag{4}$$

where we have substituted the volume of sales (3) into the Board's decision rule (2) evaluated at indifference. Lemma 2 confirms that if shareholders follow an x^*-threshold strategy then equation (4) has a unique solution, and further that the Board will reject the bidder's offer for all $\theta > \theta^*$ and will accept it otherwise.

Now consider the market-maker. It sets a stock price that equals the conditional expected value after observing the net order flow ρ:

$$M^* = V + (P_2 - V)\Pr(\theta \leq \theta^*|\rho). \tag{5}$$

In a threshold equilibrium the Board accept the offer when their resistance type is weakly below their threshold: $\theta \leq \theta^*$. Moreover, (3) shows that for a given x^*-threshold strategic sales (weakly) increase with the Board's level of resistance, θ. It follows that the takeover succeeds if and only if $\gamma(\theta) \leq \gamma(\theta^*)$. Expanding the expression for net the order flow $\rho = -\delta\gamma(\theta) + y$ we have that

$$\begin{aligned} \Pr(\theta \leq \theta^*|\rho) = \Pr\left(\gamma(\theta) \leq \gamma(\theta^*)|\rho\right) &= \Pr\left(y \leq \delta\gamma(\theta^*) + \rho\right), \\ &= \frac{1}{2\eta}\Big(\delta\gamma(\theta^*) + \rho + \eta\Big) \end{aligned} \tag{6}$$

when $[\rho + \delta\gamma(\theta^*)] \in (-\eta, \eta)$.

We restrict attention to the case where the conditional probability of a takeover is represented by (6). For the corresponding set of net order flows the market maker is uncertain about the takeover outcome, i.e., $\Pr(\theta \leq \theta^*|\rho) \in (0, 1)$, thus it sets an interior price $M^* \in (V, P_2)$. Lemma 4 below specifies the parametric assumption that guarantees that the net order flow is contained within the relevant interval.

We can now consider the selling strategy of a shareholder i receiving signal x_i. Such a shareholder updates her beliefs using Bayes' rule. If the noise term ε is sufficiently small, then $\theta|x_i$ is uniformly distributed over $[x_i - \varepsilon, x_i + \varepsilon]$. The shareholder also updates beliefs about the anticipated net order flow which the market maker will experience. So the shareholder can form an expectation of the stock price. The expected net order flow is a function of the beliefs of other shareholders:

$$E(\rho|x_i) = -\delta E(\gamma(\theta)|x_i) = -\delta\Pr(x_j > x^*|x_i). \tag{7}$$

The next Lemma characterizes the relevant second order beliefs.

Lemma 3 *Let $\theta \sim U(\underline{\theta}, \overline{\theta})$ and consider arbitrarily small ε such that $[\theta - 2\varepsilon, \theta + 2\varepsilon] \subset \left(\underline{\theta}, \overline{\theta}\right)$. Then the conditional distribution of other shareholders' signals has a triangular density $f(x_j|x_i)$ which is symmetric and strictly positive over the interval $(x_i - 2\varepsilon, x_i + 2\varepsilon)$ such that*

$$\Pr(x_j > x^*|x_i) = \begin{cases} 0 & \textit{for} \quad x_i < x^* - 2\varepsilon \\ \frac{1}{8\varepsilon^2}(x_i + 2\varepsilon - x^*)^2 & \textit{for} \quad x_i \in [x^* - 2\varepsilon, x^*) \\ 1 - \frac{1}{8\varepsilon^2}(x^* + 2\varepsilon - x_i)^2 & \textit{for} \quad x_i \in [x^*, x^* + 2\varepsilon] \\ 1 & \textit{for} \quad x_i > x^* + 2\varepsilon \end{cases}. \tag{8}$$

Proof. See Appendix A. ■

Given Board's type θ, the distribution of signals over the mass of informed shareholders satisfies $x_j|\theta \sim U[\theta - \varepsilon, \theta + \varepsilon]$. Lemma 3 shows that, when coupled with shareholder i's belief about the Board's type $\theta|x_i$, the beliefs $x_j|x_i$ are drawn from a triangular distribution of $x_j|x_i$ that is centred at her own signal x_i. The result pins down the conditional expected sales $\Pr(x_j > x^*|x_i)$, which we can use to characterize the conditional expected net order flow anticipated by shareholder i in (7). Note that this order flow decreases (increases in absolute value) with x_i as (8) is increasing in x_i. That is, a higher signal received by shareholder i translates into i believing others will also have received a higher signal of the Board's entrenchment. In turn this translates into more expected takeover resistance and thus a larger proportion of shareholders expected to sell early.

We are now ready to characterize the stock price expected by shareholder i. Using (5) and (6) we obtain

$$E(M|x_i) = V + (P_2 - V)\frac{1}{2\eta}\Big(\delta\gamma(\theta^*) + E(\rho|x_i) + \eta\Big). \tag{9}$$

The expected order flow $E(\rho|x_i)$ is given by (7) and (8). Equation (9) captures shareholder i's payoff from selling; the payoff from holding is $V + (P_2 - V)\Pr(\theta \leq \theta^*|x_i)$. If other shareholders follow an x^*-threshold strategy, then the Board will have a θ^*-threshold strategy (Lemma 2), and so the expected benefit to shareholder i of selling during takeover negotiations over holding is:

$$u(x_i, x^*) = (P_2 - V)\left[\frac{1}{2\eta}\Big(\delta\gamma(\theta^*) + E(\rho|x_i) + \eta\Big) - \Pr(\theta \leq \theta^*|x_i)\right]. \tag{10}$$

If we show that shareholder i's value of selling (10) is monotonically increasing in the signal received x_i, and that $u(x^*, x^*) = 0$ has only one solution, then we have demonstrated that there exists a unique Bayesian Nash x^*-threshold equilibrium. Lemma 4 formalises a sufficient condition:

Lemma 4 *There exists an $x^* -$ threshold equilibrium if $\eta > \frac{\delta}{2}$, and further this equilibrium is unique.*

Proof. See Appendix A. ■

The condition of Lemma 4 requires noise trade to be potentially sufficiently large: $\eta > \delta/2$. Economically the result requires that the potential supply of shares from noise traders is large enough to conceal strategic stock sales. This ensures that the market maker cannot perfectly infer the takeover outcome after observing the net order flow, and so yields that the stock price satisfies $M^* \in (V, P_2)$, i.e. that the price lies in between the bid price and the pre-merger price.

Proposition 5 *Suppose that shareholders' selling externality is not too large, i.e., $\kappa\delta < 2\varepsilon$, and that noise trade is potentially large: $\eta > \frac{\delta}{2}$. Then there exists a unique Bayesian Nash $(x^*, \theta^*) -$ threshold equilibrium in which sophisticated shareholders sell their shares to the market if they observe a Board resistance signal above x^* and hold them otherwise. The takeover succeeds if, and only if, the Board's takeover resistance is below the threshold θ^*. The two thresholds are equal and satisfy*

$$x^* = \theta^* = P_2 - V + \kappa\frac{\delta}{2}. \tag{11}$$

Proof. See Appendix A. ■

Proposition 5 is a key result of this study. First Proposition 5 confirms that there exists a unique equilibrium in threshold strategies for the Board and the sophisticated shareholders. The Board will agree to a second period offer of P_2 if their level of entrenchment is below the threshold θ^*. Sophisticated shareholders will sell during the offer period, and before the Board announce their final decision, if they receive a signal that the Board's entrenchment is above a level x^*.

We can see immediately, holding the bid price constant, the impact on the sell-early decision of a greater proportion of sophisticated shareholders, or a Board which is more heavily influenced by stock sales. In each case the critical signal threshold at which an individual sophisticated shareholder sells goes *up*.[10] Hence if there are more sophisticated shareholders, then an individual shareholder needs a higher signal that the Board is entrenched before opting for the early sale over waiting for the full acquisition to be consummated.

[10] x^* given in (11) is increasing in κ and δ.

The intuition for this is as follows. Consider the benchmark of a Board which is just indifferent between agreeing to the second period offer and declining. Now suppose that there was an increase in the proportion of sophisticated shareholders. If the shareholder signal threshold was unchanged then the absolute number of sophisticated shareholders selling would increase. In turn this would raise the pressure on the Board and cause her to no longer be marginal but to strictly prefer to agree to the second period offer. It follows that the benefit of waiting has risen for a shareholder. The shareholders therefore look forward to the full profits from the merger, and so sell a little less frequently.

This intuition begs the question of why the equilibrium exists at all. One might suspect that if all the shareholders hold back on selling, following the logic above, then the pressure on the Board could actually decline and allow them to reject the offer? The critical issue here is the relative strength of feedback effects to the first round effects described above. The assumptions $\kappa\delta < 2\varepsilon$ and $\eta > \delta/2$ prevent the feedback effects dominating the first round effects. These conditions ensure that there is enough noise in the shareholders' and market maker's inference so as to prevent excessive coordination from destroying the equilibrium.

3.2 Second period takeover offer

Given the shareholders' behaviour, the bidder will adjust his bids. We turn to this now.

At $t = 2$ it is common knowledge that the Board's type is uniformly distributed over $(\underset{\sim}{\theta}, \overline{\theta})$. The Bidder makes a second offer P_2^* to maximize his expected profit, which is the product of the surplus from the takeover and the probability that the takeover takes place:

$$E[\Pi_2] \quad = \quad (W - P_2)\Pr\left(\theta \leq \theta^* | \theta > \underset{\sim}{\theta}\right). \tag{12}$$

Proposition 5 characterizes the success threshold θ^*, which pins down the conditional probability of the takeover at $t = 3$. We substitute (11) for θ^* and plug it into $E[\Pi_2]$, yielding:

$$E[\Pi_2] = (W - P_2)\left(\frac{\theta^* - \underset{\sim}{\theta}}{\overline{\theta} - \underset{\sim}{\theta}}\right) = (W - P_2)\left(\frac{1}{\overline{\theta} - \underset{\sim}{\theta}}\right)\left[P_2 - V + \kappa\frac{\delta}{2} - \underset{\sim}{\theta}\right]. \tag{13}$$

Corner solutions do not provide qualitatively different results; we focus on interior solutions. The interior solution to the Bidder's problem is given by the first order condition with respect to the second offer, which yields:

$$P_2^* = \frac{1}{2}\left[W + V - \kappa\frac{\delta}{2} + \underset{\sim}{\theta}\right]. \tag{14}$$

The characterization of P_2^* shows that in the second period the Bidder internalizes the detrimental impact of subsequent stock sales on takeover resistance, captured by $\kappa\frac{\delta}{2}$, and offers a lower premium. The positive sign of $\underset{\sim}{\theta}$ reflects that the stronger expected resistance of the Board at $t = 2$ increases the offer and hence the takeover premium if the transaction is completed. The bidder can adjust $\underset{\sim}{\theta}$ through his first round bid at $t = 1$.

3.3 Initial takeover offer

At $t = 1$ it is common knowledge that the Board's type is uniformly distributed over $(\underline{\theta}, \overline{\theta})$. From the Board's modelled decision rule in (1) it follows that the initial acceptance threshold satisfies

$$\underset{\sim}{\theta} = P_1 - V. \tag{15}$$

If the Board's entrenchment, θ, lies at or below $\underset{\sim}{\theta}$ then the initial offer of P_1 would be accepted.

The Bidder makes offer P_1^* to maximize his expected profit at $t = 1$, which incorporates the expected outcome of subsequent negotiations if the offer is rejected:

$$E[\Pi_1] = (W - P_1)\Pr(\theta \leq \underset{\sim}{\theta}) + (W - P_2^*)\Pr(\theta \leq \theta^* | \theta > \underset{\sim}{\theta})\Pr(\theta > \underset{\sim}{\theta}). \tag{16}$$

The first term captures expected profits at the initial period, in which the Bidder faces the standard trade-off between price and probability of acceptance. The second term is the expected profit from the offer made at the second period $E[\Pi_2]$, weighted by the probability that the initial offer is rejected $\Pr(\theta > \underset{\sim}{\theta})$. This captures that when calculating the optimal initial offer, P_1^*, the bidder determines the expected profits from any subsequent rounds of negotiation given the new lower bound of the Board's type $\underset{\sim}{\theta}$, which in turn pins down optimal offer P_2^* and the acceptance threshold θ^*.

We plug in (16) the expressions for those objects that are determined in equilibrium to derive

$$\begin{aligned} E[\Pi_1] &= \left(\frac{1}{\overline{\theta} - \underline{\theta}}\right)\left[(W - P_1)(\underset{\sim}{\theta} - \underline{\theta}) + (W - P_2^*)(\theta^* - \underset{\sim}{\theta})\right] \\ &= \left(\frac{1}{\overline{\theta} - \underline{\theta}}\right)\left[(W - P_1)(P_1 - V - \underline{\theta}) + \frac{1}{4}\left(W + \kappa\frac{\delta}{2} - P_1\right)^2\right], \end{aligned} \tag{17}$$

where the second line uses expressions for θ^*, $\underset{\sim}{\theta}$ and P_2^* in (11), (15) and (14) respectively.

Focusing on interior solutions, the first order condition with respect to P_1 yields

$$P_1^* = \frac{1}{3}\left[W - \kappa\frac{\delta}{2} + 2(V + \underline{\theta})\right]. \tag{18}$$

Expression (18) reveals that the detrimental effect of sales on takeover resistance during negotiations, represented by $-\kappa\frac{\delta}{2}$, leads the Bidder to lower his initial offer. A smaller offer raises the probability that negotiations become public and thus that the bidder can take advantage of stock sales that deteriorate takeover resistance. Our setting therefore captures how *eventual* stock sales affect the entire takeover process, even if they never materialize.

Now we can work backwards to fully characterize all equilibrium outcomes as a function of the model fundamentals only. We do this in the model analysis below.

4 Model Analysis

In this section we conduct comparative statics to shed light on the impact of the discretionary power of corporate Boards to influence against takeovers on the main outcomes of the model: prices, sales volumes and probabilities of merger success. We also study the impact a greater volume of sophisticated shareholders has on these outcomes.

4.1 Acquisition price and probability of a deal

The model allows us to explore the impact on the prices offered, and the probability they are accepted, of fundamental parameters of this model:

Proposition 6 *Suppose the equilibrium uniqueness and interior conditions hold. If the proportion of sophisticated shareholders increases (larger δ), or if there is an increase in the influence of stock sales during the negotiation process on the Board (larger κ) then:*

1. *The equilibrium price offered by the Bidder in the first and second period declines;*
2. *The probability of the takeover being agreed in period 1 falls;*
3. *The probability of the takeover being agreed after the negotiation period, i.e. in period 2, increases;*
4. *The total probability of the takeover succeeding grows.*

Proof. The optimal period 1 bid price, P_1^*, is solved for in (18). We can use it together with $\underset{\sim}{\theta}$ in (15) to obtain the equilibrium second offer:

$$P_2^* = \frac{2}{3}\left[W - \kappa\frac{\delta}{2} + \frac{V + \underline{\theta}}{2}\right]. \tag{19}$$

The first result now follows from basic derivatives with respect to δ and κ.

Turning to the probability of the takeover succeeding, at $t = 1$ this is

$$\Pr(take_{t=1}) = \Pr(\theta \leq \underset{\sim}{\theta}) = \frac{\underset{\sim}{\theta} - \underline{\theta}}{\overline{\theta} - \underline{\theta}} = \left(\frac{1}{\overline{\theta} - \underline{\theta}}\right)\frac{1}{3}\left[W - \kappa\frac{\delta}{2} - (V + \underline{\theta})\right], \tag{20}$$

where we have used expressions for $\underset{\sim}{\theta}$ and P_1^* in (15) and (18) respectively.

To derive the probability of the takeover succeeding at $t = 3$ we first plug (19) into (11) to derive the equilibrium thresholds at $t = 3$:

$$\theta^* = x^* = \frac{1}{3}\left[2(W - V) + \kappa\frac{\delta}{2} + \underline{\theta}\right]. \tag{21}$$

The *unconditional* probability that the takeover succeeds at $t = 3$ is then

$$\begin{aligned}\Pr(take_{t=3}) &= \Pr\left(\theta \leq \theta^* | \theta > \underset{\sim}{\theta}\right)\Pr\left(\theta > \underset{\sim}{\theta}\right) = \frac{\theta^* - \underset{\sim}{\theta}}{\overline{\theta} - \underline{\theta}} \\ &= \left(\frac{1}{\overline{\theta} - \underline{\theta}}\right)\frac{1}{3}\left[W + 2\kappa\frac{\delta}{2} - (V + \underline{\theta})\right],\end{aligned} \tag{22}$$

where the second line uses expressions for θ^*, $\underset{\sim}{\theta}$, P_1^* and P_2^* in (11), (15), (18) and (19) respectively. The total probability that the takeover succeeds is the sum of (20) and (22):

$$\Pr(take) = \left(\frac{1}{\overline{\theta} - \underline{\theta}}\right)\frac{1}{3}\left[2(W - V - \underline{\theta}) + \kappa\frac{\delta}{2}\right]. \tag{23}$$

Now parts 2 to 4 of the proposition follow by inspection of (20), (22) and (23). ■

Proposition 6 studies how the mass and influence of informed shareholders determines both whether negotiations move to a second public phase and the value of the corresponding price offers. Proposition 6 reveals how the Bidder takes advantage of the detrimental effect that eventual stock sales have on takeover resistance. The Bidder uses the presence of more sophisticated shareholders in the target to lower the bid price, both initially, and in the subsequent negotiation phase.

When there are more sophisticated shareholders on the target firm's register, then should the bid move to a negotiation stage, the Bidder appreciates that the target Board will be under greater pressure to agree a deal. Hence the second period price offered is reduced. Anticipating this, the benefit to the Bidder of agreeing a price early is reduced, and so the Bidder can be more aggressive in the first period also, and so lower the price offered here too.

Do these reductions in the price offered lower the probability of the takeover succeeding? Here Proposition 6 offers an answer which is perhaps surprising. The lower initial price offered does indeed lower the probability of the deal being accepted at the first stage. Hence more sophisticated shareholders lowers the probability that a takeover is completed without a public negotiation phase.

However in the public negotiation phase, the lower bid price induced by having more sophisticated shareholders or ones with greater influence, coincides with a *greater* probability of the deal being accepted. The Bidder in effect splits the rents in this second stage between herself and the target shareholders. The lower price offered in the second period induces more sophisticated shareholders to sell (note x^* moves in the same direction as P_2 from (11)) and this causes the Board to be more likely to accept. The Bidder is careful to not shade down his bid so much as to compromise the probability of deal acceptance.

Overall the second effect dominates the former, and the total probability that the takeover succeeds grows with the number of sophisticated shareholders, or with their influence.

4.2 Stock sales and market prices

As noted above, regulators and stakeholders have raised concerns about changes in the shareholder register during takeover negotiations. These concerns have focused on the fear that too many share sales during the negotiation process can lead to target firms being bought too frequently and too cheaply. This has lead to calls for restrictions on the influence that new owners can exert on the Board during a takeover process. This could be affected by reducing new shareholders' voting weights for example. In the terminology of our model, the proposal is that lowering κ could lead to improved outcomes.

Proposition 6 demonstrates some of the effects we can expect from such an intervention. Lowering the influence of shareholders would indeed push the prices a Bidder offered up. In this sense influential sophisticated shareholders are pulling offered prices down. However, the policy intervention would lower the overall probability that a deal was consummated at all. Thus surplus enhancing deals would occur less frequently.

In this section we address the stated target of these policies more directly. If the influence of shareholders was reduced, would that deter existing shareholders selling out (lowering their *top-slicing*) and so encourage long-term ownership; or would the effect on prices encourage even more of the shareholders to sell, deterring long term ownership?

In our model strategic sales during the negotiation period occur upon the Board's rejection of an initial takeover offer, and are determined by a second offer P_2. However the second period offer is strategically chosen by the bidder. Thus the overall impact of sophisticated stockholders' influence requires unravelling. Doing so we have:

Proposition 7 *Suppose the equilibrium uniqueness and interior conditions hold. If a takeover should move to the negotiation stage then the proportion of the sophisticated shareholders selling during the offer period decreases in the proportion of the total shareholder population who are sophisticated (δ), and decreases in the influence of stock sales on the Board (κ).*

Proof. We plug (11) into (3) to characterize stock sales at $t = 3$, which are conditional on the first offer being rejected:

$$\gamma(\theta) = \frac{1}{2\varepsilon}\left[\theta + \varepsilon - \frac{1}{3}\left(2(W - V) + \kappa\frac{\delta}{2} + \underline{\theta}\right)\right]. \tag{24}$$

The result then follows by basic calculus. ■

Proposition 7 offers a refutation of the stated objective of policies to weaken shareholder influence: such policies do not deter share sales in the offer period, rather they increase them.

To establish an intuition, let us first consider the final decision stage, period $t = 3$. Holding the Bidder's offer constant at P_2, we can explore what the effect would be of lowering the influence of shareholder sales, that is lowering κ. Such a change would lower the signal threshold at which sophisticated shareholders would sell as *more* shareholders need to sell to maintain the pressure on the Board. This was captured in (11). The selling of shares is a strategic substitute for sophisticated shareholders. A certain volume of shares need to be sold to ensure that the Board accept good offers. If shareholders' influence is weakened, more shareholders need to sell to keep the pressure on the Board. And so the equilibrium response of shareholders to having their influence reduced is not to do less influencing of the Board and so hold on to their shares, but rather to free-ride less and sell their shares more readily to maintain their collective influence.

A second effect exists. If shareholders have less influence then the Bidding firm will alter its optimal sequence of bid prices. In particular if shareholders have less influence then the price offered by the bidding firm will rise, though the probability the deal will be accepted falls. These effects were shown in Proposition 6. The benefit to holding on to the shares may therefore be increased, and if so this would create an opposing pressure for shareholders to sell.

Overall we see that the direct effect dominates: a lesser influence of shareholders on the Board leads to more sophisticated shareholders selling. The indirect mechanism which operates via the stock market affects the result but does not reverse it. This is because of the informational advantage of sophisticated shareholders over the market maker. The inference of the market maker on the deal being successful is hampered by the presence of the noise traders, and so it remains optimal for the shareholders to sell more if their influence with the Board declines.

Hence we observe that policies which weaken the influence of shareholders during the takeover process, that is lowering κ in this model, have the effect of increasing the equilibrium proportion of sophisticated shareholders who sell up. In this respect such policies can backfire. In addition weakening sophisticated shareholders lowers the probability of takeovers succeeding. However if they do succeed, then the price agreed is higher.

4.3 Shareholders' expected takeover premium

Would reducing the influence of shareholders lower or increase the premiums shareholders can expect from a takeover process? At first glance the answer is not clear. Proposition 6 established that giving shareholders less influence would raise takeover bids, but it would also lower the probability the takeover was completed. This question also interacts with the regulatory debate about the desirability of insulating managerial Boards from shareholders discussed above. Insulation advocates have used concerns about new shareholders' short-termism as grounds for strengthening Boards' discretionary power (e.g. Lipton (2005)) whereas arguments against insulation typically hinge on the need to hold Boards accountable (e.g. Bebchuk (2013)). Our model yields the following result:

Proposition 8 *Suppose that equilibrium uniqueness and interior conditions hold. The premium to the pre-merger share price non-strategic shareholders expect to receive is concave in the proportion of sophisticated shareholders* (δ)*, and in the influence of those sophisticated shareholders* (κ)*. If the noise in the sophisticated shareholders' signal is not too large* ($\varepsilon < \underline{\theta}/2$) *then the expected non-strategic shareholders' premium is increasing in* κ *and* δ*.*

Proof. The premium over the pre-merger share price that non-strategic shareholders expect to receive in equilibrium is given by: (The premium sophisticated shareholders extract will depend upon their decision as to whether to sell during the offer period.)

$$\begin{aligned}\text{Expected premium} &= \Pr(take_{t=1})(P_1^* - V) + \Pr(take_{t=3})(P_2^* - V) \qquad (25)\\ &= \left(\frac{1}{\overline{\theta}-\underline{\theta}}\right)\frac{1}{3}\left[W - \kappa\frac{\delta}{2} - (V+\underline{\theta})\right]\frac{1}{3}\left[W - \kappa\frac{\delta}{2} + 2\underline{\theta} - V\right]\\ &\quad + \left(\frac{1}{\overline{\theta}-\underline{\theta}}\right)\frac{1}{3}\left[W + 2\kappa\frac{\delta}{2} - (V+\underline{\theta})\right]\frac{2}{3}\left[W - \kappa\frac{\delta}{2} + \frac{\underline{\theta}}{2} - V\right]\end{aligned}$$

The second equality uses expressions for P_1^* and P_2^* in (18) and (19), and expressions for $\Pr(take_{t=1})$ and $\Pr(take_{t=3})$ in (20) and (22) respectively. Algebraic manipulation of (25) then yields:

$$\text{Expected premium} = \left(\frac{1}{\overline{\theta}-\underline{\theta}}\right)\frac{1}{3}\left[-\left(\frac{\kappa\delta}{2}\right)^2 + \underline{\theta}\cdot\left(\frac{\kappa\delta}{2}\right) + (W-V)^2 - \underline{\theta}^2\right].$$

So we observe that the expected premium over the pre-merger share price is a negative quadratic in $\left(\frac{\kappa\delta}{2}\right)$ yielding the concavity result.

Differentiation yields that the expected premium is maximised at $\kappa\delta = \underline{\theta}$ and is increasing when the product $\kappa\delta$ is below this level. The equilibrium conditions of Proposition 5 require $\kappa\delta < 2\varepsilon$. Hence if the noise term is small enough we deduce that the expected premium is monotonically increasing in κ and δ as claimed. ∎

Proposition 8 demonstrates a further manner in which limiting the influence of sophisticated shareholders has unwanted side-effects: it lowers the expected premium which unsophisticated shareholders, who follow the Board's advice, receive from takeovers.

Proposition 8 demonstrates that the feedback effect created by sophisticated shareholders is important. If there are fewer such shareholders, or their influence is limited, then bid prices will rise, but the pressure on the Board to agree to good deals will be diminished, and so the Board will agree less often (Proposition 6). This latter effect is seen to dominate: unsophisticated shareholders lose out when the influence of the sophisticated shareholders is diminished.

5 Empirical predictions

Our model characterizes a number of mechanisms that are testable. Here we propose proxies for the model's parameters and we follow with a discussion of testable implications.

The stand-alone value of the target V is typically proxied by the stock price before a takeover announcement. The dates of takeovers along with information about bids and completion is available at the Thomson SDC database. Trading volumes can be defined as the ratio of the number of shares traded to the number of shares outstanding (Betton et al. (2014)).

One proxy for the number of sophisticated shareholders in the target company δ is institutional ownership. An alternative but more restrictive proxy is the number of blockholders, typically defined by a minimum of 5%-ownership. These investors presumably have both the means and the incentives for information acquisition and sophisticated trading behaviour.[11]

Several outcomes in our analysis are a function of parameters that determine the Board's resistance type. Resistance θ is firm-specific and our model assumes that current shareholders have superior information of it than other market participants. A natural way to measure the Board's expected resistance is to consider anti-takeover provisions put in place by the firm (e.g. poison-pills, staggered boards, etc.). A prominent list of such provisions at the firm level is the G-index of Gompers et al. (2003), which continues to be widely studied (Cuñat et al. (2017); Karpoff et al. (2017)).

The parameter κ measures how rapidly a Board will find they are in an untenable position if they choose to reject a takeover when sophisticated shareholders are selling out. In our model this parameter is publicly observable and orthogonal to the Board's type, so it captures features of the regulatory framework within which the firm operates. We interpret κ as the (inverse of the) strength of the legal protection offered to Boards in the firm's jurisdiction. Martynova and Renneboog (2013) include takeover defense regulations in an international corporate governance index that is used to compare shareholder protection regulation across jurisdictions. We believe that this is an appropriate proxy for κ.

Our formal analysis, together with the proxies proposed above, provide a number of testable implications on the interplay between stock sales and takeover outcomes. These include:

1. Higher premiums, *ceteris paribus*, during the public phase of the takeover reduce trading volumes;

2. Less shareholder protection (or more insulation of Boards) raises the target's average received bid price during the takeover negotiations, while increasing, on average, the proportion of sophisticated shareholders selling out of the target firm;

3. More sophisticated investors in the target firm raise expected takeover premiums by increasing the probability of takeover success.

[11] See Edmans and Holderness (2017)'s review which includes a descriptive analysis of blockholders in US firms.

Prediction 1 follows from the observation that higher premiums raise the signal threshold (11) and so lower trading volumes (3). In our setting, more stock sales are executed when the offered takeover premium is small. These sales put pressure on the Board to agree to the takeover but they only alleviate partially the effect of a small premium; the probability of a Board agreeing, $\theta \leq \theta^*$, also declines. It follows that at the firm level, controlling for other effects such as entrenchment (θ), shareholder rights (κ), and proportion of sophisticates on the register (δ), we predict a negative relationship between trading volumes and offered takeover premia. This prediction remains to be tested to the best of our knowledge.

Prediction 2 follows from Proposition 6 and 7. Our analysis highlights a mechanism for how a change in the market-wide level of Board insulation would alter the behaviour of sophisticated (and perhaps long-term) shareholders. As noted above the UK, US and Europe have all considered altering the voting weights and influence of stock holders who acquire stock during takeover negotiations, and the objective of this has been to try and safeguard the long term focus of the Board (Lipton (2005), Takeover Panel (2010)). Targeting a similar objective are *directors' duties laws* which expand board members' duties to act for stakeholders beyond shareholders (Karpoff and Wittry (2018)). Prediction 2 results when one models the strategic interests of the sophisticated shareholders and the bidding firms. Faced with the greater insulation of the Board these shareholders, whom many would wish to see preserved as owners, increase the rate at which they sell out of the firm during takeover negotiations in response to such changes. Rules weakening shareholders cause sophisticated shareholders to free-ride less and so increases their rate of selling out to maintain pressure on the Board. Simultaneously, the bidding firm identifies the reduced pressure exerted by these shareholders and so shades her bid up to encourage the Board to accept it.

Prediction 3 is granted by Proposition 8. Top-slicing and similar trading strategies employed by sophisticated shareholders increase the probability that a takeover succeeds, and they do this by placing pressure on the Board to agree to the deal. These mechanisms also lead the bidder to offer smaller takeover premiums, however our model predicts that overall expected premia secured by shareholders rise as the probability effect dominates. The relations captured in Prediction 3 have been acknowledged by market analysts (e.g. Lipton (2005); Hillier et al. (2012)) but we are not aware of empirical analyses. We hope our formal approach provides a comprehensive framework that can facilitate such empirical studies.

6 Conclusion

The recommendation of target Boards to their shareholders is often pivotal for the success of a takeover. Stock sales during takeover negotiations diminish the Boards' ability to recommend against, i.e., to resist takeovers. These two features combined create a coordination problem for shareholders deciding whether to sell their stock during takeover negotiations. Shareholders seek to hold their shares and free-ride on others' sales when these are sufficiently many to induce the takeover. Conversely, they would rather sell their stock if enough other shareholders hold their shares enabling the Board to resist the takeover. This coordination problem interacts with the stock market and generates a feedback loop from existing shareholders' sales decisions to Board actions.

This paper studies the tension faced by shareholders deciding whether to sell during takeover negotiations and how the bidder reacts to their coordination problem. We model a takeover negotiation where stock sales only occur if the private initial offer is rejected and negotiations become public and more prolonged. We show that stock sales are inversely related to takeover premiums and that sophisticated shareholders raise the probability of deal acceptance at the cost of lowering equilibrium bid prices. Nonetheless the greater the influence sophisticated shareholders enjoy, the fewer shareholders will sell-up during the offer period, and the larger the expected premia enjoyed by non-sophisticated shareholders.

Our analysis delivers a number of empirical predictions and sheds light on mechanisms that are relevant to regulators. Policy makers have sought to diminish the impact of stock sales on takeover outcomes by strengthening boards' discretion to recommend against takeovers and/or disenfranchising short-term shareholders. Comparative statics show that these policies strengthening takeover resistance will have the perhaps unwanted side-effect of increasing shareholder turnover in target companies during negotiations and lowering the expected surplus created through takeovers.

A Technical Appendix

Proof of Lemma 2: The model requires the Board to refuse to sell if and only if $\theta > P_2 - V + \kappa\delta\gamma$. Using (3), define the function:

$$X(\theta) \triangleq \begin{cases} \theta - (P_2 - V) & \text{if } \theta < x^* - \varepsilon \\ \theta - (P_2 - V) - \kappa\frac{\delta}{2\varepsilon}(\theta + \varepsilon - x^*) & \text{if } \theta \in [x^* - \varepsilon, x^* + \varepsilon] \\ \theta - (P_2 - V) - \kappa\delta & \text{if } \theta > x^* + \varepsilon \end{cases} . \tag{26}$$

$X(\theta)$ is the Board's benefit to rejecting the offer over agreeing. The Board rejects the offer if and only if $X(\theta) > 0$. The lemma follows if $X(\theta^*) = 0$ has a unique solution and $X(\theta)$ is increasing. Observe that $X(\theta)$ is continuous in θ, and that each function piece increases in θ if $1 - \frac{\kappa\delta}{2\varepsilon} > 0$. The result follows.

Proof of Lemma 3: The conditional distribution $\theta|x_i$ is uniform over $[x_i-\varepsilon, x_i+\varepsilon]$; the signals generated by a Board's type realization $x_j|\theta$ are uniformly distributed over $[\theta-\varepsilon, \theta+\varepsilon]$. Each of the two distributions have density $(1/2\varepsilon)$ whenever the density is positive; the product of the two densities is $(1/4\varepsilon^2)$.

We derive the inverse cdf of the conditional beliefs, i.e., $\Pr(x_j > x^*|x_i)$, for four possible intervals of signal x_i.

i) Suppose that $x_i > x^* + 2\varepsilon$. Then all shareholders $j \neq i$ receive a signal $x_j > x^*$:

$$\Pr(x_j > x^*|x_i) = \int_{\theta=x_i-\varepsilon}^{x_i+\varepsilon} \int_{x_j=\theta-\varepsilon}^{\theta+\varepsilon} \left(\frac{1}{4\varepsilon^2}\right) dx_j d\theta = 1.$$

ii) Suppose that $x_i \in [x^*, x^*+2\varepsilon]$. If $\theta \leq x^*+\varepsilon$ then only a fraction $\frac{\theta+\varepsilon-x^*}{2\varepsilon}$ of shareholders $j \neq i$ receive a signal $x_j > x^*$. If $\theta > x^*+\varepsilon$ then all shareholders $j \neq i$ receive a signal $x_j > x^*$:

$$\begin{aligned}\Pr(x_j > x^*|x_i) &= \int_{\theta=x_i-\varepsilon}^{x^*+\varepsilon} \int_{x_j=x^*}^{\theta+\varepsilon} \left(\frac{1}{4\varepsilon^2}\right) dx_j d\theta + \int_{\theta=x^*+\varepsilon}^{x_i+\varepsilon} \int_{x_j=\theta-\varepsilon}^{\theta+\varepsilon} \left(\frac{1}{4\varepsilon^2}\right) dx_j d\theta \\ &= \frac{1}{8\varepsilon^2}\Big[4\varepsilon + 4\varepsilon^2(x_i - x^*) - (x_i - x^*)^2\Big],\end{aligned}$$

which can be factorised to give the third line of (8).

iii) Suppose that $x_i \in [x^*-2\varepsilon, x^*)$. If $\theta \geq x^*-\varepsilon$ then only a fraction $\frac{\theta+\varepsilon-x^*}{2\varepsilon}$ of shareholders $j \neq i$ receive a signal $x_j > x^*$. If $\theta < x^*-\varepsilon$ then no shareholder $j \neq i$ receives a signal $x_j > x^*$:

$$\Pr(x_j > x^*|x_i) = \int_{\theta=x^*-\varepsilon}^{x_i+\varepsilon} \int_{x_j=x^*}^{\theta+\varepsilon} \left(\frac{1}{4\varepsilon^2}\right) dx_j d\theta = \frac{1}{8\varepsilon^2}\Big[x_i + 2\varepsilon - x^*\Big]^2.$$

iv) Suppose that $x_i < x^* - 2\varepsilon$. Then no shareholder $j \neq i$ receives a signal $x_j > x^*$ and we have

$$\Pr(x_j > x^*|x_i) = 0.$$

The results above deliver the conditional cumulative distribution function in Lemma 3.

For the cumulative distribution of $x_j|x_i$, we proceed as by observing:

$$\Pr(x_j < x^*|x_i) := F(x^*|x_i) = 1 - \Pr(x_j > x^*|x_i)$$

And so $i)$ through $iv)$ yield the cumulative distribution function by cycling x^* through the four cases. For example, if we set $x^* \in (x_i, x_i + 2\varepsilon]$ then $F(x^*|x_i) = 1 - \frac{1}{8\varepsilon^2}[x_i + 2\varepsilon - x^*]^2$. In this way we establish:

$$F(x_j|x_i) = \begin{cases} 0 & \text{for} \quad x_j < x_i - 2\varepsilon \\ \frac{1}{8\varepsilon^2}(x_j - x_i + 2\varepsilon)^2 & \text{for} \quad x_j \in [x_i - 2\varepsilon, x_i] \\ 1 - \frac{1}{8\varepsilon^2}(x_i + 2\varepsilon - x_j)^2 & \text{for} \quad x_j \in (x_i, x_i + 2\varepsilon] \\ 1 & \text{for} \quad x_j > x_i + 2\varepsilon \end{cases} . \tag{27}$$

Differentiation with respect to x_j yields

$$f(x_j|x_i) = \begin{cases} 0 & \text{for} \quad x_j < x_i - 2\varepsilon \\ \frac{1}{4\varepsilon^2}(x_j - x_i + 2\varepsilon) & \text{for} \quad x_j \in [x_i - 2\varepsilon, x_i] \\ \frac{1}{4\varepsilon^2}(x_i + 2\varepsilon - x_j) & \text{for} \quad x_j \in (x_i, x_i + 2\varepsilon] \\ 0 & \text{for} \quad x_j > x_i + 2\varepsilon \end{cases} . \tag{28}$$

Proof of Lemma 4: We consider $u(x_i, x^*)$ in (10) when shareholder i is uncertain about the takeover outcome. That is, for signals $x_i \in [\theta^* - \varepsilon, \theta^* + \varepsilon]$. In this case shareholder i has a conditional distribution $\theta|x_i$ which is uniform on $(x_i - \varepsilon, x_i + \varepsilon)$. Therefore

$$\Pr(\theta < \theta^*|x_i) = -\frac{1}{2\varepsilon}(\theta^* - x_i + \varepsilon). \tag{29}$$

Our focus is restricted to strategy thresholds that are consistent with a threshold equilibrium, i.e., to $x^* \in [\theta^* - \varepsilon, \theta^* + \varepsilon]$. This yields two relevant function pieces of $E(\rho|x_i)$ and thus of $u(x_i, x^*)$. Using (3), (7), (8) and (29) in (10):

$$\begin{aligned} & u(x_i, x^*|x_i \leq x^*) = \\ = \quad & (P_2 - V)\left[\frac{1}{2\eta}\left(\frac{\delta}{2\varepsilon}(\theta^* + \varepsilon - x^*) - \frac{\delta}{8\varepsilon^2}(x_i + 2\varepsilon - x^*)^2 + \eta\right) - \frac{1}{2\varepsilon}(\theta^* - x_i + \varepsilon)\right]; \end{aligned} \tag{30}$$

$$\begin{aligned} & u(x_i, x^*|x_i \geq x^*) = \\ = \quad & (P_2 - V)\left[\frac{1}{2\eta}\left(\frac{\delta}{2\varepsilon}(\theta^* + \varepsilon - x^*) - \delta + \frac{\delta}{8\varepsilon^2}(x^* - x_i + 2\varepsilon)^2 + \eta\right) - \frac{1}{2\varepsilon}(\theta^* - x_i + \varepsilon)\right]. \end{aligned} \tag{31}$$

From (30) and (31) we have that $u(x_i, x^*)$ is continuous in x_i, including at $x_i = x^*$. (30) is the increasing part of a quadratic concave function in x_i with a maximum at $x_i = x^*$ when

$2\eta > \delta$; (31) is the increasing part of a quadratic convex function in x_i with a minimum at $x_i = x^*$ when $2\eta > \delta$. Hence $u(x_i, x^*)$ is increasing monotonically with x_i when $\eta > \frac{\delta}{2}$. It follows from the above that $u(x^*, x^*) = 0$ has only one solution for x^*, and that shareholder i sells if and only if $x_i > x^*$. ■

Proof of Proposition 5: At indifference for a shareholder, from the proof of Lemma 4 we have $u(x^*, x^*) = 0$. From (30) and (31), $u(x^*, x^*) = 0$ implies $x^* = \theta^*$. Then use (3) to compute $\gamma(\theta^*) = 1/2$. The characterization of the thresholds follows from (4). ■

References

Armour, J. and D. A. Skeel Jr (2007). Who writes the rules for hostile takeovers, and why-the peculiar divergence of us and uk takeover regulation. *George Town Law Journal 95*(5), 1727.

Baker, M. and S. Savasoglu (2002). Limited arbitrage in mergers and acquisitions. *Journal of Financial Economics 64*(1), 91–115.

Bebchuk, L. A. (2013). The myth that insulating boards serves long-term value. *Columbia Law Review 113*, 1637–1694.

Betton, S., B. E. Eckbo, R. Thompson, and K. S. Thorburn (2014). Merger negotiations with stock market feedback. *Journal of Finance 69*(4), 1705–1745.

Betton, S., B. E. Eckbo, and K. S. Thorburn (2008). Corporate takeovers. *Handbook of corporate finance: Empirical corporate finance 2*, 291–430.

Bordalo, P., N. Gennaioli, and A. Shleifer (2013). Salience and consumer choice. *Journal of Political Economy 121*(5), 803–843.

Brav, A., A. Dasgupta, and R. D. Mathews (2018). Wolf pack activism. European Corporate Governance Institute, Finance Working paper No. 501/2017.

Cornelli, F. and D. D. Li (2002). Risk arbitrage in takeovers. *Review of Financial Studies 15*(3), 837–868.

Corum, A. A. and D. Levit (2019). Corporate control activism. *Journal of Financial Economics, forthcoming.*

Cuñat, V., M. Gine, and M. Guadalupe (2017). Price and probability: Decomposing the takeover effects of anti-takeover provisions. mimeo.

Dalkir, E., M. S. Dalkir, and D. Levit (2018). Freeze-out mergers. *Review of Financial Studies, forthcoming.*

Dimopoulos, T. and S. Sacchetto (2014). Preemptive bidding, target resistance, and takeover premiums. *Journal of Financial Economics 114*(3), 444–470.

Dow, J., I. Goldstein, and A. Guembel (2016). Incentives for information production in markets where prices affect real investment. *Journal of the European Economic Association,forthcoming.*

Edmans, A., I. Goldstein, and W. Jiang (2015). Feedback effects, asymmetric trading, and the limits to arbitrage. *American Economic Review 105*(12), 3766–3797.

Edmans, A. and C. G. Holderness (2017). Blockholders: A survey of theory and evidence. In *The Handbook of the Economics of Corporate Governance*, Volume 1, pp. 541–636. Elsevier.

Ekmekci, M. and N. Kos (2016). Information in tender offers with a large shareholder. *Econometrica 84*(1), 87–139.

Ferris, S. P., T. Jandik, R. M. Lawless, and A. Makhija (2007). Derivative lawsuits as a corporate governance mechanism: Empirical evidence on board changes surrounding filings. *Journal of Financial and Quantitative Analysis 42*(1), 143–165.

Fishman, M. J. (1988). A theory of preemptive takeover bidding. *The Rand Journal of Economics*, 88–101.

Foucault, T. and L. Fresard (2014). Learning from peers' stock prices and corporate investment. *Journal of Financial Economics 111*(3), 554–577.

Giammarino, R. M. and R. L. Heinkel (1986). A model of dynamic takeover behavior. *The journal of finance 41*(2), 465–480.

Gomes, A. (2012). Takeovers, freezeouts, and risk arbitrage. *Unpublished working paper. University of Pennsylvania*.

Gompers, P., J. Ishii, and A. Metrick (2003). Corporate governance and equity prices. *The Quarterly Journal of Economics 118*(1), 107–156.

Grossman, S. J. and O. D. Hart (1980). Takeover bids, the free-rider problem, and the theory of the corporation. *Bell Journal of Economics 11*(1), 42–64.

Hillier, D., M. Grinblatt, and S. Titman (2012). *Financial Markets and Corporate Strategy.* Berkshire: McGraw-Hill Education.

Hirshleifer, D. and I. P. Png (1989). Facilitation of competing bids and the price of a takeover target. *The Review of Financial Studies 2*(4), 587–606.

Jensen, M. C. and R. S. Ruback (1983). The market for corporate control: The scientific evidence. *Journal of Financial Economics 11*(1-4), 5–50.

Jiang, W., T. Li, and D. Mei (2018). Influencing control: Jawboning in risk arbitrage. *The Journal of Finance 73*(6), 2635–2675.

Karpoff, J. M., R. J. Schonlau, and E. W. Wehrly (2017). Do takeover defense indices measure takeover deterrence? *The Review of Financial Studies 30*(7), 2359–2412.

Karpoff, J. M. and M. D. Wittry (2018). Institutional and legal context in natural experiments: The case of state antitakeover laws. *The Journal of Finance 73*(2), 657–714.

Kau, J. B., J. S. Linck, and P. H. Rubin (2008). Do managers listen to the market? *Journal of Corporate Finance 14*(4), 347–362.

Kershaw, D. (2016). Hostile takeovers and the non-frustration rule: Time for a re-evaluation. *LSE Law, Society and Economy Working Papers*.

Kyle, A. S. (1985). Continuous auctions and insider trading. *Econometrica 53*(6), 1315–1336.

Levit, D. (2017). Advising shareholders in takeovers. *Journal of Financial Economics 126*(3), 614–634.

Lipton, M. (2005). Twenty-five years after takeover bids in the target's boardroom: Old battles, new attacks and the continuing war. *The Business Lawyer*, 1369–1382.

Luo, Y. (2005). Do insiders learn from outsiders? evidence from mergers and acquisitions. *The Journal of Finance 60*(4), 1951–1982.

Malmendier, U. and G. Tate (2015). Behavioral ceos: The role of managerial overconfidence. *Journal of Economic Perspectives 29*(4), 37–60.

Marquez, R. and B. Yilmaz (2008). Information and efficiency in tender offers. *Econometrica 76*(5), 1075–1101.

Marquez, R. and B. Yilmaz (2012). Takeover bidding and shareholder information. *Review of Corporate Finance Studies 1*(1), 1–27.

Martynova, M. and L. Renneboog (2013). An international corporate governance index. *The Oxford Handbook of Corporate Governance*, 97.

Mathias, J. H., M. M. Neumeier, and J. J. Burgdoerfer (2014). *Directors and officers liability: Prevention, insurance, and indemnification*. Law Journal Press.

Morris, S. and H. S. Shin (2003). *Advances in Economics and Econometrics (Proceedings of the Eighth World Congress of the Econometric Society)*, Chapter Global Games: Theory and Applications, pp. 56–114. Cambridge: Cambridge University Press.

Roe, M. J. (2013). Corporate short-termism—in the boardroom and in the courtroom. *The Business Lawyer*, 977–1006.

Takeover Panel, U. (2010). Review of certain aspects of the regulation of takeover bids. Consultation paper.

Thanassoulis, J. and B. Somekh (2016). Real economy effects of short-term equity ownership. *Journal of International Business Studies 47*(2), 233–254.