How Financial Markets Create Superstars*

Spyros Terovitis[†] Vladimir Vladimirov[‡]

September 14, 2022

Abstract

High valuations reflect good growth prospects but can also improve these prospects by attracting key stakeholders, such as employees, business partners, or investors. We show that this feedback channel allows speculators without positive information about a firm to profit from inflating its stock price, thereby, helping the firm "fake it till it makes it." Reversing such feedback effects is hard even when traders have negative information. Likely targets are firms in "normal" (neither hot nor cold) markets, compensating stakeholders with performance pay or equity. Investors, such as VCs, can also profit from inflating firms' valuations in private markets.

Keywords: Speculation, manipulation, superstar firms, unicorns, market efficiency, stakeholders, high-skilled employees, misallocation of resources.

JEL Classification: D62, D82, D84, G30

*We thank Snehal Banerjee, Dan Bernhardt, Arnoud Boot, Pallab Dey, Alex Edmans, Andrew Ellul, Sivan Frenkel, Alexander Guembel, Laurent Fresard, Erik Gilje, Piero Gottardi, Jungsuk Han, Ruggero Jappelli, Ron Kaniel, Ilan Kremer, John Kuong, Matthias Lassak, Stefano Lovo, Nadya Malenko, Rafael Matta, Vincent Maurin, Simon Mayer, Albert Menkveld, Enrico Perotti, Francesco Sannino, Günter Strobl, Avanidhar Subrahmanyam, Yenan Wang, Josef Zechner, and conference and seminar participants at the FSU SunTrust Beach Conference, Finance Theory Group (Budapest), FMCG conference, RSM Corporate Finance Day, New Zealand Finance Meeting, Australasian Finance and Banking Conference, Aalto University, and the University of Amsterdam for helpful feedback.

[†]University of Amsterdam, e-mail: S.Terovitis@uva.nl.

[‡]University of Amsterdam and CEPR, e-mail: Vladimirov@uva.nl.

1 Introduction

A fundamental principle of financial economics is that firms' valuations are forward-looking and reflect their growth prospects. However, the high valuations of many firms precede the acquisition of capital and key stakeholders, such as talented employees and business partners, instrumental to success. This makes it hard to disentangle whether high valuations not only reflect but also lead to a higher likelihood of success by attracting stakeholders who rationally infer from the high stock prices that a firm's prospects are good. Tesla, labeled by Forbes a "$1 Trillion of Speculation" (Trainer, 2021), is a case in point. Three years after its IPO in 2010, Tesla was beset by production difficulties. Yet its stock price was ten times its IPO price. The firm had become a magnet for investors and engineers, whose capital and expertise subsequently transformed it into a superstar, enriching all involved in the process.

The possibility that high valuations could reflect stellar growth prospects often draws talent and capital even when there are widespread concerns that the valuations are inflated. Examples abound. Before it became known that Theranos' founder had misled stakeholders and investors about its technology, the firm had managed to attract more than 800 highly skilled employees. Related, WeWork's employees recount that the high valuations encouraged them to believe that "it was going to be a rocket ship." The same employees subsequently felt "shortchanged on salary" as the value of their equity-based pay collapsed (Sharf and Jeans, 2020). And in its 2020 annual report, Nikola (also accused of lying about its technology) explicitly discusses the importance of a high stock price for attracting employees essential for realizing its business prospects. Furthermore, GameStop's steady stock price increase in 2021 was accompanied by its success in attracting a dozen experienced top-level executives from Amazon and Chewy in leading positions, including those of CEO and CFO. The hype surrounding these firms arguably also helped them raise capital. For example, GameStop raised over a billion in new equity after its stock price steadily increased in 2021.[1]

It is hardly surprising that firms can benefit when inflated valuations attract stakeholders and investors. Yet it is much less clear why speculators without any positive information or prior positions in a firm might benefit from inflating prices if everyone is rational and anticipates such speculation. We show that speculators can profit from inflating stock prices, as that can help firms "fake it till they make it" by attracting capital or high-quality stakeholders that make the firms better. This comes at the expense of the truly good firms in the economy and leads to a misallocation of resources. Crucially, we show that "normal" market conditions — i.e., neither hot nor cold — are most conducive to such speculation.

[1] Note that we do not refer to the short-run surge and crash in GameStop's stock price in January 2021 but to the subsequent long-lasting price increase. See "GameStop's Earnings Don't Justify Its Price, But Investors Don't Care," June 23, 2021, Business Insider.

Our insight that uninformed speculators — i.e., speculators that have no fundamental information about the firm — can profit from inflating its stock price fills a gap in the literature studying the real effects of financial markets. This literature has argued that uninformed speculators can only profit from short selling, as inflating prices and misleading internally-funded investment decisions erode the value of speculators' long positions, making such speculation unprofitable (Goldstein and Guembel, 2008). We demonstrate that this argument does not apply when prices guide the decisions of firm outsiders, such as prospective employees, business partners, or investors — which we collectively refer to as prospective "*stakeholders.*" Our result holds even though everyone is rational and speculators do not have prior long positions (that they may be trying to offload at a higher price), implying that the hurdle to engaging in such speculation is low for a wide array of traders.

We develop a model in which the release of news about a firm triggers trading in its stock in financial markets. There is a market maker who sets bid and ask prices, anticipating that the order flows may come from noise traders or strategic speculators. Speculators, whose entry is endogenous and profit-motivated, may or may not be able to infer the firm's true prospects from the released news, giving rise to informed or uninformed strategic trading. The firm's prospects depend on whether it can attract crucial stakeholders who have outside opportunities. Being outsiders, these prospective stakeholders make rational inferences about the firm's prospects from its stock price. Indeed, a firm's stock price is an important guide for prospective stakeholders, especially when their compensation and growth opportunities depend on the firm's future success (Fombrun and Shanley, 1990; Subrahmanyam and Titman, 2001; Liang et al., 2020).[2]

Based on this setting, we provide answers to the questions of why and when uninformed speculators can profit from inflating a firm's stock price by placing buy orders as if they had positive information about the firm's prospects. What is important is that stakeholders are rational and do not lose on average. Specifically, they require to be compensated for the probability of uninformed speculation, resulting in cross-subsidization from firms with better prospects to firms with with worse prospects but inflated stock prices. This cross-subsidization has the standard implication that firms with worse prospects can make a profit from attracting stakeholders at a low cost. The novel insight is that as a result of this cross-subsidization, the uninformed speculator does not fully internalize the cost of inflating the price of the wrong firm. Hence, the speculator's profit from inflating prices is at the expense of firms with better prospects, that end up cross-subsidizing those with worse prospects.

[2]For further evidence that a firm's profitability and stock price is of first-order importance for prospective stakeholders, see Turban and Greening (1997), Bergman and Jenter (2007), Agrawal and Matsa (2013), and Choi et al. (2020).

For an uninformed speculator to make a profit, she needs to trade over multiple periods. The crux for such a speculator is that leading rational stakeholders to believe that high prices reflect positive information requires inflating the firm's price above the level at which an uninformed trader would make a profit. Hence, uninformed speculators necessarily make trading losses when inflating prices above such levels, implying that they cannot make a profit from a single trading round. However, as long as trading takes place over multiple periods and prices initially adjust slowly, speculators can profit from executing their initial trades at low prices. That is, the speculator's profit is derived from her private information that she will continue inflating the firm's stock price, while the market maker is uncertain about whether the buy pressure will continue and positive feedback effects will kick in.

Our model generates clear predictions about which firms are likely to be the targets of uninformed speculators. A necessary condition for uninformed speculators to profit from inflating a firm's stock price is that the firm offers stakeholders state-contingent contracts, such as equity. Otherwise (with contracts that do not depend on firm success), there is no cross-subsidization across firms, leading uninformed speculators to internalize the cost of inflating the price of the wrong firm and making such speculation unprofitable. Thus, potential targets of speculative trading will be firms that offer employees significant performance or equity-based pay or firms that seek equity financing to fund investments.[3] Such firms should have a sufficiently high upside potential to appear promising to stakeholders despite rational concerns about inflated prices. In practice, we expect that likely targets of speculators will be human-capital intensive firms, developing cutting-edge technologies, growth firms, newly-public firms, or firms in transition.

We also study under what market conditions uninformed speculation can arise. For uninformed speculators to profit from inflating a firm's stock price, market conditions need to be "normal" (i.e., neither hot nor cold) as captured by the stakeholders' prior beliefs and opportunity costs. Intuitively, uninformed speculators can profit from inflating the firm's stock price only if that facilitates sufficiently large cross-subsidization across firms. However, the scope for such cross-subsidization is limited if the stakeholders' prior beliefs are already very positive, such as in hot markets. Stakeholders' prior beliefs cannot be very negative either, as then stock prices cannot sufficiently improve stakeholders' beliefs about the firm. Similarly, "normal" can also refer to the stakeholders' outside options. If these options are very low, cross-subsidization has a minor impact on the firm's stock price, making it impossible for uninformed speculators to make a profit; and if the stakeholders' outside

[3]Though outside of our model, firms may offer such contracts for incentive reasons, to align risk preferences, or because collateral constraints or the risk and cash flow profile of their investment opportunities limit their access to debt financing.

options are very high, the firm will not be able to attract stakeholders, especially when they anticipate that its stock price is artificially inflated.

Markets need to be "normal" also in terms of how costly or difficult it is to obtain information about a firm, as for speculative trading to be profitable, prices need to be moderately informative. Indeed, if prices are uninformative, speculation is unlikely to have real effects, as stakeholders will not condition their decisions on prices. Speculators also cannot make a profit if prices are very informative, as prices will react quickly to trading orders. Thus, intermediate costs of acquiring information will be most conducive to speculation. An immediate implication is that the firm's choice of transparency could affect the likelihood that the firm becomes a target for speculative trading.

Once triggered, positive feedback effects are hard to reverse, implying a persistent impact on a firm's prospects. This is easiest to see when we interpret stakeholders as capital providers: once a capital injection is sunk, it cannot be reclaimed at terms different from what investors have contractually agreed to. Furthermore, reversals (typically triggered by short-sellers) may also be hard if we interpret stakeholders as employees. For example, this is the case if the value created by employees does not fully dissipate with their departure, and they have been promised a substantial bonus or equity pay that they would forgo by leaving. In such cases, even though the size of the pie might grow less than in the firm's best-case scenario, the pie is shared among fewer parties if employees leave, mitigating the negative impact for remaining equity holders. This makes short-selling less attractive.[4] The fact that reversing feedback effects is hard, together with our insights that inflating prices is often the only type of uninformed speculation that can be profitable, suggests that profiting from inflating prices is easier than undermining them.[5]

Similar to uninformed speculators in secondary markets, uninformed investors in the private (primary) markets might also have an incentive to inflate a firm's valuation if that helps it attract key stakeholders. Specifically, we extend our model to consider the problem of an entrepreneur who raises capital from a venture capitalist before the firm goes public. Following similar arguments to those in the baseline model, we show that the firm and the venture capitalist can make a profit by helping the firm pursue the well-known Silicon Valley mantra of "fake it till you make it" (Braithwaite, 2018; Owen, 2020; Taparia, 2020).

[4] There are also other reasons why reversing positive feedback effects is hard. The positive externalities of being in a star team are likely to keep stakeholders even if they subsequently observe less positive information. Leaving is also made difficult by contractual and non-compete agreements (Marx et al., 2009). Furthermore, employees are typically reluctant to leave after less than a year, as such short-tenured job-hopping is considered a major red flag by recruiters (Bullhorn, 2012; Fan and DeVaro, 2020).

[5] We show that if the firm cannot attract stakeholders without a positive feedback effect from stock prices, uninformed short-selling will have no real effect and will be unprofitable. By contrast, uninformed buying can be profitable.

The uninformed investors' profit comes again at the expense of the truly good firms in the economy. Together with our baseline model, these results help explain why unicorns can be created in an apparent discrepancy with fundamentals in private markets (Gornall and Strebulaev, 2020) and why the "buzz" can persist and have a positive real effect on firm value also in secondary markets.

Related Literature. Our paper primarily relates to the fast-growing literature studying feedback effects from secondary markets on firm value (Dow and Gorton, 1997; Bond et al., 2012). Building on Subrahmanyam and Titman (2001) and extensive work in strategic management (Fombrun and Shanley, 1990; Turban and Greening, 1997), we explore the feedback effect between financial markets and firms' ability to attract key employees, business partners, and investors. Our main contribution is to show that this feedback effect can be triggered by uninformed speculation and to derive predictions about when such trading is more likely and how firms can manage their exposure to it.

Our result that uninformed speculators can profit from inflating stock prices is opposite to the predictions Goldstein and Guembel (2008) but is based on a different type of feedback effect. In their paper and follow-up work (Edmans et al., 2015), financial markets mislead internally-funded investment decisions, which always destroys shareholder value. As a result, even though trading on positive information is more profitable than trading on negative information (Edmans et al., 2015), *uninformed* speculators can only profit from short-selling. By contrast, we show that uninformed speculative buying can be profitable, as it comes at the expense of outside third parties and helps firms "fake it till they make it." Moreover, by showing that uninformed speculators can often only profit from inflating prices (and not from eroding prices) and providing clear predictions for what type of firms under what market conditions are likely to be affected, we provide guidance for when regulators' primary concern should be the inefficiencies emerging from such speculation rather than from short-selling.[6]

Endogenizing feedback effects not only leads to additional predictions but also reverses some predictions based on exogenous feedback effects. In particular, we show that profitable speculative trading can be initiated by speculators that do not have any shares in the firm. Thus, the scope for such trading is very large, as it is potentially open to anyone. By contrast, when feedback effects are exogenous, trading that inflates a firm's stock price is beneficial for speculators only if they already have a sufficiently large position in the firm

[6] Our result that reversing positive feedback effects is hard even when short-sellers have negative information *reinforces* the profitability of uninformed speculation inflating prices. This prediction is further strengthened by our result that firms can affect the likelihood of becoming a target of speculative trading by making it more costly for traders to gather information. While we do not model how firms could respond to such speculation after they have become a target, existing work suggests that endogenizing such responses will make the asymmetry we predict stronger. For example, large blockholders may trade against short sellers (Khanna and Mathews, 2012), and managers may engage in stock repurchases (Campello et al., 2020).

(Khanna and Sonti, 2004), implying a limited scope for such speculation.[7] More broadly, the feedback mechanism we describe adds to work in which speculators pump up a firm's stock price, hoping to sell at a higher price (Allen and Gorton, 1992; Kumar and Seppi, 1992; Chakraborty and Yilmaz, 2004). The main difference to such schemes is that speculative trading in our setting increases a targeted firm's fundamental value.[8]

Our extension about private firms raising financing from a VC shares the premise of Khanna and Mathews (2016) that high valuations can help attract stakeholders to private firms by signaling good prospects. The main conceptual differences to Khanna and Mathews (2016) are that their model does not consider manipulation by uninformed investors, there is no misallocation of talent and resources, and "B" firms cannot be made into stars. By contrast, all these aspects are central to our results that uninformed investors can profit from helping firms "fake it till they make it."

Our results that uninformed speculation is more likely to occur when firms' transparency is intermediate complements work on how transparency affects feedback effects of financial markets, which has mostly focused on how disclosure may crowd in or crowd out information production by traders (Gao and Liang, 2013; Goldstein and Yang, 2017, 2019). While not our main focus, in our model, more transparency does not necessarily make prices more informative, as it can attract uninformed speculators. This insight adds to prior work showing that more transparency may undermine price efficiency (Banerjee et al., 2018).[9]

2 Model

We consider a firm that tries to attract stakeholders to realize a growth opportunity. One interpretation of stakeholders is as high-quality employees or business partners. An alternative interpretation is as capital providers. The firm's stock is traded, and its price is set by a market maker depending on the trading orders of a speculator. Prospective stakeholders infer the firm's prospects from its stock price, which aids their decision of whether to accept the contract offered by the firm. All players are risk neutral, maximize their profits, and there is no discounting. In what follows, we add more structure to this framework.

[7] Ahnert et al. (2022) find a similar result, but in a setting where policy makers learn from prices and the speculator aims to trigger a bailout, for which she has a private benefit.

[8] Our focus on how stock prices can help attract talent differentiates our paper also from prior work that studies how feedback effects impact asset sales (Frenkel, 2020) and how feedback effects could lead traders to trade in the same direction (Goldstein et al., 2013). Interestingly, Matta et al. (2020) show that speculators can benefit from shorting a firm's stock while buying its competitor.

[9] More broadly, our results that uninformed trading affects the firm's fundamental value by attracting stakeholders adds to other mechanisms through which trading affects shareholder value, such as by affecting shareholders' incentives to intervene to discipline management (Maug, 1998), vote (Levit et al., 2020), or exert pressure through the threat of exit (Edmans and Manso, 2011).

Timeline. There are four dates, $t \in \{0, 1, 2, 3\}$. At date $t = 0$, the firm has liquid assets in place $y \geq 0$. The prospects of the firm's investment opportunity depend on whether the firm can attract stakeholders and on the realization of a firm-specific shock $\omega = \{G, B\}$. This shock is realized at the end of date $t = 0$, and it affects the success probability of the firm's investment opportunity.

There is a news release about the shock at date $t = 1$, which triggers trading at dates $t = 1$ and $t = 2$. There are two agents in the financial market: a trader ("she") and a market maker ("he"). The market maker does not have the specialized knowledge to interpret the news and infer ω. Furthermore, he cannot distinguish the type of trader he is facing. The ex ante probability of facing a noise trader who does not trade strategically is β. The probability of facing a strategic trader is $1-\beta$. Initially, we take β as given but later endogenize it (Section 3.3.3). It is common knowledge that the trader and her type are the same in both periods.

The probability that a speculator can interpret the news as a signal s about ω depends on the firm's level of transparency α, which maps into the probability of informed trading. Specifically, with probability α, the speculator's knowledge about the firm is sufficient, and her signal perfectly reveals ω. With probability $1 - \alpha$, the speculator's signal is pure noise (i.e., $s = \varnothing$).[10] Intuitively, if the firm is more transparent, it is easier for the speculator to infer useful information from the news (e.g., Fishman and Hagerty, 1989; Banerjee et al., 2018). The evidence supports our premise that a more detailed corporate disclosure policy has a key impact on the informativeness of stock prices (Healy et al., 1999; Gelb and Zarowin, 2002). Note that unlike the bulk of the literature (see Bond et al., 2012 for an overview), we do not assume that financial markets are better-informed than the firm's management about the firm's prospects.[11]

At date $t = 3$, the firm offers a contract to prospective stakeholders who need to be compensated for forgoing an outside option of $\overline{w}$ (if we interpret stakeholders as employees or business partners) or for investing $\overline{w}$ (if we interpret stakeholders as capital providers). Prospective stakeholders observe the firm's stock price, form their beliefs about the expected compensation given the contract offered by the firm, and decide whether to accept it.

In Section 5, we extend this baseline model by introducing an additional period at which the firm raises start-up capital. We relegate the details of this extension to Section 5.

[10] To give an example, suppose that there is news that the firm's CFO resigns. Noise traders and the market maker do not know how to interpret this news, but strategic traders, closely following the firm, might be able to infer the news' true information content.

[11] That is, the speculator's information can also be about firm fundamentals. Instead, in the literature in which outsiders are better informed than managers, the speculator's information is typically about generic aspects such as market demand, industry trends, or competition.

Projects and Contracting. If the firm attracts stakeholders, it has a probability λ_ω of becoming a "star" and generating $x > 0$. This probability is higher if the shock is good, i.e., $\lambda_G - \lambda_B \equiv \Delta\lambda > 0$. If the firm does not attract stakeholders, it generates low cash flows, which are normalized to zero. It is common knowledge that the ex-ante probability that the shock is good ($\omega = G$) is q_0, and the probability that the shock is bad ($\omega = B$) is $1 - q_0$. We assume that attracting stakeholders creates value only if $\omega = G$, i.e.,

$$\lambda_B x < \overline{w} < \lambda_G x.$$

Contracting with prospective stakeholders involves offering a payment of R to stakeholders that the firm pays regardless of the cash flow state realized at $t = 3$ and an additional payment ΔR that the firm pays on top of R in the high cash flow state. As it is standard, we assume that all parties are protected by limited liability and that contracts are monotone, i.e., $0 \leq R \leq y$ and $0 \leq \Delta R \leq \Delta y$, where $\Delta y \equiv x - y$.[12] The latter monotonicity assumptions ensure that no party has incentives to sabotage the firm (Innes, 1990). Once the firm attracts stakeholders, its project is implemented, and all cash flows are realized. In Section 4, we extend this baseline model to consider stakeholders leaving the firm after they have joined.

Trading in the Financial Market. Following Glosten and Milgrom (1985), we assume that the market maker sets a bid and an ask price at which he is willing to sell or buy one unit of the stock. The prices are equal to the firm's expected value, conditional on the information revealed by the order flow, D_t. Price p_{D_1} at $t = 1$ is conditional on the order flow, D_1, at $t = 1$, and price $p_{D_1 D_2}$ at $t = 2$ is conditional on the order flows at $t = 1$ and $t = 2$. The market maker absorbs the trading flow out of his inventory.

We restrict attention to market orders of the form $D_t \in \{-1, 0, 1\}$, i.e., the trader can buy, (short) sell one unit, or do nothing. After observing signal s, the speculator submits an order $D_1 \in \{-1, 0, 1\}$ at date $t = 1$. The speculator's trading order $D_2 \in \{-1, 0, 1\}$ at $t = 2$ can be contingent not only on signal s but also on the trading strategy at date $t = 1$. We assume that noise traders are non-strategic and submit a trading order equal to -1, 0, or 1 with equal probability. Before trading starts at $t = 1$, the trader has neither long nor short positions in the firm.

[12] We can further relax the assumption that the project generates zero in the low cash flow state and that the project's cash flows are binary. Ultimately, all that will matter for our analysis is that the firm offers state-contingent contracts.

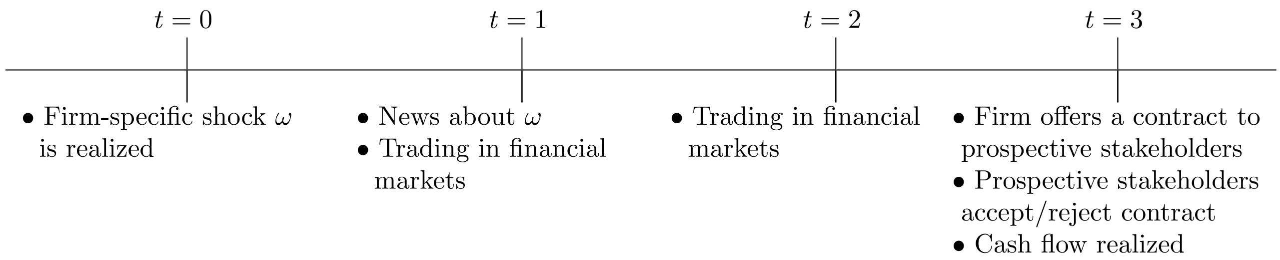

Figure 1: Timeline.

Equilibrium Concept. The equilibrium concept is Perfect Bayesian Equilibrium, where the speculator submits her trading orders to maximize her expected final-period payoff

$$\max_{D_{1,2}\in\{-1,0,1\}} \left(y - R + \left(\lambda_B + q\left(s\right)\Delta\lambda\right)\left(\Delta y - \Delta R\right) - p_{D_1}\right) D_1 \\ + \left(y - R + \left(\lambda_B + q\left(s\right)\Delta\lambda\right)\left(\Delta y - \Delta R\right) - p_{D_1 D_2}\right) D_2$$

subject to: (i) her beliefs $q(s)$ at the time of contracting, where $q(B) = 0$, $q(\varnothing) = q_0$, and $q(G) = 1$; (ii) the market maker's price-setting rule p_{D_1} and $p_{D_1 D_2}$, which conditions on the order flow D_1 and D_2 and allows the market maker to break even in expectation; (iii) the prospective stakeholders' participation constraint

$$R + \left(\lambda_B + q_{D_1 D_2}\Delta\lambda\right)\Delta R \geq \overline{w},$$

where, with some abuse of notation, we $q(p_{D_1 D_2}) := q_{D_1 D_2}$ denotes the stakeholders' posterior beliefs that the firm-specific shock is $\omega = G$. This short-hand notation makes explicit that the beliefs depend on the prices, which depend on the order flow observed by the market maker in the financial market; (iv) all players use Bayes' rule to update their beliefs; (v) and all players are rational, and their beliefs about the other players' strategies are correct in equilibrium. We restrict attention to pure strategies (except for the noise trader). Figure 1 summarizes the model.

Alternative Interpretations. Our model applies to both non-financial stakeholders, such as employees or business partners, and financial stakeholders, such as capital providers.[13] Another interpretation of stakeholders is as a target firm in an M&A transaction, where the target firm's owners require at least $\overline{w}$ to sell out. One caveat of this interpretation is that targets in M&A are likely to do their own due diligence, making them arguably similarly informed to the informed speculators in our model. Note that the same is likely to be true

[13] In particular passive investors, investing in myriad of firms, such as institutional investors, endowments, banks, and family offices are likely to pay attention to prices to inform their investment decisions.

for investors, such as venture capitalists, with deep knowledge of the firm, who sometimes continue to provide capital to firms after they go public (Iliev and Lowry, 2020) but are unlikely to be swayed by uninformed speculators in the market.

Our insights are also not restricted to a firm attracting new stakeholders. To the extent that speculators in financial markets may have information that insiders do not, an alternative interpretation of the model is that existing workers need to be incentivized to take an action that increases the firm's value but has a private cost $\overline{w}$ for the workers. Another interpretation is that workers need to be persuaded not to leave for an outside option, paying $\overline{w}$.[14]

3 Why and When Inflating Prices is Profitable

We solve the model backward by characterizing, first, the stakeholders' decision of whether to accept the contract offered by the firm at $t = 3$. We analyze, then, the trading game at $t = 2$ and $t = 1$. Initially, we simplify the exposition by setting the firm's liquid assets in place to zero, i.e., $y = 0$, as this allows us to abstract from issues related to contracting. Subsequently, we study the importance of contracts by allowing for $y > 0$ in Section 3.3.1.

The firm attracts the stakeholders at date $t = 3$ if their posterior beliefs indicate that the contract offered by the firm is at least as valuable as their opportunity cost $\overline{w}$. A necessary condition for such a contract to be feasible is that

$$(\lambda_B + q_{D_1 D_2} \Delta\lambda)\, x \geq \overline{w},$$

which is equivalent to

$$q_{D_1 D_2} \geq q^* \equiv \frac{\overline{w} - \lambda_B x}{\Delta\lambda x}. \tag{1}$$

3.1 Benchmark: Trading When Stakeholders Do Not Learn From Prices

We start by exploring the benchmark case in which stakeholders do not use the information revealed in prices to update their beliefs about the firm. This could be rational if stakeholders also observe the firm-specific shock ω. In this case, trading has no real feedback effects, and uninformed speculators cannot benefit from trading.

[14] If a firm finds itself on a negative trajectory, however, it may suffer from negative contagion effects where stakeholders start leaving because others are leaving. Equity-based compensation makes firms especially susceptible to such contagion risks (Hoffmann and Vladimirov, 2022).

An uninformed trader cannot make a profit because, when she buys, she buys at a higher price, and when she sells, she sells at a lower price than what she believes to be the firm's true value. These unfavorable price adjustments occur because the market maker accounts for the probability that the trades might be coming from an informed trader. Thus, buy orders lead to a price increase while sell orders to a price decrease. Intuitively, an uninformed trader cannot beat a market in which she is the worst-informed player.[15] Relegating all formal proofs to the Appendix, we can summarize this benchmark case as:

Lemma 1 *If stakeholders do not rely on prices to learn about the expected value of the contract offered by the firm, the speculator does not trade if she is uninformed.*

3.2 How Uninformed Speculation Creates Superstars

Our first main result is that the prediction from Lemma 1 breaks down if potential stakeholders learn from market prices about the expected value of the compensation offered by the firm. In that case, an uninformed trader can make a profit, as she is better informed about the direction of her follow-up trades and whether these trades are likely to affect the stakeholders' beliefs about the firm, affecting the firm's ability to attract stakeholders. Interestingly, the fact that trades move prices made it impossible for uninformed traders to make a profit when stakeholders did not learn from financial markets (Lemma 1). However, when prospective stakeholders use the firm's stock price to update their beliefs about the firm, a higher stock price can help the firm attract stakeholders at a lower cost by improving their posterior beliefs. In what follows, we make this intuition more precise by showing why the uninformed speculator's trading strategy can be profitable even though the market maker and prospective stakeholders are rational, anticipate this strategy and break even in expectation.

Consider the following candidate equilibrium in which the uninformed speculator trades as if she had positive information about the firm: The speculator buys in both periods if her signal is good or uninformative, $s \in \{G, \varnothing\}$, and sells if the signal is bad. Hence, buy orders reveal positive information about the firm's prospects, whereas sell orders reveal negative information; the firm can attract stakeholders if their posterior beliefs about the compensation offered by the firm are higher than their outside option $\overline{w}$. The firm optimally sets the stakeholders' compensation such that they just break even for their posterior beliefs

[15] An uninformed speculator could make a trading profit in a modification of our model with two traders — a noise trader and a speculator, similar to Goldstein and Guembel (2008). In this modification, if the noise trader buys in the first period (moving prices up), the uninformed speculator can make a trading profit from short selling in the second period, as she knows that there is no informed trader around. Such profit opportunities do not exist in our model, as all trades come from the same trader.

(for details, see Lemma C.2 in the Appendix):

$$R + (\lambda_B + q_{D_1 D_2}\Delta\lambda)\,\Delta R = \overline{w}. \tag{2}$$

Note that if $y = 0$, the only feasible value for R is zero, and it holds that $\Delta R = \frac{\overline{w}}{(\lambda_B + q_{D_1 D_2}\Delta\lambda)}$.

Consider the pricing of the firm's equity. Since the market maker must account for the probability that the buy orders may also come from uninformed or noise traders, the price does not fully adjust to the firm's true value even after two buy orders ($D_1 = D_2 = 1$). Specifically, the price p_{11} at $t = 2$ after two buy orders and the price p_1 at $t = 1$ after one buy order, respectively, are

$$p_{11} = (\lambda_B + q_{11}\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right), \tag{3}$$

$$p_1 = \pi_{11}p_{11} + (1 - \pi_{11})\,(\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)\mathbf{1}_{q_0 \geq q^*}, \tag{4}$$

where π_{11} is the (endogenous) probability that the market maker assigns to observing a buy order at $t = 2$ after observing a buy order at $t = 1$; $\mathbf{1}_{q_0 \geq q^*}$ is an indicator function taking the value of one if $q_0 \geq q^*$, in which case the firm attracts stakeholders at a compensation of $\frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}$ instead of $\frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}$.

Since it is a standard result that an informed trader can profit from her information advantage by trading with her information, we focus our discussion on the case in which the speculator is uninformed. The uninformed speculator's valuation of the firm if the stakeholders join at a compensation of $\frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}$ is

$$(\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right). \tag{5}$$

Notably, the price p_{11} (given by (3)) at which the uninformed speculator buys at $t = 2$ is higher than her expectations about the value of the firm, given by (5), as $q_{11} > q_0$. Intuitively, the price cannot be lower, as it must reflect a higher probability that the state is good compared to uninformed players' prior beliefs, i.e., $q_{11} > q_0$. Thus, an uninformed speculator cannot make a profit in a one-period trading game.

However, the uninformed speculator can make a profit when trading takes place over multiple periods, as then she might be able to execute her initial trades at a lower price. Specifically, if the price p_1 (given by (4)) at which she buys at $t = 1$ is lower than her valuation of the firm, the trading profit from the first trading period could more than offset the loss from the second.[16] Note that despite the second-period trading loss, there is no time-inconsistency in the uninformed speculator's trading strategy, as, without her second trade, the firm will not be able to attract stakeholders at a lower cost.

In a nutshell, uninformed speculation can be profitable, because the speculator is better informed about how she intends to trade at $t = 2$. That is, the speculator's private information that she intends to continue inflating the price, which will allow the firm to attract stakeholders (at a lower cost), gives rise to an endogenous information rent even though the speculator has no private information about firm fundamentals. The reason that the price p_1 at $t = 1$ may react only slowly, allowing the uninformed speculator to make a profit on her first-period trade, is that the market maker must take into account that the order flow could be coming from noise traders. This intuition also extends to alternative equilibria with uninformed trading, such as ones in which the speculator buys only in $t = 1$ and does not trade in $t = 2$ if $s \in \{G, \varnothing\}$.

Thus far, we have presented the case where uninformed speculators find it profitable to inflate stock prices. It is conceivable that an uninformed speculator might also pursue the opposite strategy – mimicking the trading strategy of a negatively informed speculator, e.g., by short-selling in both periods. However, this strategy is never profitable if $q_0 < q^*$. Then, the stakeholders' prior beliefs are not sufficiently positive, making it impossible for the firm to attract stakeholders without a positive feedback effect from the market. In this case, there is no equilibrium in which the uninformed speculator can profit from short-selling, as selling has no real feedback effects — with or without short-selling, the firm cannot attract stakeholders. Hence, an intuition similar to Lemma 1 applies again.

Proposition 1 *(i) There are multiple pure-strategy equilibria in which an uninformed speculator ($s = \varnothing$) mimics the trading strategy of a positively informed speculator ($s = G$), and the firm attracts stakeholders by offering a contract $\Delta R = \frac{\overline{w}}{\lambda_B + q_{D_1 D_2} \Delta\lambda}$. (ii) If $q_0 < q^*$, there are equilibria with uninformed buying but no equilibria with uninformed short-selling in which the speculator makes a profit.*

The fact that the speculator is better informed about her future trades is one of the main reasons that inflating the firm's stock price without positive information about the firm can be profitable. However, other conditions must also be satisfied. In what follows, we discuss these conditions in detail.

[16] For comparison, note that a positively-informed speculator (observing $s = G$) makes a profit on both trades, as her valuation, $\lambda_G (x - w)$, is higher than both p_1 and p_{11}.

3.3 When Does Uninformed Speculation Occur?

3.3.1 The Importance of Contract Design

A fundamental insight from our paper is that an uninformed speculator can only make a profit from inflating a firm's stock price if the firm compensates stakeholders with state-contingent contracts. Explaining why this is the case requires investigating at whose expense the speculators make a profit.

Stakeholders and the market maker in our model are rational and break even — thus, they do not lose out from the fact that speculators might be trading without any information. In particular, they anticipate that buy orders might be coming from an uninformed speculator and, as a result, the firm's stock price might be higher than warranted. Since stakeholders' posterior beliefs do not improve as much as they might in equilibria without uninformed speculation, firms with good prospects are forced to offer more favorable terms to attract stakeholders. Hence, truly good firms, whose stock prices are below fundamental value, end up cross-subsidizing worse firms, whose stock prices are inflated by uninformed speculators. The key implication is that the uninformed speculator's profits are at the expense of the truly good firms.[17] In particular, by allowing firms with worse projects to make a profit from attracting stakeholders, cross-subsidization effectively protects uninformed speculators from internalizing the full cost of inflating the price of the wrong firm.

When contracts are more sensitive to the realized state ω (which occurs if $\Delta R/R$ is large, holding the stakeholders' participation constraint binding), the effect of cross-subsidization is stronger and the uninformed speculator's profits are higher. Without cross-subsidization, the uninformed speculator cannot make a profit from inflating the firm's stock price. To show these claims more formally, we consider (for this Section only) the case in which the firm has liquid assets in place $y > 0$. To focus on the impact of contract design on the opportunities for uninformed speculation, we assume that the firm's owners have the same information as stakeholders.[18]

In this setting, Proposition 1 applies unchanged if the firm offers a contract $\{R, \Delta R\} = \left\{0, \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right\}$. However, Proposition 1 no longer applies if the firm offers a compensation contract $\{R, \Delta R\} = \{\overline{w}, 0\}$, which guarantees stakeholders a payment of $\overline{w}$, regardless of the firm's cash flow state. That is, the stakeholders' compensation does not involve any cross-subsidization from G-firms to B-firms.[19] To see that an uninformed speculator cannot

[17] As is standard, noise traders also lose out.

[18] If the firm is better informed about its project than stakeholders, the choice of $\{R, \Delta R\}$ will play a signaling role. As it is standard, the unique contract surving standard equilibrium refinements stipulates $R = \min\{\overline{w}, y\}$, as this minimizes the cross-subsidization of B-firms by G-firms (this analysis can be provided upon request).

[19] If firms do not offer stakeholders state-contingent contracts, learning by stakeholders plays no role. This

make a profit, recall that a necessary condition for such a profit in an equilibrium in which she trades as a positively informed trader is that her first-period trading profit is positive. However, this is never the case if $\{R, \Delta R\} = \{\overline{w}, 0\}$. In particular, it holds that

$$\begin{aligned} p_1 &= \pi_{11} p_{11} + (1 - \pi_{11}) \left(y + \left(-\overline{w} + (\lambda_B + q_0 \Delta\lambda) x \right) \mathbf{1}_{q_0 \geq q^*} \right) \\ &\geq \pi_{11} p_{11} + (1 - \pi_{11}) \left(y - \overline{w} + (\lambda_B + q_0 \Delta\lambda) x \right) \end{aligned}$$

since attracting stakeholders, given beliefs q_0, only increases firm value if $q_0 \geq q^*$. Hence, given that $p_{11} = y - \overline{w} + (\lambda_B + q_{11} \Delta\lambda) x$, the uninformed speculator's first-period trading profit is:

$$\begin{aligned} & y - \overline{w} + (\lambda_B + q_0 \Delta\lambda) \Delta y - p_1 \\ \leq\ & \pi_{11} (q_0 - q_{11}) \Delta\lambda \Delta y < 0. \end{aligned}$$

Summing up, for $\{R, \Delta R\} = \{\overline{w}, 0\}$, the first-period trading profit and, as a result, the overall profit from uninformed speculation is negative. Intuitively, without cross-subsidization, the uninformed speculator fully internalizes the cost that attracting stakeholders destroys value for equity holders if $\omega = B$, which, in turn, erodes the value of the uninformed speculator's long position.

Proposition 2 *For any given contract $\{R, \Delta R\}$ for which stakeholders' participation constraint binds, the uninformed speculator's profit increases in the variable component, ΔR, of stakeholders' compensation. There is no equilibrium with uninformed speculation if $R = \overline{w}$.*

3.3.2 Speculation and Market Conditions

Another central insight from our model is that equilibria with uninformed speculation do not arise in hot or cold markets but rather when market conditions are "normal." In what follows, we define this notion of "normal" along several dimensions.

First, a necessary condition for equilibria with uninformed speculation to exist is that the stakeholders' opportunity cost, $\overline{w}$, is neither too high nor too low. On the one hand, if $\overline{w}$ is very high, the stakeholders' posterior beliefs need to improve significantly for the firm to be able to attract the stakeholders. However, this is unlikely if they expect that the stock price could have also been driven by uninformed speculation. On the other hand, if $\overline{w}$ is very

case essentially corresponds to that analyzed in Goldstein and Guembel (2008) who consider a setting in which a manager learns from stock prices whether to use the firm's internal resources to make an investment. The assumption that the firm's owners have the same information as stakeholders nests Goldstein and Guembel's (2008) setting into our model by implying that they learn from prices whether paying $\overline{w}$ to attract stakeholders creates value.

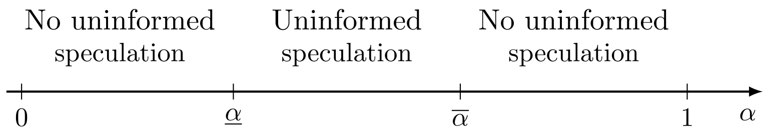

Figure 2: Transparency and uninformed speculation.

low, cross-subsidization in the stakeholders' compensation affects little the firm's stock price, which makes it impossible for an uninformed speculator to make an overall trading profit.

It is worth noting that the condition on stakeholders' opportunity cost $\overline{w}$ for a given prior q_0 can alternatively be stated in terms of a condition on the stakeholders' prior beliefs q_0 for a given level of opportunity cost $\overline{w}$. Taking this interpretation, the stakeholders' priors also need to be "normal." If q_0 is very low, stakeholders' posteriors about the firm cannot improve sufficiently to convince stakeholders to forgo their outside options. On the other hand, if q_0 is very high, there is little scope for further improvement in beliefs, implying that cross-subsidization in stakeholders' compensation matters little for stock prices, making it again impossible for an uninformed speculator to make an overall trading profit.

Second, the probability of informed trading, captured by α, should be intermediate, as buy orders should have an intermediate impact on the market maker's posterior beliefs and the resulting prices (Figure 2). On the one hand, if the probability of informed trading is high, prices will increase steeply following buy orders. This will make it hard for the uninformed speculator to profit from buying, as she is, after all, not sure about the true nature of the firm-specific shock. On the other hand, if the probability of informed trading is very low, prices will have little impact on the stakeholders' beliefs. Hence, prices will not affect much the firm's ability to attract stakeholders or the contracts it needs to offer them, muting the feedback effects of financial markets. Moreover, if the probability of informed trading is low, it could also become optimal for a negatively informed speculator to buy in both periods. Such deviations would undermine the proposed uninformed speculation equilibrium.[20]

Proposition 3 *There are thresholds $\underline{\alpha}$ and $\overline{\alpha}$ such that an equilibrium in which an uninformed speculator ($s = \varnothing$) mimics the trading strategy of a positively informed speculator ($s = G$) exists if the probability that the speculator is informed is intermediate, $\alpha \in [\underline{\alpha}, \overline{\alpha}]$. Furthermore, necessary conditions for such equilibria to exist is that the outside option, $\overline{w}$, and prior beliefs, q_0, are intermediate (the threshold values for α, $\overline{w}$, and q_0 are defined in the Appendix).*

As a side note, it is worth briefly remarking that higher transparency may decrease price

[20]Note that there can be no equilibrium in which a negatively-informed speculator also buys, as then the trades will seize to have any information role.

efficiency, defined by the difference between the firm's fundamental equity value and its stock market value.[21] To give a simple example, if transparency is very low, the compensation that the stakeholders require to join is very high. In the extreme, it is $\Delta R = \frac{\overline{w}}{\lambda_B + q_{D_1 D_2} \Delta\lambda} = x$, and the pricing error is zero, as the firm's fundamental value is zero regardless of whether the firm can attract stakeholders. As transparency increases and the firm is able to attract stakeholders at a lower cost, the price set by the market maker is in general different from its fundamental value — that is, the pricing error increases.

Corollary 1 *By affecting stakeholders contracts and the firms' ability to attract stakeholders, higher transparency requirements can lead to a larger discrepancy between the firm's fundamental equity value and its stock market valuation.*

3.3.3 Endogenous Entry of Speculators

The speculator in our model can make positive trading profits regardless of whether she is informed, raising the question of whether this profit opportunity dissipates if we allow for entry of speculators. If there are no entry costs, the answer is simple: uninformed speculators will enter until the probability of informed trading falls to the threshold allowing for the existence of such equilibria.

The more interesting and realistic scenario, however, is when entry of speculators entails a cost. We extend our model to study this scenario in Appendix B.1. In particular, we assume that identifying potential targets for speculation requires monitoring the news and analyst reports and forecasts. Once a speculator has identified such a target, she may or may not have become better informed about it, and our baseline model applies. In this setting, equilibria with uninformed speculation exist as long as entry costs are intermediate (Proposition B.1). If they are too high, the equilibrium fraction of speculators and the probability of informed trading (captured by $(1-\beta)\,\alpha$) will be too low for prices to meaningfully affect prospective stakeholders' decisions. Instead, if entry costs are too low, speculators will be attracted to enter, making prices very sensitive to new trades (Proposition B.1). Overall, this insight supports the general message that emerges from our paper that market conditions need to be normal (as opposed to extreme).

3.3.4 Discussion: Other Equilibria

Next to equilibria with uninformed speculation, there can be also equilibria without uninformed speculation. In Proposition B.2 in Appendix B.2, we discuss when equilibria with

[21] In our model, stock market capitalization is the same as the firm's market value as the firm has no debt. Note that we often use stock price and stock market value interchangeability.

and without uninformed speculation coexist, raising the question of which equilibrium will be more likely to emerge in financial markets. Dealing with the important question of equilibrium selection is beyond the scope of our analysis. In practice, it is conceivable that uninformed speculative trading could be triggered by news releases, possibly overhyped by (social) media.[22] Given our result that speculators do not need to have prior inventory in the firm, the implication is that there is wide scope for engaging in such speculation.

4 Speculative Short-Selling vs Speculative Buying

Proposition 1 shows that for $q_0 < q^*$, uninformed speculators can only benefit from inflating the firm's stock price but not from short-selling that erodes the firm's stock price. In this section, we consider the opportunities for short-selling when $q_0 \geq q^*$ so that the stakeholders' prior beliefs are sufficiently high that they would join the firm even without a positive feedback effect from the market.

4.1 Speculation Before the Firm Attracts Stakeholders

If $q_0 \geq q^*$, both uninformed buying and short-selling can have real effects. In particular, if an uninformed trader mimics a negatively informed speculator, short-selling will worsen the terms at which the firm can attract stakeholders. It could even make attracting stakeholders impossible altogether if stakeholders' posterior beliefs drop below q^*. In the presence of such real effects, uninformed short-selling can become profitable. Together with Proposition 1, it follows:

Corollary 2 *Both uninformed speculative buying and short-selling can be profitable if* $q_0 \geq q^*$.

Figure 3 summarizes the insights from Proposition 3 and Corollary 2 in terms of the stakeholders' opportunity costs $\overline{w}$. In the Appendix, we offer concrete parametric examples, for which different types of equilibria can be supported.[23]

[22] The importance of media for stock prices has been recently analyzed in Goldman et al. (2021).

[23] We do not discuss in detail equilibria with uninformed short-selling, as the existence of such equilibria has been analyzed in detail by prior work (Goldstein and Guembel, 2008).

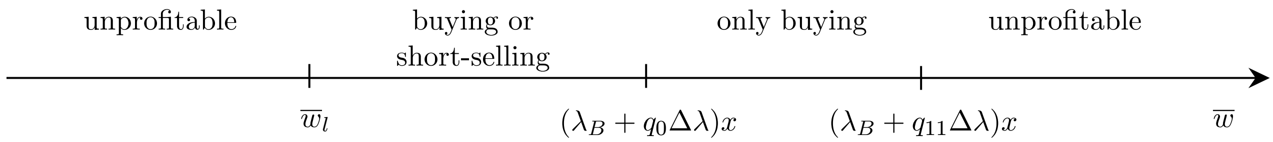

Figure 3: Profitability of uninformed speculation. The figure shows the regions in which uninformed speculation can be profitable depending on stakeholders' opportunity cost and beliefs. In this figure, $\overline{w}_l$ is the lowest threshold for $\overline{w}$ for which an equilibrium with uninformed speculation can be supported.

4.2 Speculation After the Firm Attracts Stakeholders: Limits to Arbitrage

Next, we explore the question of when speculative trading can reverse stakeholders' decision to join the firm. Considering this question is important, as the stakeholders' prior beliefs could be the result of speculative trading preceding date $t = 0$. Moreover, the prospect of reversal affects the incentives to inflate prices in the first place. To address this question, we extend our analysis to consider the case in which the stakeholders' high prior beliefs, $q_0 \geq q^*$, allow the firm to attract stakeholders already at $t = 0$.[24]

The limits to reversing positive feedback effects (and, thus, possibly arbitraging away inefficiencies) are immediate when we interpret stakeholders as capital providers. Then, reversals are not possible if the investment $\overline{w}$ is sunk. The new information effectively comes too late for capital providers, and all they can do is wait for their contractual payments in $t = 3$. Thus, neither informed nor uninformed speculation will have real effects.

In what follows, we consider the alternative interpretation of stakeholders as employees and show that reversals are often unlikely also in this context. The difference between the interpretation of stakeholders as employees and investors is that the employees' opportunity cost $\overline{w}$ is not necessarily sunk. We consider the following scenario. If employees leave before $t = 3$: (i) they can still claim their outside option $\overline{w}$; (ii) forgo their compensation; (iii) the project is yields a (liquidation) payoff of L.

Assumption (ii) is arguably realistic in the context of workers paid in vesting equity and performance bonuses, which is the setting we are interested in (Proposition 2). Assumption (iii) applies to cases in which the value workers have created at a firm does not fully dissipate with their departure. Arguably most businesses geared toward producing physical products fit this description. However, there are also other examples such as when scientists and

[24]We assume that the compensation promised to stakeholders at $t = 0$ and due at $t = 3$ is then $\frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}$. However, note that when trading takes place after the workers are hired, it might be optimal for the firm to set $\Delta R > \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}$ to prevent that workers leave if their beliefs about the firm's success probability deteriorate.

engineers generate patents for the firm. We assume that it is efficient that employees leave and the project be liquidated if $\omega = B$ but not if $\omega = G$:

$$\lambda_B \left(x - \frac{\overline{w}}{\lambda_B + q_0 \Delta\lambda} \right) \leq L \leq \lambda_G \left(x - \frac{\overline{w}}{\lambda_B + q_0 \Delta\lambda} \right).$$

The trade-off for speculators is now readily apparent. If the negative price pressure from short-selling causes stakeholders to leave, the firm is relieved from its obligation to pay them. Thus, even though the departure of stakeholders reduces the expected size of the "pie" if $\omega = G$, there is a countervailing effect for equity holders, as they are left with a larger share of the (safer) pie, L. This countervailing effect dominates if the liquidation value L that becomes available through the employees' involvement is sufficiently high (i.e., L is larger than some lower bound $\underline{L}$) or if the firm has promised a large fraction of its cash flows to employees in order to make sure it can attract them to realize the risky project.[25] In these cases, short-selling scaring stakeholders away and forcing the firm to liquidate the risky project ends up *increasing* the firm's stock price.[26] As a result, short-selling becomes unattractive regardless of the firm's information.

Lemma 2 *The opportunities for reversing positive feedback effects, possibly driven by inflated prior beliefs, are limited. There are thresholds* $\underline{L}$ *and* $\overline{L}$*, such that if* $L \in \left[\underline{L}, \overline{L}\right]$*, there is no equilibrium in which the negative information impounded into prices by short-sellers triggers stakeholders to abandon the firm before* $t = 3$*.*

Interestingly, though Edmans et al. (2015) show that trading on negative information is less profitable than trading on positive information, which is related to Lemma 2, they also show that uninformed speculation inflating prices is not profitable. By contrast, the main insight from our analysis in Propositions 1–2 and Lemma 2 is that such speculation is not only profitable but also likely to persist, as positive feedback effects are hard to reverse.

4.3 Transparency and Speculation Opportunities

Firms often have wide latitude in how transparent about their business they want to be, raising the question of how the firm's choice of transparency affects the probability of un-

[25] L cannot be too high either, as then there can be an equilibrium in which a negatively informed speculator can profit from buying (as a positively informed speculator) and then selling at a high price in the second trading date, which triggers stakeholders to leave.

[26] Though this is reminiscent to laying off staff to improve operational efficiency, the difference is that employees leave voluntarily. In particular, although equity holders might end up better off liquidating the project, this does not imply that attracting employees in the first place is suboptimal, as they are instrumental both for running the project and for its positive liquidation value. Indeed, the firm generates zero if it does not attract stakeholders.

informed speculation. While we do not mean to suggest that transparency decisions are primarily made on the basis of this calculation, we believe that considerations about how transparency will affect speculative trading in the firm's stock are economically significant enough to be contemplated when deciding on the firm's level of transparency. For example, one effect that a firm might consider is that outside the intermediate region for L defined in Lemma 2, informed and possibly uninformed speculative short-selling can potentially reverse positive feedback effects. However, in analogy to Proposition 1, there are no equilibria with speculative short-selling if transparency is sufficiently low or sufficiently high.

More precisely, suppose that the firm choose its transparency level α. A firm that wants to avoid becoming the target of speculative short-selling scaring off stakeholders can benefit from choosing to be either very transparent or very intransparent.[27] Specifically, if the transparency level α is very low, the probability of informed trading is low and, hence, prices have little impact on stakeholders' beliefs and decisions to leave the firm. This is trivial to see if $\alpha = 0$. Alternatively, firms can reduce the likelihood that stakeholders leave by increasing transparency. Higher transparency makes prices more sensitive to trades. As a result, the parameter range $L \in \left[\underline{L}, \overline{L}\right]$ for which speculators cannot benefit from trading on negative information increases ($\overline{L}$ increases). This strategy is not as effective as setting $\alpha = 0$, but is possibly more realistic for public firms, which typically must comply with minimum disclosure requirements.[28]

Proposition 4 *The firm can reduce the profitability of short-selling, triggering stakeholders to leave, by choosing the highest feasible transparency level α. Alternatively, the firm can prevent that trading has an impact on stakeholders' decision to leave by choosing a transparency level below a threshold $\underline{\alpha}''$ (defined in the Appendix).*

Taken together, our results suggest that opportunities for speculative trading will be endogenously asymmetric. First, speculation inflating stock prices is the only type of profitable speculation if speculators are uninformed and $q_0 < q^*$ (Corollary 2). Second, the firm has incentives and tools to prevent becoming target of speculation that scares off stakeholders (Proposition 4). Thus, when prices affect stakeholders' decisions, speculative buying is more

[27]Examples of information that could help speculators infer ω include the firm's choice of quality of auditor, the number of items it reports in its financial reports, the accuracy of such reports, the intensity of discussion of items such as R&D expenses, capital expenditures, product and segment data, and major business partners (Bushman et al., 2004). Furthermore, in its regulatory filings, earnings calls, and news releases, a firm can choose how transparent it wants to be about its strategy; organizational structure; the identity of major shareholders; the background, share ownership, and affiliations of board members; as well as non-executive officers and employees.

[28]Moreover, lowering transparency might be hard for firms that had previously chosen high transparency (outside of our model) since, once information is released, it cannot be taken back.

likely than speculative short-selling. All of this is strengthened by the fact that, once positive feedback effect have been triggered, they are hard to reverse (Lemma 2). This asymmetry is noteworthy, as in models in which stock prices inform internally-funded investment decisions, the asymmetry goes the other way (Goldstein and Guembel, 2008).

Corollary 3 *Opportunities for profiting from uninformed trading will be asymmetric, with more opportunities for uninformed speculators to benefit from speculative buying inflating prices than from speculative short-selling deflating prices.*

5 Fake It Till You Make It in Private Markets

The insight that investors can benefit from an artificially inflated valuation if that helps the firm "fake it till it makes it" by attracting high-quality stakeholders extends beyond trading in secondary markets. This section shows that manipulation exploiting this feedback effect can start already while the firm is still private and raises growth financing. The cost of manipulation is once again at the expense of outside third parties — the good firms that end up cross-subsidizing firms with worse prospects. Moreover, the only feasible manipulation is one that presents the firm to be better than it is.[29]

Extension: Raising Start-up Capital. Consider an extension of the baseline model with two additional dates $t = -2$ and $t = -1$ at which the firm is started with outside capital. Specifically, at $t = -2$, a penniless entrepreneur seeks financing K from a venture capitalist (VC) to start the firm. Apart from this start-up capital, the firm also needs to attract stakeholders — i.e., employees or business partners with an outside option of $\overline{w}$ or, alternatively, follow-up financing of $\overline{w}$ provided by uninformed investors. Before the financing contract with venture capitalists is signed, the entrepreneur and the venture capitalist, but not the stakeholders, observe a signal $\widetilde{s} \in \{G, B, \varnothing\}$, which may reveal the firm-specific shock, $\widetilde{\omega}$ that determines the firm's likelihood of generating high cash flows at $t = -1$. The firm-specific shock $\widetilde{\omega}$ and the cash flows at $t = -1$ may, but need not, be correlated with the firm-specific shock ω at $t = 0$ and the cash flows at $t = 3$. Similar to the baseline model, the signal $\widetilde{s}$ is fully informative with probability α and pure noise, i.e., $\widetilde{s} = \varnothing$, otherwise. The prior probability that the firm-specific shock is good is $\widetilde{q}$. If the firm-specific shock is good, the firm has a probability λ_G of generating high cash flows at date $t = -1$ if it attracts stakeholders. If the shock is bad, this probability is λ_B.

[29] Note that the concept of short-selling has no analog in private markets.

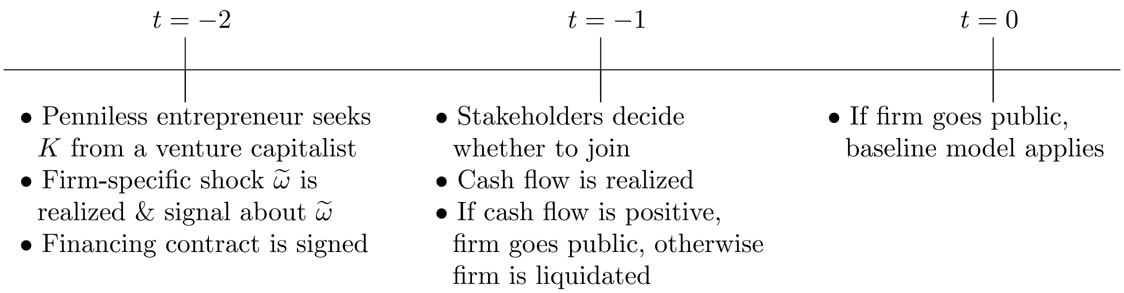

Figure 4: Timeline — Raising Start-Up Capital.

To keep the analysis simple, we assume that the firm is liquidated if its cash flow at $t = -1$ is zero. If the firm generates x, it goes public, and the venture capitalist sells out.[30] The game continues then with the baseline model starting at date $t = 0$. That is, the price at which the venture capitalist sells its contracts is equal to the firm's expected value given the anticipated outcome of the trading game from the baseline model. Figure 4 summarizes the model's extension.

Contracting. Consider date $t = -2$ at which an entrepreneur seeks capital K to start the firm. We assume that investors compete on prices. As in the baseline model, we stipulate that $y = 0$ so that the firm can only offer a payment, denoted by ΔR_0, in the high cash flow state. Thus, without loss of generality, we assume that the firm offers the venture capitalist an equity stake γ that satisfies

$$\lambda_G \gamma \left(x - \Delta R_0 + p_0\right) = K, \tag{6}$$

if they have observed $s = G$. In expression (6), $\lambda_G \left(x - \Delta R_0\right)$ is the firm's expected cash flow at $t = 0$ net of the compensation ΔR_0 promised to stakeholders; and p_0 is the price of equity if the firm goes public at $t = -1$. We are implicitly assuming that the residual cash flow, $x - \Delta R_0$ at $t = -1$ is paid out to the firm's equity holders.

The central insight from this section is that the venture capitalist and the firm can profit from pretending to be positively informed by agreeing on an equity stake γ, defined by expression (6) even if they are uninformed about the state $\widetilde{\omega}$. For the venture capitalist to break even with such a contract, the firm and the venture capitalist can agree on an additional payment, undisclosed to outsiders, which increases the overall payment to the venture capitalist at $t = -1$ to $S \geq \gamma \left(x - \Delta R_0\right)$, with this contract converting to an

[30] If the states in $t = -2$ and $t = 0$ are correlated, the venture capitalist's decision to stay invested could act as a signal about the firm's type. We do not pursue this extension, as it does not add qualitatively to our results. Venture capitalists typically, indeed, exit their investments at the time of a firm's initial public offering (Gompers, 1996).

equity stake γ upon an initial public offering.[31] Such convertible contracts promising venture capitalists a higher expected payoff than their pure equity stake (conditional on conversion in an IPO) are common in venture capital financing (Hellmann, 2006; Gornall and Strebulaev, 2020). Defining $\overline{\lambda} \equiv \lambda_B + \widetilde{q}\Delta\lambda$, the venture capitalist's contract when observing $\widetilde{s} = \varnothing$ must satisfy

$$\overline{\lambda}\,(S + \gamma p_0) = K. \tag{7}$$

Since the stakeholders are rational and anticipate that the venture capitalist and the firm might be uninformed, the stakeholders' (binding) participation constraint is

$$\left(\frac{\alpha\widetilde{q}}{\alpha\widetilde{q} + 1 - \alpha}\lambda_G + \frac{1-\alpha}{\alpha\widetilde{q} + 1 - \alpha}\overline{\lambda} \right) \Delta R_0 = \overline{w}, \tag{8}$$

where the term before λ_G is the probability that stakeholders attribute to the venture capitalist being positively informed, and the term before $\overline{\lambda}$ is the probability that the venture capitalist is uninformed.[32] That is, stakeholders are rational and demand to be compensated for the risk that they might be dealing with a firm about which investors are uninformed, leading to cross-subsidization across firms. Similar to the baseline model, this cross-subsidization makes it possible for investors to break even by helping the firm attract stakeholders despite lacking positive information about its prospects.

To show that the firm and the investors can benefit from pretending to have observed a good signal in order to attract the stakeholders (even if they have observed $s = \varnothing$), it suffices to show that it is feasible to construct contracts that satisfy the three break-even conditions (6)–(8). Similar to Proposition 3, we obtain that inflating the firm's valuation is feasible and can help attract stakeholders as long as the stakeholders' outside option $\overline{w}$ is not too high. If $\overline{w}$ were to high, the stakeholders' posterior beliefs cannot improve sufficiently to convince the to accept the firm's contract offer, given that they anticipate that the firm's valuation might have been inflated.

Proposition 5 *If the entrepreneur and venture capitalist observe $\widetilde{s} = G$, the firm can raise equity financing by issuing $\gamma = \frac{K}{\lambda_G(x - \Delta R_0 + p_0)}$ and attract stakeholders at $t = -2$ by promising them a compensation of $\Delta R_0 = \frac{\overline{w}}{\frac{\alpha\widetilde{q}}{\alpha\widetilde{q}+1-\alpha}\lambda_G + \frac{1-\alpha}{\alpha\widetilde{q}+1-\alpha}\overline{\lambda}}$. If the entrepreneur and the venture capitalist are uninformed about $\widetilde{\omega}$, i.e., $\widetilde{s} = \varnothing$, they can still mislead prospective stakeholders to*

[31] We implicitly assume that stakeholders' contracts cannot condition on those offered to the venture capitalist. This assumption is realistic, and relaxing it is possible.

[32] To be precise, stakeholders interpret the firm's offer as a signal about its prospects and use Bayes rule to update their prior beliefs. As it is standard, there are only pooling equilibria in this signaling game in which the uninformed firm makes the same offer to stakeholders as the informed firm. We refine out-of-equilibrium beliefs by assuming that stakeholders place probability one on $s = B$ if they observe an offer different from ΔR_0.

join by agreeing on a financing contract paying the venture capitalist $S = \frac{K}{\overline{\lambda}} - \gamma p_0$ *at* $t = -1$ *and converting to an equity stake* γ *upon an IPO. Only the VC's equity stake,* γ*, is disclosed to outsiders. This contract is feasible if*

$$\overline{w} \leq \left(\frac{\alpha\widetilde{q}\lambda_G + (1-\alpha)\,\overline{\lambda}}{\alpha\widetilde{q} + (1-\alpha)}\right)\left(x + p_0 - \frac{K}{\overline{\lambda}}\right). \tag{9}$$

6 Empirical Implications

Our model's premise is that there is a feedback effect from stock prices on prospective stakeholders' decisions. Anecdotal evidence for this feedback channel abounds (see Introduction). There is also extensive empirical evidence that a wide variety of stakeholders pay attention to prices and that elevated prices remain high long enough to allow firms to benefit from an improved image that can help them attract stakeholders. For example, it has been found that two of the most important factors for prospective employees before joining a firm are its profitability and stock market value (Dowling, 1986; Fombrun and Shanley, 1990; Turban and Greening, 1997; Bergman and Jenter, 2007).[33] A firm's stock price also matters for business partners and suppliers, deciding whether to expand their relationship with a firm by making firm-specific investments (Liang et al., 2020). There is evidence that capital providers also pay attention to stock prices (Baker, Stein, and Wurgler, 2003; Derrien and Kecskes, 2013; Grullon, Michenaud, and Weston, 2012). Naturally, for high valuations and stock prices to affect stakeholders' decisions, they must remain elevated for some time. This is typically the case in private markets, where valuations are rarely updated more than once a year when the firm raises a new funding round. Also in public markets, it is common that speculative trading keeps prices elevated over many months (Aggarwal and Wu, 2006). The same is often true when prices increase following news releases not containing fundamental information (Huberman and Regev, 2001; Cooper et al., 2001).

Based on this feedback channel, our central result is that uninformed speculators can profit from inflating firm valuations, even when everyone is rational and anticipates such speculation. Clearly, not all firms can become a target of speculative trading. Firms must have a sufficiently high potential to attract stakeholders despite concerns about an inflated valuation. Furthermore, in line with the cited anecdotal evidence, firms must be compensating stakeholders with performance pay or raising equity (Proposition 2).

Implication 1 ***(Speculation targets)*** *Uninformed speculators target firms that:*
(i) have high growth potential but are hard to assess, such as human-capital intensive firms,

[33] Exceptional stock market performance not only draws new talent but also leads to a rise in the number of college students choosing to major in related fields (Choi et al., 2020).

growth firms, recently-listed firms, or firms undergoing a transition or restructuring; (ii) compensate employees and business partners with performance pay or equity-like instruments; or raise equity financing.

For speculation to have real effects, market conditions need to be "normal." This means that the probability of informed trading and the cost of acquiring information about the firm must be intermediate (Propositions 1 and B.1) and markets must be neither hot nor cold (Proposition 3).

Implication 2 ***(Speculation and market conditions)*** *Uninformed speculation is more likely in "normal" markets, in which: stakeholders' opportunity costs; prior beliefs about targeted firms; and the probability of informed trading and the cost of acquiring information are intermediate — i.e., neither too high nor too low.*

Implication 2 differentiates our paper from irrational exuberance theories focusing on hot markets in which firms can free ride on a positive market sentiment, helping them cheaply attract financial and possibly non-financial capital (Baker and Wurgler, 2002; Baker et al., 2003). Another stark contrast to such theories is that stakeholders in our model anticipate that valuations may be inflated and do not lose on average from their dealings with the firm.

Our model further predicts that the price reversals following news (Barber and Odean, 2008) will be less-pronounced for firms, such as those from Implication 1, that can use the increase in their stock price to attract high-quality employees and business partners or raise capital. For example, while GameStop's share price partially reversed after its increase in March 2021, at the end of 2021, it had stabilized at more than eight times its 2020 levels. The fact that the reversal was partial possibly reflects the firm's success in attracting experienced high-level executives and raising the capital it needs for its transformation to an e-commerce business.[34]

Furthermore, reversals of positive feedback effects are hard (and, thus, price reversals will be partial) even when there are traders with negative information about the firm. This is the case if investors have already sunk capital in the firm; or when the value created by employes is unlikely to dissipate after their departure (Lemma 2). Hence, the price inflation created by speculative buying can persist, making it even more profitable to pursue such speculation.[35]

[34] Notably, this partial reversal is entirely rational and unrelated to other explanations of reversal patterns, attributed to overreaction and other behavioral biases (Jegadeesh and Titman, 2001; Daniel et al., 1998).

[35] Related, Dow et al. (2020) show that, once the firm's price has moved in one direction for non-fundamental reasons, it might stay there even after the shock is removed.

Implication 3 ***(Speculation and price reversals)*** *Inflated prices will reverse less for firms that can benefit from building up their stakeholder base by attracting employees and raising capital. Furthermore, price reversals are less likely if: investors have sunk capital in the firm or employees must forgo part of their compensation when leaving the firm, and the value they have created does not fully dissipate with their departure.*

Overall, we expect that uninformed speculation opportunities will be endogenously asymmetric and more likely to benefit targeted firms (Corollaries 2 and 3). In particular, while firms will not try to preempt speculation inflating their stock price from which they can benefit, they can try to preempt speculative short-selling that harms them. For example, one lever through which firms can make uninformed speculation less profitable is by choosing high transparency.[36] Furthermore, once the firm has become the target of speculative trading, corrective price reversals are hard (Implication 3).[37] As should be intuitive, short-selling constraints (such as the up-tick rule in the U.S.) make corrective trading more difficult and exacerbate the resulting misallocation of talent and resources.

Uninformed speculation related to artificially inflating a firm's valuation is not restricted to secondary markets and can occur when a firm raises start-up capital. Indeed, venture capitalists are often accused of abating the well-known strategy of "fake it till you make it," which (as in our model) has the objective of attracting business and employees by portraying a firm in a better light than it is (Braithwaite, 2018; Owen, 2020; Taparia, 2020). In line with such concerns, Gornall and Strebulaev (2020) show that close to half of unicorns would lose their unicorn status once properly accounting for the complexity of VC contracts. Our model illustrates that firms for which building up their stakeholder base is particularly important and that compensate stakeholders with performance or equity-based pay are more likely to fall in this category of unicorns, whose investors effectively help them "fake it till they make it." Uninformed speculation is again asymmetric, as firms and financiers cannot benefit from manipulation that erodes firm value.

Implication 4 ***(Inflated unicorns)*** *Venture capitalists are more likely to agree to inflated valuations that can attract stakeholders and help firms "fake it till they make it" when firms pay stakeholders with performance or equity-based pay. Convertible financing contracts that offer VCs downside protection not clearly communicated to outsiders, facilitate this strategy.*

[36] More disclosure and transparency is often associated with better corporate governance. However, more transparency may backfire in some contexts by increasing agency costs emerging from too much monitoring (Hermalin and Weisbach, 2012) or premature abandonment of investments (Boot and Vladimirov, 2020).

[37] Moreover, since equity holders can benefit from inflated valuations, they are likely to trade against short-sellers seeking to correct the stock price. For example (outside of our model), large blockholders may purchase more shares (Khanna and Mathews, 2012) or the firm's management may engage in stock repurchases (Campello et al., 2021).

7 Conclusion

In this paper, we argue that speculators without any fundamental information about a firm can profit from inflating its stock price and help it "fake it till it makes it" even though everyone is rational and anticipates such strategies. The underlying mechanism is that high prices attract stakeholders, such as key employees, business partners, or investors, who rationally infer that there is a chance that the high prices reflect stellar prospects. Since stakeholders are rational and anticipate that prices might also be inflated, they do not lose out on average. Instead, the speculators' profits come at the expense of the good firms in the economy that end up cross-subsidizing worse ones or lose access to talent and funding altogether.

Not any firm can become target for speculative trading. Such firms must have a sufficiently high potential to attract stakeholders despite concerns about inflated valuations. Typical examples include high-flying growth firms, newly-listed firms, or firms in transition. A key insight from our model is that speculation is open to anyone regardless of their prior inventory in the firm. A necessary condition for speculative trading to be profitable is that targeted firms compensate stakeholders with performance-based or equity-based instruments. In the presence of such instruments, there is cross-subsidization from good to bad firms, which protects uninformed speculators against the risk of inflating the price of the wrong firm. Notably, uninformed speculation is most likely to occur in "normal" as opposed to hot markets. In particular, stakeholders' outside options can be neither too low or too high; and stakeholders' prior beliefs about the firm cannot be too positive or too negative. The reason is that in these cases, there will be little scope for speculation to affect stakeholders' beliefs and decisions. Moreover, there will be little scope for cross-subsidization to sufficiently affect prices to allow uninformed speculators to profit.

Our analysis suggests that uninformed speculators are more likely to profit from inflating than from eroding a firm's stock price for several reasons. First, inflating prices is often the only form of speculation from which uninformed speculators can make a profit. Second, once speculation triggers positive feedback effects, they are hard to reverse, even when there are informed traders with negative information about a firm. Third, firms could try to preempt speculative short-selling that harms them but will not act to preempt speculative buying that benefits them.

Inflated valuations that help firms fake it till they make are specific not only to secondary markets. They can occur early on in a firm's life when it raises capital in private markets. In such cases, firms and investors can benefit from agreeing to inflate the firm's valuation in order to attract high-quality stakeholders. Hence, our model rationalizes why venture capitalists and entrepreneurs might knowingly agree on unrealistic valuations elevating firms to unicorns and why such an inflated image can persist in secondary markets and subsequently become a reality.

References

[1] Aggarwal, Rajush, and Guojun Wu, 2006, Stock market manipulations, *Journal of Business*, 79(4), 1915–1953.

[2] Agrawal, Ashwini K., and David A. Matsa, 2013, Labor unemployment risk and corporate financing decisions. *Journal of Financial Economics*, 108(2), 449–470.

[3] Ahnert, Toni, Caio Machado, and Anna Pereira, 2022, Trading for bailouts, Working Paper

[4] Allen, Franklin, and Garry Gorton, 1992, Stock price manipulation, market microstructure and asymmetric information, *European Economic Review* 36(2–3), 624–630.

[5] Baker, Malcolm, and Jeffrey Wurgler, 2002, Market timing and capital structure, *Journal of finance* 57(1), 1–32.

[6] Baker, Malcolm, Jeremy Stein, and Jeffrey Wurgler, 2003, When does the market matter? Stock prices and the investment of equity-dependent firms, *Quarterly Journal of Economics* 118(3), 969– 1006.

[7] Banerjee, Snehal, Jesse Davis, and Naveen Gondhi, 2018, When transparency improves, must prices reflect fundamentals better?, *Review of Financial Studies* 3(6), 2377–2414.

[8] Barber, Brad M., and Terrance Odean, 2008, All that glitters: the effect of attention and news on the buying behavior of individual and institutional investors, *Review of Financial Studies* 21(2), 785–818.

[9] Bergman, Nittai K., and Dirk Jenter, 2007, Employee sentiment and stock option compensation, *Journal of Financial Economics* 84(3), 667–712.

[10] Boot, Arnoud, and Vladimir Vladimirov, 2020, Co-opetition and disruption with public ownership, Working Paper.

[11] Bond, Philip, Alex Edmans, and Itay Goldstein, 2012, The real effects of financial markets, *Annual Review of Financial Economics* 4, 39–60.

[12] Braithwaite, Tom, 2018, "Fake it till you make it" – but know when to stop, Retrieved from https://www.ft.com/content/d7a06eb6-d18b-11e5-92a1-c5e23ef99c77.

[13] Bushman, Robert M., Joseph D. Piotroski, and Abbie J. Smith, 2004, What determines corporate transparency?, *Journal of Accounting Research* 42(2), 207–252.

[14] Campello, Murillo, Rafael Matta, and Pedro A. C. Saffi, Does stock manipulation distort corporate investment? The role of short selling costs and share repurchases, 2020, Working Paper

[15] Chakraborty, Archishman, and Bilge Yilmaz, 2004, Informed manipulation, *Journal of Economic theory* 114(1), 132–152.

[16] Choi, Darwin, Dong Lou, and Abhiroop Mukherjee, 2020, Superstar firms and college major choice, Working Paper.

[17] Cooper, Michael J., Orlin Dimitrov, and P. Raghavendra Rau, 2001, A rose. com by any other name, Journal of Finance 56(6), 2371–2388.

[18] Daniel, Kent, David Hirshleifer, and Avanidhar Subrahmanyam, 1998, Investor psychology and security market under-and overreactions, *Journal of Finance* 53(6), 1839–1885.

[19] Derrien, Francois, and Ambrus Kecskes, 2013, The real effects of financial shocks: evidence from exogenous changes in analyst coverage, *Journal of Finance* 68(4), 1407–1440.

[20] Dow, James, and Gary Gorton, 1997, Stock market efficiency and economic efficiency: is there a connection?, *Journal of Finance* 52(3), 1087–1129.

[21] Dow, James, Jungsuk Han, and Francesco Sangiorgi, 2020, Hysteresis in price efficiency and the economics of slow-moving capital, *Review of Financial Studies* forthcoming.

[22] Dowling, Grahame R., 1986, Managing your corporate images, *Industrial Marketing Management* 15(2), 109–115.

[23] Edmans, Alex, Itay Goldstein, and Wei Jiang, 2015, Feedback effects, asymmetric trading, and the limits to arbitrage, *American Economic Review* 105(12), 3766–3799.

[24] Edmans, Alex, and Gustavo Manso, 2011, Governance through trading and intervention: a theory of multiple blockholders, *Review of Financial Studies* 24(7), 2395–2428.

[25] Fan, Xiaodong, and Jed DeVaro, 2020, Job hopping and adverse selection in the labor market, *Journal of Law, Economics, and Organization* 36(1), 84–138.

[26] Fishman, Michael J., and Kathleen M. Hagerty, 1989, Disclosure decisions by firms and the competition for price efficiency, *Journal of Finance* 44(3), 633–646.

[27] Fombrun, Charles, and Mark Shanley, 1990, What's in a name? Reputation building and corporate strategy, *Academy of Management Journal* 33(2), 233–258.

[28] Frenkel, Sivan, 2020, Dynamic asset sales with a feedback effect, *Review of Financial Studies* 33(2), 829–865.

[29] Gao, Pingyang, and Pierre Jinghong Liang, 2013, Informational feedback, adverse selection, and optimal disclosure policy, *Journal of Accounting Research* 51(5), 1133–1158.

[30] Gelb, David S., and Paul Zarowin, 2002, Corporate disclosure policy and the informativeness of stock prices, *Review of Accounting Studies* 7(1), 33–52.

[31] Goldman, Eitan, and Günter Strobl, 2013, Large shareholder trading and the complexity of corporate investments, *Journal of Financial Intermediation* 22 (1), 106–122.

[32] Goldman, Eitan, Jordan Martel, and Jan Schneemeier, 2021, A theory of financial media, *Journal of Financial Economics*, forthcoming.

[33] Goldstein, Itay, and Alexander Guembel, 2008, Manipulation and the allocational role of prices, *Review of Economic Studies* 75(1), 133–164.

[34] Goldstein, Itay, Emre Ozdenoren, and Kathy Yuan, 2013, Trading frenzies and their impact on real investment, *Journal of Financial Economics* 109(2), 566–582.

[35] Goldstein, Itay, and Liyan Yang, 2017, Information disclosure in financial markets, *Annual Review of Financial Economics* 9, 101–125.

[36] Goldstein, Itay, and Liyan Yang, 2019, Good disclosure, bad disclosure, *Journal of Financial Economics* 131(1), 118–138.

[37] Gompers, Paul A., 1996, Grandstanding in the venture capital industry, *Journal of Financial Economics* 42(1), 133–156.

[38] Glosten, Lawrence R., and Paul R. Milgrom, 1985, Bid, ask and transaction prices in a specialist market with heterogeneously informed traders, *Journal of Financial Economics* 14(1), 71–100.

[39] Gornall, Will, and Ilya Strebulaev, 2020, Squaring venture capital valuations with reality, *Journal of Financial Economics* 135(1), 120–143.

[40] Grullon, Gustavo, Sebastien Michenaud, and James P. Weston, 2015, The real effects of short-selling constraints, *Review of Financial Studies* 28(6), 1737–1767.

[41] Healy, Paul M., Amy P. Hutton, and Krishna G. Palepu, 1999, Stock performance and intermediation changes surrounding sustained increases in disclosure, *Contemporary Accounting Research* 16(3), 85–520.

[42] Hellmann, Thomas, 2006, IPOs, acquisitions, and the use of convertible securities in venture capital, *Journal of Financial Economics* 81(3), 649–679.

[43] Hermalin, Benjamin E., and Michael S. Weisbach, 2012, Information disclosure and corporate governance, *Journal of Finance* 67(1), 195-233.

[44] Hoffmann, Florian, and Vladimir Vladimirov, 2022, Worker runs, Working Paper.

[45] Huberman, Gur, and Tomer Regev, 2001, Contagious speculation and a cure for cancer: a nonevent that made stock prices soar, Journal of Finance 56(1), 387–396.

[46] Iliev, Peter, and Michelle Lowry, 2020, Venturing beyond the IPO: financing of newly public firms by venture capitalists, *Journal of Finance* 75(3), 1527-1577.

[47] Inderst, Roman, and Vladimir Vladimirov, 2019, Growth firms and relationship finance: a capital structure perspective, *Management Science* 65(11), 5411–5426.

[48] Innes, Robert D., 1990, Limited liability and incentive contracting with ex-ante action choices, *Journal of Economic Theory* 52(1), 45–67.

[49] Jegadeesh, Narasimhan, and Sheridan Titman, 2001, Profitability of momentum strategies: an evaluation of alternative explanations, *Journal of Finance* 56(2), 699–720.

[50] Khanna, Naveen, and Ramana Sonti, 2004, Value creating stock manipulation: feedback effect of stock prices on firm value, *Journal of Financial Markets* 7(3), 237–270.

[51] Khanna, Naveen, and Richmond D. Mathews, 2012, Doing battle with short-sellers: the conflicted role of blockholders in bear raids, *Journal of Financial Economics* 106(2), 229-246.

[52] Khanna, Naveen, and Richmond D. Mathews, 2016, Posturing and holdup in innovation, *Review of Financial Studies* 29(9), 2419–2454.

[53] Kumar, Praveen, and Duane J. Seppi, 1992, Futures manipulation with "cash settlement", *Journal of Finance* 47(4), 1485–1502.

[54] Levit, Doron, Nadya Malenko, and Ernst Maug, 2020, Trading and shareholder democracy, Working Paper.

[55] Liang, Lantian, Ryan Williams, and Steven Chong Xiao, 2020, Stock market information and innovative investment in the supply chain, *Review of Corporate Finance Studies*, forthcoming.

[56] Marx, Matt, Deborah Strumsky, and Lee Fleming, 2009, Mobility, skills, and the Michigan non-compete experiment, *Management Science* 55(6), 875–879.

[57] Matta, Rafael, Sergio Rocha, and Paulo Vaz, 2020, Product market competition and predatory stock price manipulation, Working Paper.

[58] Maug, Ernst, 1998, Large shareholders as monitors: Is there a trade-off between liquidity and control?, *Journal of Finance* 53(1), 65–98.

[59] Nachman, David C., and Thomas H. Noe, 1994, Optimal design of securities under asymmetric information, *Review of Financial Studies* 7(1), 1–44.

[60] Owen, Thomas, 2020, Fake it until you make it: a Silicon Valley strategy that seems unstoppable, Retrieved from https://www.sfchronicle.com/business/article/Fake-it-until-you-make-it-a-Silicon-Valley-15012062.php.

[61] Sharf, Samantha, and David Jeans, 2020 WeWork employees feel abandoned and angry as SoftBank ditches its $3 billion buyout offer, retrieved from https://www.forbes.com/sites/samanthasharf/2020/04/13/wework-employees-feel-abandoned-and-angry-as-softbank-ditches-its-3-billion-buyout-offer/.

[62] Subrahmanyam, Avanidhar, and Sheridan Titman, 2001, Feedback from stock prices to cash flows, *Journal of Finance* 56(6), 2389-2413.

[63] Taparia, Neal, 2020, 5 reasons why founders fake it till they make it, Retrieved from https://www.forbes.com/sites/nealtaparia/2020/06/17/5-compelling-reasons-to-fake-it-till-you-make/?sh=7b4f703d526

[64] Turban, Daniel B., and Daniel W. Greening, 1997, Corporate social performance and organizational attractiveness to prospective employees, *Academy of Management Journal* 40(3), 658–672.

[65] Van Wesep, Edward D., and Brian Waters, 2021, All-in investors and unstable asset prices, Working Paper.

Appendix A Proofs

Proof of Lemma 1. We proceed backward. Suppose that prospective stakeholders observe the firm specific shock. At $t = 3$, the stakeholders join the firm if and only if the firm-specific shock is G. As argued in Lemma C.2, it is optimal for the firm to offer a compensation of $\Delta R = \frac{\overline{w}}{\lambda_G}$. Hence, the firm's expected payoff if the firm-specific shock is G is $\lambda_G x - \overline{w}$. By contrast, if the firm-specific shock is B, the firm cannot attract stakeholders, and its value is zero.

Let $\mu_t \in \{0, 1\}$ be the probability that a trader that has received signal $s = G$ buys in period t. There is no equilibrium in which $\mu_t = 0$ in both periods. To see this, suppose to a contradiction that $\mu_1 = \mu_2 = 0$. The price set by the market maker depends also on the equilibrium strategies in case the trader observes $s \in \{B, \varnothing\}$. However, for any such strategies, the market maker's price is at most

$$q_0 \lambda_G (x - \Delta R) = q_0 (\lambda_G x - \overline{w}) \tag{A.1}$$

since the stakeholders join only if the firm-specific shock is G. Thus, by deviating and buying in both periods, the positively informed trader would be able to gain at least

$$\begin{aligned} &2 (\lambda_G (x - \Delta R) - q_0 \lambda_G (x - \Delta R)) \\ &= 2 (1 - q_0) (\lambda_G x - \overline{w}) > 0. \end{aligned}$$

Thus, in any equilibrium of the trading game, it must be that $\mu_t = 1$ in at least one of the trading periods.

In any such equilibrium, it holds that the prices set by the market maker at dates $t = 1$ and $t = 2$ are higher than $q_0 (\lambda_G x - \overline{w})$. To see this, observe that from expression (C.1), the market maker's posteriors beliefs at $t = 2$ after he observes a trading pattern which is consistent with that of a positively informed speculator' equilibrium strategy Ω_t is

$$q_{D_1 D_2} > q_0 \text{ if } D_1 \in \Omega_1, D_2 \in \Omega_2.$$

Hence, the price set by the market maker will be

$$p_{D_1 D_2} = q_{D_1 D_2} (\lambda_G x - \overline{w}) > q_0 (\lambda_G x - \overline{w}).$$

For any other strategies that the trader may pick from (i.e., $D_1 \notin \Omega_1$ or $D_2 \notin \Omega_2$), the price at $t = 2$ will be equal to $q_0 (\lambda_G x - \overline{w})$. Furthermore, the price at $t = 1$ is

$$p_{D_1} = \sum_{D_2 = \{-1,0,1\}} \Pr(D_2|D_1) p_{D_1 D_2} > q_0 (\lambda_G x - \overline{w}) \text{ if } D_1 \in \Omega_1$$

and $p_{D_1} = 0$ if $D_1 \notin \Omega_1$.

It is now straightforward to show that the uninformed speculator will never trade. Her expected profit when she follows the same trading strategy as when she observes $s = G$ is

$$(q_0 (\lambda_G x - \overline{w}) - p_{D_1}) D_1 + (q_0 (\lambda_G x - \overline{w}) - p_{D_1 D_2}) D_2 < 0,$$

which is less than her expected payoff of zero when she abstains from trading in both periods. Furthermore, the uninformed trader cannot strictly benefit from trading in a way that, on the equilibrium path, can only come from a noise trader. For such trades, the price will be equal to $q_0 (\lambda_G x - \overline{w})$, which is the same as the speculator's expected value of the firm, leading to a trading profit of zero. The argument that the trader will sell in at least one of the periods if she observes $s = B$ and that she will have no incentives to follow the same trading strategy if she is uninformed is symmetric. **Q.E.D.**

Proof of Proposition 1 and 3. In what follows, we show the existence of an equilibrium in which the speculator buys in both periods if $s \in \{G, \varnothing\}$ and sells in both periods if $s = B$. We discuss the existence of other equilibria at the end of the proof. To show existence, we, first, derive the posterior beliefs and the prices in both trading dates $t = 1$ and $t = 2$ (Step 1). In Step 2, we derive the speculator' expected trading profit and derive necessary and sufficient conditions for this profit to be positive. Subsequently, we verify that the trading strategies at $t = 2$ and $t = 1$ are optimal given these stock prices, the subsequent trading, and the stakeholders' decision to join the firm (Steps 3 and 4).

Step 1: Posterior beliefs, prices, and equilibrium payoffs. The market maker's posterior belief that the firm-specific shock is $\omega = G$ is

$$q_{11} = \frac{\left((1-\beta) + \beta \frac{1}{9}\right) q_0}{(1-\beta)\alpha q_0 + (1-\beta)(1-\alpha) + \beta \frac{1}{9}} > q_0$$

$$q_{-1-1} = \frac{\beta \frac{1}{9} q_0}{(1-\beta)\alpha(1-q_0) + \beta \frac{1}{9}} < q_0$$

and $q_{D_1 D_2} = q_0$ for all other orders D_1 an D_2 (see for details expression (C.1) in Lemma C.1). Since the stakeholders join only if $q_{11} \geq q^*$, then if $q_0 < q^*$, there is a threshold

$\alpha_{11}^{*} \equiv \max\left\{0, \frac{\left(1-\frac{8}{9}\beta\right)\left(1-\frac{q_0}{q^*}\right)}{(1-\beta)(1-q_0)}\right\}$, defined by $q_{11} = q^*$, such that they join if $\alpha \geq \alpha_{11}^{*}$. If $q_0 > q^*$, $\alpha_{11}^{*} = 0$.

Furthermore, the market maker's beliefs that the trader chooses $D_2 = 1$ after she has chosen $D_1 = 1$ and, respectively $D_2 = -1$ after $D_1 = -1$ are (see for details expression (C.2) in Lemma C.1)

$$\begin{aligned}
\pi_{11} &= \frac{(1-\beta)\,\alpha q_0 + (1-\beta)\,(1-\alpha) + \beta\frac{1}{9}}{(1-\beta)\,\alpha q_0 + (1-\beta)\,(1-\alpha) + \beta\frac{1}{3}} \\
\pi_{-1-1} &= \frac{(1-\beta)\,\alpha\,(1-q_0) + \beta\frac{1}{9}}{(1-\beta)\,\alpha\,(1-q_0) + \beta\frac{1}{3}}.
\end{aligned}$$

From expressions (C.3) and (C.4), the prices at $t = 2$ and $t = 1$ are

$$\begin{array}{ll}
p_{11} = (\lambda_B + q_{11}\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right) & \text{if } D_1 = D_2 = 1 \\
p_1 = \pi_{11}p_{11} + (1-\pi_{11})\,(\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)\mathbf{1}_{q_0 \geq q^*} & \text{if } D_1 = 1 \\
p_{-1-1} = (\lambda_B + q_{-1-1}\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right)\mathbf{1}_{q_{-1-1} > q^*} & \text{if } D_1 = D_2 = -1 \\
p_{-1} = \pi_{-1-1}p_{-1-1} + (1-\pi_{-1-1})\,(\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)\mathbf{1}_{q_0 \geq q^*} & \text{if } D_1 = -1 \\
p_{D_1D_2} = p_0 \equiv (\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)\mathbf{1}_{q_0 \geq q^*} & \text{otherwise}
\end{array},$$

The speculator's expected payoff from buying in both trading periods is

$$\Pi\,(s) = 2\,(\lambda_B + q\,(s)\,\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right) - p_{D_1} - p_{D_1D_2}$$

which after plugging in for p_{D_1} and $p_{D_1D_2}$ can be stated as

$$\Pi_{11}\,(s) = \begin{cases}
\begin{array}{l} 2q\,(s)\,\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right) \\ + \left((1-\pi_{11})\,\lambda_B - (1+\pi_{11})\,q_{11}\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right) \end{array} & \text{if } q_0 < q^* \\
\begin{array}{l} 2q\,(s)\,\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}}\right) \\ +\Delta\lambda\left((1-\pi_{11})\,(q_{11} - q_0)\,x - 2q_{11}\left(x - \frac{(\overline{w} - R)}{\lambda_B + \Delta\lambda q_{11}}\right)\right) \end{array} & \text{if } q_0 \geq q^*
\end{cases} \tag{A.2}$$

Furthermore, we obtain that the speculator's expected payoff from selling in both trading periods is

$$\Pi_{-1-1}(s)=\begin{cases}0 & \text{if } q_0<q^* \\ (1-\pi_{-1-1})(\lambda_B+q_0\Delta\lambda)\left(x-\frac{\overline{w}}{\lambda_B+q_0\Delta\lambda}\right) & \text{if } q_0\geq q^*>q_{-1-1} \\ (1-\pi_{-1-1})(q_0-q_{-1-1})\Delta\lambda x & \\ -2(q(s)-q_{-1-1})\Delta\lambda\left(x-\frac{\overline{w}}{\lambda_B+q_{-1-1}\Delta\lambda}\right) & \text{if } q_{-1-1}\geq q^*\end{cases} \tag{A.3}$$

Step 2. Necessary and sufficient conditions for $\Pi_{11}(\varnothing)>0$. First, consider the case in which $q_0<q^*$ (i.e., $\overline{w}>(\lambda_B+q_0\Delta\lambda)x$). In this case, $\mathbf{1}_{q_0\geq q^*}=0$, and the uninformed speculator's profit is $\Pi_{11}(\varnothing)>0$ if $\alpha\leq\frac{1-\frac{2}{3}\beta-\sqrt{\left(1-\frac{2}{3}\beta\right)^2-\frac{4}{9}\beta\left(1-\frac{8}{9}\beta\right)}}{2(1-\beta)(1-q_0)}$ (as then the sum of all terms multiplied by $\Delta\lambda$ is positive). Hence, $\Pi_{11}(\varnothing)$ can be non-positive only for some $\overline{\alpha}_{11}>\frac{1-\frac{2}{3}\beta-\sqrt{\left(1-\frac{2}{3}\beta\right)^2-\frac{4}{9}\beta\left(1-\frac{8}{9}\beta\right)}}{2(1-\beta)(1-q_0)}>0$. In Lemma C.3 in Appendix C, we show that if there is such a value $\overline{\alpha}_{11}\in[\alpha_{11}^*,1]$ at which $\Pi_{11}(\varnothing)=0$, it must be that $\frac{\partial}{\partial\alpha}\Pi_{11}(\varnothing)<0$ at $\overline{\alpha}_{11}$. Hence, there is at most one such $\overline{\alpha}_{11}\leq 1$. We still need to consider that $\overline{\alpha}_{11}\leq 1$ does not contradict the condition that $\alpha\geq\alpha_{11}^*$. Observe that $\alpha_{11}^*\to 0$ for $\overline{w}=0$ and that α_{11}^* is increasing in $\overline{w}$ (as q^* is increasing in $\overline{w}$). By contrast, if there is an $\overline{\alpha}_{11}\leq 1$ for which $\Pi_{11}(\varnothing)=0$, $\overline{\alpha}_{11}$ does not depend on $\overline{w}$. Hence, there is a unique cutoff for $\overline{w}$, implicitly defined by $\alpha_{11}^*=\min\{\overline{\alpha}_{11},1\}$, such that $\alpha_{11}^*\leq\overline{\alpha}_{11}$ for $\overline{w}$ below this cutoff.

Second, consider the case in which $q_0\geq q^*$ (i.e., $\overline{w}\leq(\lambda_B+q_0\Delta\lambda)x$). Since in this case $\alpha_{11}^*=0$, the condition that $\alpha\geq\alpha_{11}^*$ is never binding. In Lemma C.3, we show that a necessary condition for $\overline{\alpha}_{11}>0$ is that $\overline{w}>\frac{1+\pi_{11}}{2}(\lambda_B+q_{11}\Delta\lambda)x$. Once again, it holds that if $\Pi_{11}(\varnothing)=0$, then this is for at most one value of $\overline{\alpha}_{11}\in(0,1)$.

Note that in both cases, $\overline{w}$ needs to be intermediate, as defined by the respective thresholds; and that these conditions on $\overline{w}$ can alternatively be stated in terms of q_0. ■

Step 3: Ruling Out Deviations at $t=2$. We start by verifying that after the speculator with $s\in\{G,\varnothing\}$has played $D_1=1$ at $t=1$, she will not trade as a noise trader by choosing $D_2\in\{-1,0\}$. If she does so, the stakeholders and the market maker will believe that the trades come from a noise trader. Thus, the stakeholders join only if $q_0\geq q^*$, and the price set by the market maker will be p_0. The speculator's expected payoff is then

$$(v(s)-p_1)+(v(s)-p_{1D_2})D_2<0,$$

which is less than what she obtains on the equilibrium path if $s\in\{G,\varnothing\}$.

Similarly, a negatively informed speculator ($s=B$) will also not deviate after playing

$D_1 = -1$ at $t = 1$, as then her second-period trading payoff will be either zero (if $D_2 = 0$) or negative (if $D_2 = 1$) since the price set by the market maker will be weakly higher than her expected value of the firm, $p_0 \geq \lambda_B \left(x - \frac{w}{\lambda_B + q_0 \Delta\lambda}\right) \mathbf{1}_{q_0 \geq q^*}$. By contrast, the speculator's expected payoff from selling in the second period is positive since $p_{-1-1} - v(B) > 0$

Step 4: Ruling Out Deviations at $t = 1$. We continue by verifying that the speculator will not deviate at $t = 1$. In what follows we present the proof for the case in which $q_0 < q^*$, which is sufficient to show the existence we claim in the proposition. For completeness, we also analyze the case in which $q_0 \geq q^*$ in Appendix C, which follows the same steps but is algebraically more tedious (see Lemma C.4).

Suppose that the speculator has observed $s \in \{G, \varnothing\}$. Regardless of how the speculator trades at $t = 2$, deviating to $D_1 \in \{-1, 0\}$, and thus trading as a negatively informed or noise trader at $t = 1$, results in the firm not being able to attract stakeholders, in which case its value is equal to the price set by the market maker at both trading dates: $p_{D_1} = p_{D_1 D_2} = p_0$. The speculator's expected payoff is then $(p_0 - p_{D_1}) D_1 + (p_0 - p_{D_2}) D_2 = 0$, which is less than what she obtains on the equilibrium path. The same argument applies if $s = B$, but the speculator deviates to $D_1 = 0$. That is, the speculator would make a deviation profit of zero, which is less than her equilibrium expected payoff.

It remains to consider the case in which the speculator observes $s = B$ but mimics the strategy of a positively informed speculator and buys in both periods, i.e., $D_1 = D_2 = 1$. If the speculator's expected payoff, given by expression (A.2), is $\Pi_{11}(B) > 0$ for some α, then it always crosses zero in α for a unique cutoff $\underline{\alpha}_{11}$. Note that since $\Pi(s)$ is increasing in $q(s)$ and $q(G) = 1 \geq q_0 \geq q(B) = 0$, it always holds that $\alpha_{11} < \overline{\alpha}_{11}$. Defining $\underline{\alpha}_{11} \equiv \max\{\alpha_{11}, \alpha^*_{11}\}$, we obtain that there is no profitable deviation from the proposed equilibrium if $\alpha \in [\underline{\alpha}_{11}, \overline{\alpha}_{11}]$. For this equilibrium, $[\underline{\alpha}_{11}, \overline{\alpha}_{11}]$ corresponds to $[\underline{\alpha}, \overline{\alpha}]$ stated in the proposition.[38]

It is straightforward to modify the above proof to show that there are equilibria in which the speculator buys in both periods if $s \in \{G, \varnothing\}$ and does not trade if $s = B$ or sells only in one of these periods. The only difference is in the posterior belief that the speculator has observed a bad signal. However, since the price set by the market maker for any posterior belief $q_{D_1 D_2} \leq q_0$ is the same as above (i.e., zero), all arguments apply without any further changes. Furthermore, observe that if $q_0 < q^*$, in any equilibrium in which the uninformed speculator short sells in either one or both trading periods, her equilibrium expected payoff will be zero in analogy to (A.3). Thus, as stated in the Proposition, there is no equilibrium

[38] We use $[\underline{\alpha}, \overline{\alpha}]$ in the statement of the proposition, as for other specuation equilibria, such as those discussed below, the thresholds might be different.

in which she makes a positive profit from short-selling. In Lemma C.5, we show that there are equilibria with uninformed speculation in which the speculator buys in $t = 1$ and does not trade in $t = 2$ if $s \in \{G, \varnothing\}$. Note that the expected payoff for an uninformed speculator in such equilibria is higher compared to when she buys in both periods since the price at which she buys in the first period is the same, but she does not incur a loss from trading at $t = 2$. **Q.E.D.**

Proof of Proposition 2. We show the proof only for the class of equilibria in which the speculator buys the firm's stock in both trading dates if $s \in \{G, \varnothing\}$. The prices at $t = 1$ and $t = 2$ are then

$$p_{11} = y - R + (\lambda_B + q_{11}\Delta\lambda)\left(\Delta y - \frac{\overline{w} - R}{(\lambda_B + q_{11}\Delta\lambda)}\right), \tag{A.4}$$

$$p_1 = \pi_{11}p_{11} + (1 - \pi_{11})\left(y + \mathbf{1}_{q_0 \geq q^*}\left(-R + (\lambda_B + q_0\Delta\lambda)\left(\Delta y - \frac{\overline{w} - R}{(\lambda_B + q_0\Delta\lambda)}\right)\right)\right), \tag{A.5}$$

where, for any given R, ΔR is pinned down by the stakeholders' participation constraint as $\Delta R = \frac{\overline{w} - R}{\lambda_B + q_{D_1 D_2}\Delta\lambda}$; also note that it is never optimal to offer $R > \overline{w}$, implying that $\Delta R \geq 0$ is satisfied. The speculator's valuation of the firm if the firm can attract stakeholders is

$$y - R + (\lambda_B + q(s)\Delta\lambda)(\Delta y - \Delta R). \tag{A.6}$$

First, we show that the uninformed speculator's expected payoff is decreasing in ΔR. Plugging in for $\Delta R = \frac{\overline{w} - R}{(\lambda_B + q_{11}\Delta\lambda)}$ and from the expressions from (A.4) and (A.5) for p_{11} and p_1, the speculator's expected payoff becomes

$$\begin{aligned} \Pi(s) \;=\; & \left(2(\lambda_B + q(s)\Delta\lambda) - (1 + \pi_{11})(\lambda_B + q_{11}\Delta\lambda)\right)\left(\Delta y - \frac{\overline{w} - R}{\lambda_B + q_{11}\Delta\lambda}\right) \\ & - (1 - \pi_{11})\left(R + \mathbf{1}_{q_0 \geq q^*}\left(-R + (\lambda_B + q_0\Delta\lambda)\left(\Delta y - \frac{\overline{w} - R}{(\lambda_B + q_0\Delta\lambda)}\right)\right)\right). \end{aligned} \tag{A.7}$$

Taking the derivative with respect to R for the case in which $s = \varnothing$ and simplifying, we obtain that:

$$\frac{\partial}{\partial R}\Pi(s) = 2\frac{q_0 - q_{11}}{\lambda_B + q_{11}\Delta\lambda}\Delta\lambda < 0.$$

Next, we show that the uninformed speculator's trading profit payoff is negative if $R = \overline{w}$.

To see this, observe that if $R = \overline{w}$, this trading profit becomes

$$\begin{aligned}\Pi(\varnothing) &= (2(\lambda_B + q_0\Delta\lambda) - (1+\pi_{11})(\lambda_B + q_{11}\Delta\lambda))\Delta y \\ &\quad - (1-\pi_{11})(\overline{w} + \mathbf{1}_{q_0 \geq q^*}(-\overline{w} + (\lambda_B + q_0\Delta\lambda)\Delta y)) \\ &< (2(\lambda_B + q(s)\Delta\lambda) - (1+\pi_{11})(\lambda_B + q_{11}\Delta\lambda) - (1-\pi_{11})(\lambda_B + q_0\Delta\lambda))\Delta y \\ &= (1+\pi_{11})(q_0 - q_{11})\Delta\lambda\Delta y < 0.\end{aligned}$$

Finally, observe that if $R = 0$, expression (A.7) is the same as (A.2) with the only difference that we need to replace x by Δy. Thus, Proposition 1 applies nearly unchanged. This proves the last statement of the proposition. **Q.E.D.**

Proof of Corollary 1. We define as price efficiency the expectation of the squared error between the value of the firm and the price at which its equity is traded

$$\mathrm{E}\left[(v(s) - p_{D_1})^2 + (v(s) - p_{D_1 D_2})^2\right],$$

where the expectation is over s. It is sufficient to show that the pricing error increases in the transparency parameter α for at least one equilibrium.

Consider the case in which $\alpha = \underline{\alpha}_{11}$, and consider a switch to the equilibrium being played in part (i) of Proposition 1. If λ_B is sufficiently low, we have that $\underline{\alpha}_{11} = \alpha^*_{11}$ and $x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda} = 0$. At this degenerate equilibrium, the firm's fundamental value is zero regardless of whether the stakeholders join, as all cash flows are paid out as compensation to stakeholders. Hence, the firm's price and the pricing errors are also zero regardless of how the speculator trades. **Q.E.D.**

Proof of Corollary 2. We present parametric examples showing existence of equilibria with uninformed speculation for $q_0 < q^*$ and $q_0 \geq q^*$ in Appendix C. **Q.E.D.**

Proof of Lemma 2. We argue to a contradiction that there is no equilibrium in which the speculator sells in either one or both periods, leading the stakeholders to leave the firm. We consider the case in which $\lambda_G\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right) > L$ since otherwise the firm would always benefit when the stakeholders leave regardless of ω.[39]

Suppose that there is an equilibrium in which the stakeholders leave the firm at $t = 2$ when they observe a trading pattern $\{D_1, D_2\}$ that is consistent with the equilibrium strategy

[39] Then, the firm has an incentive to ask stakeholders to leave, possibly paying them an amount up to $L - \lambda_G\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)$ to do so.

of a negatively but not a positively informed speculator. The speculator's expected payoff from a trading strategy leading to such an outcome is

$$(L - p_{D_1})\, D_1 + (L - p_{D_1 D_2})\, D_2. \tag{A.8}$$

Instead, the speculator's expected payoff when stakeholders do not leave the firm is

$$((\lambda_G + q(s)\,\Delta\lambda)\,(x - \Delta R) - p_{D_1})\, D_1 + ((\lambda_G + q(s)\,\Delta\lambda)\,(x - \Delta R) - p_{D_1 D_2})\, D_2. \tag{A.9}$$

Let $\pi_{D_1 D_s}$ denote the probability that the market maker assigns that the trade in the second period comes from a speculator with signal s, after observing her order flow, D_1, in the first period. Analogously, let $p_{D_1 D_s}$ be the price that would result in period two if the market maker observes trading consistent with the equilibrium strategy of a speculator with signal s. The price at $t = 1$ can be stated as

$$p_{D_1} = \pi_{D_1 D_B} p_{D_1 D_B} + \pi_{D_1 D_G} p_{D_1 D_G} + (1 - \pi_{D_1 D_B} - \pi_{D_1 D_G})\,(\lambda_B + q_0 \Delta\lambda)\,(x - \Delta R)\,. \tag{A.10}$$

If the market maker observes an order flow at $t = 2$ that is consistent with the strategy of a negatively but not a positively informed speculator, we have that $p_{D_1 D_B} = L$ and $\pi_{D_1 D_G} = 0$. If D_1 is the same for $s = B$ and $s = G$, but D_2 differs depending on the signal, we have that

$$p_{D_1 D_G} = (\lambda_B + q_{D_1 D_G} \Delta\lambda)\,(x - \Delta R)\,.$$

Observe, further, that there is no equilibrium in which the speculator does not buy in both periods if $s = G$. To see this, suppose to a contradiction that the speculator either does not trade or sells at $t = 1$ or $t = 2$ if $s = G$. By deviating and buying in both periods, the speculator will have to pay $p_1, p_{11} \leq (\lambda_B + q_0 \Delta\lambda)\,(x - \Delta R)$ since the market maker associates this strategy with a noise trader or a negatively informed trader. Hence, the speculator's deviation trading profit is at least $2\,(\lambda_G - (\lambda_B + q_0 \Delta\lambda))\,(x - \Delta R)$, which is higher than her equilibrium profit of (A.9), since the speculator makes a loss from short-selling, no profit from no trading, and a smaller profit from buying, since she buys at a price higher than $(\lambda_B + q_0 \Delta\lambda)\,(x - \Delta R)$.

We now argue that there is no equilibrium in which a negatively informed speculator plays $D_1 \in \{0, -1\}$, which makes her better off than not trading in both periods. Suppose to a contradiction that such an equilibrium existed. Since $D_1 = 1$ if $s = G$, it holds that $p_{D_1 D_B} = L$ and $\pi_{D_1 D_G} = 0$. Plugging into expressions (A.8) and (A.10), we obtain that the speculator obtains a weakly negative expected payoff from $D_1 \in \{0, -1\}$ if $L > \underline{L} \equiv$

$(\lambda_B + q_0\Delta\lambda)(x - \Delta R)$.

It remains to show that there is also no equilibrium in which a negatively informed speculator buys in period one, i.e., $D_1 = 1$. Suppose to a contradiction that such an equilibrium existed. Since the speculator's valuation of the firm coincides with the price of $p_{D_1 D_B} = L$ in period two, candidate equilibria in which the negatively informed speculator sells or does not trade in the second trading date are payoff-equivalent. We, now, show that in any such candidate equilibrium, a speculator will buy in the first trading period regardless of her signal.

First, note that in any equilibrium in which a negatively informed speculator makes a profit from trading, a speculator observing $s = \varnothing$ will play the same strategy, as the expected payoff from doing so does not depend on s, while the profit from not trading is zero. Furthermore, observe that the trading profit in the second period is zero if the stakeholders leave, since there is no uncertainty about the firm's fundamental value. Thus, without loss of generality, assume that $\{D_1, D_2\} = \{1, 0\}$ if $s = \{B, \varnothing\}$. It holds that:

$$\pi_{10} = \frac{(1-\beta)(\alpha(1-q_0) + (1-\alpha)) + \frac{1}{9}\beta}{1 - \frac{2}{3}\beta}$$

$$\pi_{11} = \frac{(1-\beta)\alpha q_0 + \frac{1}{9}\beta}{1 - \frac{2}{3}\beta}$$

$$p_{11} = \left(\lambda_B + \frac{\left((1-\beta)\alpha + \frac{1}{9}\beta\right) q_0}{(1-\beta)\alpha q_0 + \frac{1}{9}\beta}\Delta\lambda\right)(x - \Delta R)$$

Hence, plugging π_{10}, π_{11}, p_{11} and p_1 into (A.10), we derive that a negatively informed speculator's expected profit from buying at $t = 1$ (given by $L - p_1$) is negative as long as $L < \overline{L} \equiv \left(\lambda_B + \frac{(1-\beta)\alpha + \frac{2}{9}\beta}{(1-\beta)\alpha q_0 + \frac{2}{9}\beta} q_0 \Delta\lambda\right)(x - \Delta R)$, where $\overline{L}$ is implicitly defined by $L = p_1$, and $\overline{L}$ increases in α.

Finally, note that a negatively informed speculator cannot profit from mimicking a positively informed speculator in the second trading period, as then the negatively informed speculator will be buying at a price above her expectations about the firm's fundamental value. **Q.E.D.**

Proof of Proposition 4. Stakeholders leave the firm if and only if their expected compensation at the firm is lower than their outside option of $\overline{w}$. Hence, there is a threshold $\widehat{q} \equiv \frac{\overline{w} - \lambda_B \Delta R}{\Delta\lambda\Delta R}$, such that stakeholders leave if and only if their posterior beliefs are lower than $\widehat{q}$. Clearly, if $\Delta R = \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}$, then $\widehat{q} = q_0$.

Consider any candidate equilibrium in which the speculator plays the strategy $\{\widehat{D}_1, \widehat{D}_2\}$ when observing $s = B$. For any such strategy, it holds that the posterior $\partial q_{\widehat{D}_1 \widehat{D}_2} / \partial\alpha < 0$.

Hence, there is a unique threshold $\underline{\alpha}_{\widehat{D}_1\widehat{D}_2}$ defined by $q_{\widehat{D}_1\widehat{D}_2} = \widehat{q}$ such that stakeholders leave the firm if $\alpha > \underline{\alpha}_{\widehat{D}_1\widehat{D}_2}$ and stay otherwise. Trivially, if $\alpha = 0$, the probability of informed trading is zero, trades do not affect prices, and stakeholders' decisions to stay is never affected. Denoting with $\underline{\alpha}'' \equiv \min \underline{\alpha}_{\widehat{D}_1\widehat{D}_2}$, where the minimum is taken over all $\underline{\alpha}_{D_1D_2}$ for which there is an equilibrium in which the stakeholders leave, we obtain the lower bound for α stated in the proposition. The rest of the proof follows from the arguments in the main text and the proof of Lemma 2. **Q.E.D.**

Proof of Proposition 5. From the break even condition (6) of a venture capitalist who has observed $\widetilde{s} = G$, we obtain

$$\gamma = \frac{K}{\lambda_G \left(x - \Delta R_0 + p_0\right)}. \tag{A.11a}$$

If the venture capitalist has observed $\widetilde{s} = \varnothing$, from the break even condition (7), we can derive

$$S = \frac{K}{\overline{\lambda}} - \gamma p_0. \tag{A.12}$$

The latter expression is strictly positive since $\lambda_G > \overline{\lambda}$ (see expressions (6) and (7)).

From the stakeholders' break even condition (8), we have

$$\Delta R = \frac{\overline{w}}{\left(\frac{\alpha \widetilde{q} \lambda_G + (1-\alpha)\overline{\lambda}}{\alpha \widetilde{q} + (1-\alpha)}\right)}. \tag{A.13}$$

It remains to show that these contracts satisfy the feasibility restrictions $\gamma \in [0,1]$ and $0 \leq S + \gamma p_0 + w_0 \leq x + p_0$. The last inequality requires that the sum of payment promised to the financier and the stakeholders cannot exceed the firm's cash flow and the price that the firm can obtain from selling its equity stake at $t = -1$ when the firm goes public. It holds

$$\begin{aligned} 0 &\leq (x + p_0) - (S + \gamma p_0 + \Delta R) \\ &= x + p_0 - \frac{K}{\overline{\lambda}} - \frac{\overline{w}}{\left(\frac{\alpha \widetilde{q} \lambda_G + (1-\alpha)\overline{\lambda}}{\alpha \widetilde{q} + (1-\alpha)}\right)}. \end{aligned} \tag{A.14}$$

Finally, we need to show that

$$\gamma = \frac{K}{\lambda_G \left(x - \Delta R_0 + p_0\right)} = \frac{K}{\lambda_G \left(x + p_0 - \frac{\overline{w}}{\left(\frac{\alpha \widetilde{q} \lambda_G + (1-\alpha)\overline{\lambda}}{\alpha \widetilde{q} + (1-\alpha)}\right)}\right)} < 1,$$

which can be restated as

$$0 < x + p_0 - \frac{K}{\lambda_G} - \frac{\overline{w}}{\left(\frac{\alpha\widetilde{q}\lambda_G + (1-\alpha)\bar{\lambda}}{\alpha\widetilde{q} + (1-\alpha)}\right)}. \tag{A.15}$$

Observe that condition (A.15) is satisfied if condition (A.14) is satisfied. Thus, from condition (A.14), we obtain condition (9). **Q.E.D.**

Appendix B For Online Publication

B.1 Endogenous Entry of Speculators

To model the possibility of entry by speculators, we modify the baseline model (for this discussion only) such that there is a pool of traders, the size and the composition of which are endogenously determined. While the number of noise traders in that pool is fixed, the number of speculators is endogenous. The trader that the market maker faces in periods one and two is a random draw from that pool. That is, β is the endogenous probability that the market maker faces a noise trader. New entry by speculators leads to a decrease in β. We denote by κ the speculator's cost of entry, which we interpret as the cost of monitoring the news and identifying which firm can become the target of speculative trading. This decision takes place after the firm chooses its transparency level (captured by α), but before trading starts. We continue to assume that the news observed by such speculators is informative about the state ω with probability α.

Let Π^{inf} and Π^{uninf} denote the speculator's profits conditional on becoming informed or remaining uninformed after observing a signal about ω. In any equilibrium with endogenous entry, all positive profit opportunities will be exhausted. That is, it must hold that

$$\alpha\Pi^{inf}(\beta) + (1-\alpha)\,\Pi^{uninf}(\beta) = \kappa. \tag{B.1}$$

The intuition is straightforward. If the expected profits from entry were positive, it would attract more entry. If they were negative, speculators would not enter. Thus, for any given level of transparency α and entry cost κ, condition (B.1) defines the equilibrium shares of noise traders, β, and speculators, $1-\beta$.

There is a wide parameter range for κ for which the speculation equilibria described in Proposition 1 arise in a setting with endogenous entry. The notable feature of this range is that entry costs must be intermediate. If they are too high, the equilibrium fraction of speculators and the probability of informed trading (captured by $(1-\beta)\,\alpha$) will be too low for prices to meaningfully affect prospective stakeholders' decisions. Instead, if entry costs are very low, speculators will be attracted to enter, making prices very sensitive to new trades. This would make it impossible for uninformed traders to profit from inflating prices. Hence, the case with endogenous entry adds to the general insight from our paper that speculation equilibria affecting prospective stakeholders' decisions arise when market conditions are "normal" as opposed to extreme.

Proposition B.1 *There are thresholds $\underline{\kappa}$ and $\overline{\kappa}$ such that for $\kappa \in [\underline{\kappa}, \overline{\kappa}]$, there are equilibria with uninformed speculation, where the equilibrium shares of speculators and noise traders are determined by condition (B.1).*

B.2 Other Equilibria

Financial markets are characterized in some cases by the coexistence of equilibria with and without uninformed speculation and in other cases by speculation or non-speculation equilibria only. First, consider the case in which the firm cannot attract stakeholders without a positive feedback effect from the market ($q_0 < q^*$). In this case, short-selling (both on- or off-the equilibrium path) has no real effects and is unprofitable for uninformed speculators. In this case, next to the speculative trading equilibria characterized in Proposition 1, there are also equilibria without uninformed speculation triggering feedback effects as long as the probability that the trader is informed is sufficiently high, i.e., α is above a threshold $\underline{\alpha}'$. Since this threshold is lower than for equilibria with uninformed speculation, there are sometimes only non-speculation equilibria. To illustrate this simply, suppose that α is lowered from just above to just below $\underline{\alpha}$, so that an equilibrium with uninformed speculation cannot be supported. Since uninformed speculators are no longer involved, there is a discrete jump in the probability that the stakeholders are facing a good firm after observing two buy orders even though the probability, α, that the speculator is informed has decreased only marginally. Thus, the firm will be able to attract stakeholders, and informed traders will trade on their positive information.

By contrast, if stakeholders' priors are sufficiently positive, there are, in some cases, no equilibria without uninformed speculation. In particular, suppose that the firm's stock price drops to $p_{D_1D_2}$ after a negatively-informed speculator's strategy $\{D_1, D_2\}$ and that $q_0 \geq q^* \geq q_{D_1D_2}$, i.e., the firm can attract stakeholders for beliefs q_0 but not for $q_{D_1D_2}$. In this case, an uninformed speculator can make the same profit as a negatively-informed speculator from short-selling that undermines the firm's stock prices, making it impossible for the firm to attract stakeholders.[40] Thus, there can be no equilibria in which the negatively-

[40]The profit is the same as firm value does not depend on the speculator's signal s if the firm does not

informed speculator impounds her information into prices in which an uninformed speculator does not trade.

Proposition B.2 *Equilibria with and without uninformed speculation can coexist, except for the following cases: (i) If $q_0 < q^*$ and $\alpha \in [\underline{\alpha}', \underline{\alpha}]$, there are only equilibria without uninformed speculation; (ii) If $q_0 \geq q^* \geq q_{-1-1}$, then in any equilibrium in which the speculator short-sells if $s = B$, she trades as if she has positive or negative information if she is uninformed ($s = \varnothing$).*

B.3 Proofs of Propositions B.1 and B.2

Proof of Proposition B.1. We only show the argument for the case in which $q_0 < q^*$ and the equilibrium with uninformed speculation in which the uninformed speculator buys in both periods. Similar intuition applies to all other equilibria with speculation. In what follows, we take the firm's choice of transparency α as given. Following the same steps as in that proof of Proposition 1, we can express the existence condition in terms of $\beta \in [\underline{\beta}_{11}, \overline{\beta}_{11}]$. The lower bound $\underline{\beta}_{11}$ is implicitly defined by $\Pi(\varnothing) = 0$. For the upper bound, it holds that $\overline{\beta}_{11} = \min\{\beta_{11}, \beta^*_{11}\}$, where β_{11} is implicitly defined by $\Pi(B) = 0$ and β^*_{11} by condition (1).

Observe, now, that for any $\beta \in [\underline{\beta}_{11}, \overline{\beta}_{11}]$, there is a unique $\kappa^*(\beta) \equiv \mathrm{E}\Pi(\alpha, \beta)$, for which condition (B.1) holds. That is, there is an equilibrium with endogenous entry and uninformed speculation in which the share of noise traders is $\widetilde{\beta}$ if the entry cost is $\kappa^*(\widetilde{\beta})$. To find the domain of κ that supports equilibria with uninformed speculation and endogenous entry, we therefore need to find $\kappa^*(\beta)$ for all $\beta \in [\underline{\beta}_{11}, \overline{\beta}_{11}]$. Let $\underline{\kappa} = \min_{\beta \in [\underline{\beta}_{11}, \overline{\beta}_{11}]} \mathrm{E}\Pi(\alpha, \beta)$ and $\overline{\kappa} = \max_{\beta \in [\underline{\beta}_{11}, \overline{\beta}_{11}]} \mathrm{E}\Pi(\alpha, \beta)$. Using that $\mathrm{E}\Pi(\beta)$ and, thus, $\kappa^*(\beta)$ are continuous in β, we obtain that equilibria with uninformed speculation and endogenous entry exist if $\kappa \in [\underline{\kappa}, \overline{\kappa}]$. **Q.E.D.**

Proof of Proposition B.2. We show the claim for a non-speculation equilibrium in which the trader submits $D_1 = 0$ and $D_2 = 1$ if $s = G$, does not trade if $s = \varnothing$, and sells if $s = B$. In the proposed equilibrium, the stakeholders' and the market maker's posterior belief that the firm-specific shock is $\omega = G$ is

$$q_{01} = \frac{\left((1-\beta)\alpha + \beta\frac{1}{9}\right) q_0}{(1-\beta)\alpha q_0 + \beta\frac{1}{9}}.$$

The stakeholders join the firm if and only if $q_{01} > q^*$. Thus, for $q_0 < q^*$ there is again a threshold $\alpha^{**} \equiv \frac{\frac{1}{9}\beta\left(\frac{q^*}{q_0}-1\right)}{(1-\beta)(1-q^*)}$ such that the stakeholders join only if $\alpha > \alpha^{**}$. The prices set by

attract stakeholders.

the market maker are as follows:

$$\begin{array}{ll} p_{01} = \left(\lambda_B + q_{01}\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_{01}\Delta\lambda}\right) & \text{if } D_1 = 0 \text{ and } D_2 = 1 \\ p_{-1-1} = \mathbf{1}_{q_{-1-1}\geq q^*}\left(\lambda_B + q_{-1-1}\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right) & \text{if } D_1 = -1 \text{ and } D_2 = -1 \\ p_{-1} = \pi_{-1-1}p_{-1-1} + \left(1 - \pi_{-1-1}\right)p_0 & \text{if } D_1 = -1 \\ p_{D_1} = p_{D_1D_2} = p_0 = \mathbf{1}_{q_0\geq q^*}\left(\lambda_B + q_0\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right) & \text{otherwise} \end{array}$$

where $\pi_{-1-1} = \frac{(1-\beta)\alpha(1-q_0)+\beta\frac{1}{9}}{(1-\beta)\alpha(1-q_0)+\beta\frac{1}{3}}$. The speculator's expected payoff from $D_1 = 0$ and $D_2 = 1$ is

$$\begin{aligned} \Pi_{01}\left(s\right) &= \left(\lambda_B + q\left(s\right)\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_{01}\Delta\lambda}\right) - p_{D_1D_2} \\ &= \left(q\left(s\right) - q_{01}\right)\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + q_{01}\Delta\lambda}\right). \end{aligned}$$

Note that this expected payoff is positive if $s = G$, but is negative if $s \in \{B, \varnothing\}$. Thus, the speculator has no incentive to mimic $s = G$ if she observes $s \in \{B, \varnothing\}$.

The speculator's expected payoff from selling twice is

$$\begin{aligned} \Pi_{-1-1}\left(s\right) \;&=\; p_{-1-1} + p_{-1} - \mathbf{1}_{q_{-1-1}\geq q^*}2\left(\lambda_B + q\left(s\right)\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right) \\ &=\; \left(\left(1 + \pi_{-1-1}\right)\left(\lambda_B + q_{-1-1}\Delta\lambda\right) - 2\left(\lambda_B + q\left(s\right)\Delta\lambda\right)\right)\mathbf{1}_{q_{-1-1}\geq q^*}\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right) \\ &\quad + \left(1 - \pi_{-1-1}\right)\mathbf{1}_{q_0\geq q^*}\left(\lambda_B + q_0\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right). \end{aligned}$$

This payoff is zero if $q_0 < q^*$, as then the firm's fundamental value is commonly known and equal to the price set by the market maker of $p_0 = 0$. Hence, if $q_0 < q^*$, the speculator also does not deviate if $s = G$ to short-selling or trading as a noise trader. Similarly, the speculator does not strictly benefit from trading as a noise trader if $s \in \{B, \varnothing\}$ as her payoff is then the same as on the equilibrium path.

Consider, next, the case in which $q_0 \geq q^* \geq q_{-1-1}$. Then

$$\Pi_{-1-1}\left(s\right) = \left(1 - \pi_{-1-1}\right)\left(\lambda_B + q_0\Delta\lambda\right)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right) > 0.$$

Since this payoff is positive, while that from not trading is zero, there can be no equilibrium in which the speculator does not trade either as positively or negatively informed. We show the existence of the former type of equilibria in Lemma C.4. The existence of the latter of equilibria is also straightforward to verify but omitted for space reasons.

Finally, we show that if $q_0 < q^*$, it holds that there is a parameter range in which we can have only equilibria without uninformed speculation. The equilibrium without uninformed speculation, derived above requires that $\alpha > \alpha^{**}$. The easiest-to-sustain equilibrium with uninformed speculation is when speculator buys in the first trading date but does not trade in the second (Lemma C.5). It requires that $\alpha \in [\underline{\alpha}_{10}, \overline{\alpha}_{10}]$. To show the claim, it is sufficient to show that $\alpha^{**} < \underline{\alpha}_{10}$. Since $\underline{\alpha}_{10} = \max\{\alpha_{10}, \alpha^*_{10}\}$, it is sufficient to show that $\alpha^{**} \leq \alpha^*_{10}$. Suppose to a contradiction that $\alpha^{**} - \alpha^*_{10} > 0$. It holds

$$\begin{aligned}
\alpha^{**} - \alpha^*_{10} &= \frac{\frac{1}{9}\beta\left(\frac{q^*}{q_0} - 1\right)}{(1-\beta)(1-q^*)} - \frac{\left(1-\frac{8}{9}\beta\right)\left(1-\frac{q_0}{q^*}\right)}{(1-\beta)(1-q_0)} \\
&= \frac{(q^*-q_0)}{(1-\beta)}\left(\frac{\frac{1}{9}\beta(1-q_0)q^* - \left(1-\frac{8}{9}\beta\right)(1-q^*)q_0}{(1-q^*)q_0(1-q_0)q^*}\right).
\end{aligned}$$

which is positive if

$$\beta > \frac{1}{\left(\frac{1}{9}\frac{(1-q_0)q^*}{(1-q^*)q_0} + \frac{8}{9}\right)}. \tag{B.2}$$

However, for an equilibrium with uninformed speculation to exist, it must also be that $\alpha^*_{10} < 1$. That is

$$\frac{\left(1-\frac{8}{9}\beta\right)\left(1-\frac{q_0}{q^*}\right)}{(1-\beta)(1-q_0)} < 1 \Longleftrightarrow \frac{1}{\left(\frac{1}{9}\frac{(1-q_0)q^*}{q_0(1-q^*)} + \frac{8}{9}\right)} > \beta,$$

giving a contradiction to condition (B.2). **Q.E.D.**

Appendix C Proofs of Auxiliary Lemmas

Lemma C.1 *Let $id \in \{in, un, no\}$ denote the identity of the speculator, depending on whether she is informed (in), uninformed (un), or a noise trader (no). Let $\Omega_t \subseteq \{-1, 0, 1\}$ be the set of equilibrium actions that can be taken by the informed speculator at date t. Following trades D_1 and D_2 the market maker's and the stakeholders' posterior belief that the firm-specific shock is $\omega = G$ is*

$$q_{D_1D_2} = \frac{\sum_{id=\{in,un,no\}} \Pr(id)\Pr(D_1, D_2|id, G)\Pr(G)}{\sum_{id=\{in,un,no\}} \Pr(id)\sum_{\omega=\{G,B\}} \Pr(D_1, D_2|id, \omega)\Pr(\omega)} \quad \textit{if } D_1 \in \Omega_1, D_2 \in \Omega_2, \tag{C.1}$$

and $q_{D_1D_2} = q_0$ *if* $D_1 \notin \Omega_1$ *or* $D_2 \notin \Omega_2$. *Furthermore, after observing a trade* D_1 *at* $t = 1$, *the market maker assigns the following probability that the trader will play* D_2 *at* $t = 2$:

$$\pi_{D_1D_2} = \frac{\sum_{id=\{in,un,no\}} \Pr(id) \sum_{\omega=\{G,B\}} \Pr(D_1, D_2|id, \omega) \Pr(\omega)}{\sum_{id=\{in,un,no\}} \Pr(id) \sum_{\omega=\{G,B\}} \Pr(D_1|id, \omega) \Pr(\omega)}. \tag{C.2}$$

The stock price at date $t = 2$ *is given by*

$$p_{D_1D_2} = \begin{cases} (\lambda_B + q_{D_1D_2}\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{D_1D_2}\Delta\lambda}\right) & \text{if } D_1 \in \Omega_1, D_2 \in \Omega_2 \\ (\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)\mathbf{1}_{q_0 \geq q^*} & \text{otherwise} \end{cases}, \tag{C.3}$$

where $\mathbf{1}_{q_0 \geq q^*} = 1$ *if* $q_0 \geq q^*$ *and zero otherwise. The price at date* $t = 1$ *is*

$$p_{D_1} = \begin{cases} \sum_{D_2=\{-1,0,1\}} \pi_{D_1D_2} p_{D_1D_2} & \text{if } D_1 \in \Omega_1 \\ (\lambda_B + q_0\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right)\mathbf{1}_{q_0 \geq q^*} & \text{otherwise} \end{cases}. \tag{C.4}$$

The speculator's expected profit from both trades is

$$\Pi(s) = (v(s) - p_{D_1}) D_1 + (v(s) - p_{D_1D_2}) D_2, \tag{C.5}$$

where

$$v(s) = \begin{cases} (\lambda_B + q(s)\Delta\lambda)\left(x - \frac{\overline{w}}{\lambda_B + q_{D_1D_2}\Delta\lambda}\right) & \text{if the firm attracts stakeholders} \\ 0 & \text{if the firm does not attract stakeholders} \end{cases}.$$

Proof of Lemma C.1. Expressions (C.1) and (C.2) follow from a simple application of Bayes' rule

$$q_{D_1D_2} = \Pr(G|D_1, D_2) = \frac{\Pr(D_1, D_2|G)\Pr(G)}{\Pr(D_1, D_2)}$$
$$\pi_{D_1D_2} = \Pr(D_2|D_1) = \frac{\Pr(D_1, D_2)}{\Pr(D_1)}.$$

The prices reflect the market maker's rational expectation about the firm's fundamental value given the trades D_1 and D_2 and the trader's equilibrium trading strategies. **Q.E.D.**

Lemma C.2 *If the firm attracts the stakeholders, then, regardless of whether it observes the firm-specific shock* ω, *it offers a contract such that the stakeholders' participation constraint binds*

$$R + (\lambda_B + q_{D_1D_2}\Delta\lambda)\Delta R = \overline{w}, \tag{C.6}$$

where $q_{D_1D_2}$ is the stakeholders' posterior belief that the state is $\omega = G$ based on the market price $p_{D_1D_2}$ at $t = 2$. If the stakeholders observe the firm-specific shock ω, the firm can attract them if and only if $\omega = G$ in which case $q_{D_1D_2}$ is replaced by one in expression (C.6).

Proof of Lemma C.2. We need to distinguish between several cases depending on what the firm and the stakeholders know at $t = 3$. First, if the firm and the stakeholders have the same information, which they infer from the firm's stock price, it is optimal for the firm to satisfy the worker's participation constraint with equality. The stakeholders' compensation (for $y = R = 0$) is then given by

$$\Delta R = \frac{\overline{w}}{\lambda_B + q_{D_1D_2}\Delta\lambda}. \tag{C.7}$$

For completeness, note that offering contract (C.7) is optimal also if the firm observes the firm-specific shock ω, while the stakeholders form their beliefs based on the firm's stock price. The argument is standard. In the resulting signaling game, the unique equilibrium contract is pooling and must satisfy condition (C.7). If the firm has positive liquid assets in place, $y > 0$, in that equilibrium it will hold that $R = y$.[41] Since the contract offered by the firm is uninformative about the true firm-specific shock, the stakeholders' posterior beliefs are formed once again from the stock prices. Finally, for use in Lemma 1, if the stakeholders observe the firm-specific shock (regardless of whether the firm observes it), it is optimal for the firm to offer a contract for which (C.6) is satisfied for $q_{D_1D_2} = 1$. Then, the stakeholders will join if and only if they observe that $\omega = G$. **Q.E.D.**

Lemma C.3 *For any feasible (β, q_0), if there is a value for α, denoted by $\overline{\alpha}_{11}$, for which $\Pi(\varnothing) = 0$, then $\frac{\partial}{\partial\alpha}\Pi(\varnothing) < 0$ at $\overline{\alpha}_{11}$.*

Proof of Lemma C.3. We show the claim by verifying that if $\Pi_{11}(\varnothing) = 0$ for some α, then it must be that $\frac{\partial}{\partial\alpha}\Pi_{11}(\varnothing) < 0$ at that α. We have two cases depending on whether $\overline{w}$ is larger or smaller than $(\lambda_B + q_0\Delta\lambda)\, x$.

Case: $\overline{w} > (\lambda_B + q_0\Delta\lambda)\, x$ (i.e., $q_0 < q^*$). From expression (A.2), the uninformed speculator's profit is

$$\Pi_{11}(\varnothing) = \left(\left(2q_0 - (1 + \pi_{11})\, q_{11}\right)\Delta\lambda + (1 - \pi_{11})\, \lambda_B\right)\left(x - \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}\right). \tag{C.8}$$

[41] See Nachman and Noe (1994) and Inderst and Vladimirov (2019) for detailed proofs.

Since by construction $x \geq \frac{\overline{w}}{\lambda_B + q_{11}\Delta\lambda}$ for $\alpha > \alpha_{11}^*$, it suffices to analyze the first term in brackets in expression (C.8), $C_1 \equiv ((2q_0 - (1+\pi_{11})\, q_{11})\, \Delta\lambda + (1-\pi_{11})\, \lambda_B)$. A sufficient condition that this term is always positive is that $2q_0 \geq (1+\pi_{11})\, q_{11}$. Plugging in for π_{11} and q_{11}, we obtain that this is the case if $\alpha \leq \frac{1-\frac{2}{3}\beta - \sqrt{\left(1-\frac{2}{3}\beta\right)^2 - \frac{4}{9}\beta\left(1-\frac{8}{9}\beta\right)}}{2(1-\beta)(1-q_0)}$.

We show, now, that if $\alpha > \frac{1-\frac{2}{3}\beta - \sqrt{\left(1-\frac{2}{3}\beta\right)^2 - \frac{4}{9}\beta\left(1-\frac{8}{9}\beta\right)}}{2(1-\beta)(1-q_0)}$, C_1 crosses zero at most once from above. Taking derivative of C_1 with respect to α, we have

$$\begin{aligned} & -\frac{\partial}{\partial\alpha}\left(q_{11} + \pi_{11} q_{11}\right)\Delta\lambda - \frac{\partial}{\partial\alpha}\pi_{11}\lambda_B \\ = \; & -\left(\frac{q_0\,(1-\beta)\,(1-q_0)\left(1-\frac{8}{9}\beta\right)}{\left((1-\beta)\,\alpha q_0 + (1-\beta)\,(1-\alpha) + \beta\frac{1}{9}\right)^2} + \frac{q_0\,(1-\beta)\,(1-q_0)\left(1-\frac{8}{9}\beta\right)}{\left((1-\beta)\,\alpha q_0 + (1-\beta)\,(1-\alpha) + \beta\frac{1}{3}\right)^2}\right)\Delta\lambda \\ & + \frac{\frac{2}{9}\beta\,(1-\beta)\,(1-q_0)}{\left((1-\beta)\,\alpha q_0 + (1-\beta)\,(1-\alpha) + \beta\frac{1}{3}\right)^2}\lambda_B \end{aligned} \tag{C.9}$$

Suppose, now, that the speculator's profit is zero at some $\alpha > \alpha_{11}^*$. From expression (C.8), we can then express $\lambda_B = \frac{-(2q_0 - (1+\pi_{11})q_{11})\Delta\lambda}{(1-\pi_{11})}$. Plugging in for λ_B, expression (C.9) can be simplified to

$$\begin{aligned} & 6q_0\,(1-\beta)\,(1-q_0) \\ & \times \frac{((1-\beta)\,81\alpha\,(1-q_0) - 144\,(1-\beta) - 18)\,(1-\beta)\,\alpha\,(1-q_0) + (9-8\beta)^2 + (9-8\beta)\,\beta}{(3\,(1-\beta)\,\alpha\,(1-q_0) + 2\beta - 3)\,(9\alpha\,(1-\beta)\,(1-q_0) + 8\beta - 9)^2}\Delta\lambda \end{aligned} \tag{C.10}$$

Observe, now that the numerator in expression (C.10) is positive for any (α, q_0). To see this, denote $A \equiv \alpha\,(1-q_0)$, and observe that the numerator of (C.10) is convex in A, obtaining a minimum value at $A = \frac{8\beta-9}{9\beta-9} > 1$ for any $\beta \in [0,1]$. Since $\alpha \in [0,1]$ and $q_0 \in [0,1]$, the minimum value of the numerator is achieved at $A = 1$, for which the numerator becomes equal to $\beta\,(9-7\beta) > 0$. Furthermore, observe that expression $(3\,(1-\beta)\,\alpha\,(1-q_0) + 2\beta - 3)$ in the denominator is negative for any (α, q_0), since $3\,(1-\beta)\,A + 2\beta - 3 \leq -\beta < 0$. Hence, we obtain that $\frac{\partial}{\partial\alpha}\Pi_{11}(\varnothing) < 0$ for any α for which $\frac{\partial}{\partial\alpha}\Pi_{11}(\varnothing) = 0$, as was to be shown. ■

Case: $\overline{w} \leq (\lambda_B + q_0\Delta\lambda)\, x$ (i.e., $q_0 \geq q^*$). From expression (A.2), the uninformed speculator's profit simplifies to

$$\Pi_{11}(\varnothing) = \frac{(q_{11} - q_0)\,\Delta\lambda}{\lambda_B + q_{11}\Delta\lambda}\left(2\overline{w} - (\lambda_B + q_{11}\Delta\lambda)\,(1+\pi_{11})\, x\right)$$

After plugging in for q_{11} and π_{11}, the term after the fraction can be rewritten as

$$\begin{aligned}
C_2 &\equiv 2\overline{w} - \left(\lambda_B + \frac{\left(1-\frac{8}{9}\beta\right)q_0}{(1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{9}}\Delta_\lambda\right) \\
&\qquad \times\left(2-\frac{\beta\frac{2}{9}}{(1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{3}}\right)x \\
&= \frac{2}{\left((1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{9}\right)\left((1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{3}\right)} \\
&\quad \times\left(\overline{w}\left((1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{9}\right)\left((1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{3}\right)\right. \\
&\quad -\left(\left((1-\beta)(1-\alpha(1-q_0))+\beta\frac{1}{9}\right)\lambda_B+\left(1-\frac{8}{9}\beta\right)q_0\Delta\lambda\right) \\
&\qquad \times\left((1-\beta)(1-\alpha(1-q_0))+\beta\frac{2}{9}\right)x
\end{aligned}$$

Denoting $A\equiv(1-\alpha(1-q_0))$, the numerator in the above expression can be restated as

$$\begin{aligned}
&\overline{w}\left((1-\beta)A+\beta\frac{1}{9}\right)\left((1-\beta)A+\beta\frac{1}{3}\right) \\
&-\left(\left((1-\beta)A+\beta\frac{1}{9}\right)\lambda_B+\left(1-\frac{8}{9}\beta\right)q_0\Delta_\lambda\right)\left((1-\beta)A+\beta\frac{2}{9}\right)x
\end{aligned} \tag{C.11}$$

Observe that C_2 is increasing in β. Furthermore, for any (α,q_0), expression (C.11) evaluated at $\beta=1$ becomes

$$\frac{1}{27}\left(w-\frac{2}{3}x\left(\lambda_B+q_0\Delta\lambda\right)\right)$$

Hence, a necessary condition for the speculator's profit to be positive is that $\overline{w}>\frac{2}{3}x\left(\lambda_B+q_0\Delta\lambda\right)$. We will use this property in what follows to show that expression (C.11) increases in A when (C.11) is zero. Since $\frac{\partial A}{\partial\alpha}<0$, this will imply that if $\Pi_{11}(\varnothing)=0$ for some α, then $\frac{\partial\Pi_{11}(\varnothing)}{\partial\alpha}<0$ at that α.

The derivative of expression (C.11) with respect to A is

$$\begin{aligned}
&\overline{w}\frac{2}{9}(1-\beta)(9A(1-\beta)+2\beta) \\
&-\left(\frac{1}{9}(1-\beta)(18A\lambda_B+3\beta\lambda_B+9\Delta_\lambda q_0-18A\beta\lambda_B-8\beta\Delta_\lambda q_0)\right)x
\end{aligned}$$

using that $\overline{w} > \frac{2}{3}x\left(\lambda_B + \Delta_\lambda q_0\right)$, this derivative is larger than

$$\begin{aligned}
& \frac{2}{3}x\left(\lambda_B + \Delta_\lambda q_0\right)\frac{2}{9}\left(1-\beta\right)\left(9A\left(1-\beta\right)+2\beta\right) \\
& -\left(\frac{1}{9}\left(1-\beta\right)\left(18A\lambda_B + 3\beta\lambda_B + 9\Delta_\lambda q_0 - 18A\beta\lambda_B - 8\beta\Delta_\lambda q_0\right)\right)x \\
= \; & \frac{1}{27}\left(\beta-1\right)\left(\left(18A\left(1-\beta\right)+\beta\right)\lambda_B + \left(27-32\beta-36A\left(1-\beta\right)\right)\Delta_\lambda q_0\right)x \quad \text{(C.12)}
\end{aligned}$$

Consider, now, a value of $\alpha = \overline{\alpha}_{11}$ for which expression (C.11) is zero (and so $C_2 = \Pi_{11}(\varnothing) = 0$). Using again that $\overline{w} > \frac{2}{3}x\left(\lambda_B + \Delta_\lambda q_0\right)$, it holds

$$\begin{aligned}
0 \; = \; & w\left(\left(1-\beta\right)A + \beta\frac{1}{9}\right)\left(\left(1-\beta\right)A + \beta\frac{1}{3}\right) \\
& -\left(\left(\left(1-\beta\right)A + \beta\frac{1}{9}\right)\lambda_B + \left(1-\frac{8}{9}\beta\right)q_0\Delta_\lambda\right)\left(\left(1-\beta\right)A + \beta\frac{2}{9}\right)x \\
> \; & \frac{2}{3}\left(\lambda_B + \Delta_\lambda q_0\right)\left(\left(1-\beta\right)A + \beta\frac{1}{9}\right)\left(\left(1-\beta\right)A + \beta\frac{1}{3}\right)x \\
& -\left(\left(\left(1-\beta\right)A + \beta\frac{1}{9}\right)\lambda_B + \left(1-\frac{8}{9}\beta\right)q_0\Delta_\lambda\right)\left(\left(1-\beta\right)A + \beta\frac{2}{9}\right)x \\
= \; & \frac{1}{27}\left(\beta-1\right)\left(A\left(9A\left(1-\beta\right)+\beta\right)\lambda_B + \left(27A + 6\beta - 18A^2\left(1-\beta\right) - 32A\beta\right)\Delta_\lambda q_0\right)x,
\end{aligned}$$

which implies that $\left(\beta-1\right)\lambda_B < -\left(\beta-1\right)\frac{\left(27A+6\beta-18A^2(1-\beta)-32A\beta\right)}{A(9A(1-\beta)+\beta)}\Delta_\lambda q_0$. Hence, expression (C.12) at $\overline{\alpha}_{11}$ is larger than

$$\begin{aligned}
& \frac{1}{27}\left(\beta-1\right)\Bigg(-\left(18A\left(1-\beta\right)+\beta\right)\frac{27A + 6\beta - 18A^2 + 18A^2\beta - 32A\beta}{\left(9A^2 + A\beta - 9A^2\beta\right)} \\
& \qquad +27 - 32\beta - 36A\left(1-\beta\right)\Bigg)\Delta_\lambda q_0 x \\
= \; & \frac{\frac{1}{9}\left(1-\beta\right)}{A\left(9A+\beta-9A\beta\right)}\left(90A^2\beta^2 - 171A^2\beta + 81A^2 - 36A\beta^2 + 36A\beta + 2\beta^2\right)\Delta_\lambda q_0 x
\end{aligned}$$

Since $A \in [0,1]$, the term in brackets has a minimum at $A = 2\frac{\beta}{10\beta-9}$, but since $A \leq 1$, the minimum of the above expression as obtained at $A = 1$ as

$$\frac{\frac{1}{9}\left(1-\beta\right)}{A\left(9A+\beta-9A\beta\right)}\left(56\beta^2 - 135\beta + 81\right)\Delta_\lambda q_0 x > 0 \text{ for any } \beta \in [0,1].$$

Hence, the derivative of expression (C.11) at any α for which the speculator's profit is zero is positive with respect to A. Since $\frac{\partial A}{\partial \alpha} < 0$, the claim follows. ■

The proofs of the two cases completes the proof. **Q.E.D.**

Lemma C.4 *There is an equilibrium in which an uninformed speculator buys in both periods if* $q_0 \geq q^*$.

Proof of Lemma C.4. It only remains to prove Step 4 from Proposition 1 for the case in which $q_0 \geq q^*$. In particular, we continue by verifying that the speculator will not deviate at $t = 1$. Clearly, deviating to $\{D_1, D_2\} = \{0, 0\}$ is never strictly optimal, as then the speculator's deviation payoff is zero.

Ruling Out Deviations to $\{D_1, D_2\} = \{0, -1\}$ **and** $\{D_1, D_2\} = \{1, -1\}$**.** If the speculator deviates to $\{D_1, D_2\} = \{0, -1\}$ or $\{D_1, D_2\} = \{1, -1\}$, her expected payoff is

$$\begin{aligned} &\left(\left(\lambda_B + q\left(s\right)\Delta\lambda\right)\left(x - \frac{\overline{w}}{\left(\lambda_B + q_0\Delta\lambda\right)}\right) - p_1\right) D_1 \\ &- \left(\left(\lambda_B + q\left(s\right)\Delta\lambda\right)\left(x - \frac{\overline{w}}{\left(\lambda_B + q_0\Delta\lambda\right)}\right) - p_0\right). \end{aligned} \tag{C.13}$$

Case $q_0 \geq q^* \geq q_{-1-1}$: In this case, expression (C.13) reduces to $p_0 - p_1 < 0$ if $D_1 = 1$ and $\left(q_0 - q\left(s\right)\right)\Delta\lambda\left(x - \frac{\overline{w}}{\left(\lambda_B + q_0\Delta\lambda\right)}\right)$ if $D_1 = 0$. The latter is (weakly) negative for signals $s = \{G, \varnothing\}$. For signal $s = B$, we need to compare (C.13) to the negatively-informed speculator's expected payoff from selling twice. If $q_0 \geq q^* \geq q_{-1-1}$, the difference is

$$\left(\left(1 - \pi_{-1-1}\right)\left(\lambda_B + q_0\Delta\lambda\right) - q_0\Delta\lambda\right)\left(x - \frac{\overline{w}}{\left(\lambda_B + q_0\Delta\lambda\right)}\right),$$

which is positive if and only if $\lambda_B > \frac{\pi_{-1-1}}{\left(1-\pi_{-1-1}\right)} q_0\Delta\lambda$ and negative otherwise. Since π_{-1-1} is increasing in α, we obtain that if $\lambda_B > \frac{9\alpha(\beta-1)(q_0-1)+\beta}{2\beta} q_0\Delta\lambda$, there is no deviation. And if $\lambda_B \in \left[\frac{1}{3} q_0\Delta\lambda, \frac{9\alpha(\beta-1)(q_0-1)+\beta}{2\beta} q_0\Delta\lambda\right]$, there is a threshold $\alpha_{l1} \in [0, 1]$, such that a deviation by the negatively informed speculator can be prevented if $\alpha \leq \alpha_{u1}$. For $\lambda_B < \frac{1}{3} q_0\Delta\lambda$, the speculator always deviates.

Case: $q_{-1-1} \geq q^*$: Similar to the previous case, the difference between the negatively-informed speculator's expected payoff and her payoff (C.13) from deviating to $\{0, 1\}$ is

$$2q_{-1-1}\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right) + \left(1 - \pi_{-1-1}\right)\left(q_0 - q_{-1-1}\right)\Delta\lambda x - q_0\Delta\lambda\left(x - \frac{\overline{w}}{\left(\lambda_B + q_0\Delta\lambda\right)}\right) \tag{C.14}$$

which is equal to $\left(x - \frac{\overline{w}}{\lambda_B + q_0\Delta\lambda}\right) > 0$ for $\alpha \to 0$ or $\beta \to 1$. Hence, there is a threshold $\alpha_{1u} \in (0, 1]$, implicitly defined by the lowest root of (C.14) and, if this root does not exist, by $\alpha_{1u} = 1$, such that deviating is not profitable for $\alpha \leq \alpha_{1u}$.

Ruling Out Deviations to $\{D_1, D_2\} = \{0, 1\}$ or $\{D_1, D_2\} = \{1, 0\}$. Next, if the speculator deviates to $\{D_1, D_2\} = \{0, 1\}$ or $\{D_1, D_2\} = \{1, 0\}$, her expected payoff is

$$y + \mathbf{1}_{q_0 \geq q^*} \left(-R + (\lambda_B + q(s) \Delta\lambda) \left(x - \frac{\overline{w}}{(\lambda_B + q_0 \Delta\lambda)} \right) \right) - p_{D_1 D_2}. \tag{C.15}$$

If $D_1 = 0$, then $p_{D_1 D_2} = p_0$, and if $D_1 = 1$, $p_{D_1 D_2} = p_1$. In either case, (C.15) is (weakly) negative if $s = \{B, \varnothing\}$. If $s = G$, the speculator's equilibrium profit from $\{1, 0\}$ is less than from buying in both periods (Step 3). Subtracting her expected profit from $\{0, 1\}$

$$\mathbf{1}_{q_0 \geq q^*} \left((q(s) - q_0) \Delta\lambda \left(x - \frac{\overline{w}}{(\lambda_B + q_0 \Delta\lambda)} \right) \right),$$

from her equilibrium expected payoff, we obtain

$$\Delta\lambda \left(\left(2 \frac{(q_{11} - q(s))}{\lambda_B + q_{11}\Delta\lambda} + (2 - \pi_{11}) \frac{(q(s) - q_0)}{\lambda_B + q_0 \Delta\lambda} \right) \overline{w} + (q_0 - q_{11} + (q(s) - q_{11}) \pi_{11}) x \right). \tag{C.16}$$

Plugging in for q_{11} and π_{11}, this difference becomes $\left(x - \frac{\overline{w}}{\lambda_B + q_0 \Delta\lambda} \right) \geq 0$ for $\alpha \to 0$. Hence, there is a threshold, $\alpha_{u2} \in (0, 1]$, implicitly defined by the lowest root of (C.16) and α's upper bound of one, such that the positively informed speculator does not deviate for $\alpha \leq \alpha_{u2}$.

Ruling Out Deviations to $\{D_1, D_2\} = \{1, 1\}$ or $\{-1, -1\}$. Since the IC of the uninformed speculator is more difficult to satisfy, the relevant incentive constraints are $\Pi_{11}(\varnothing) \geq \Pi_{-1-1}(\varnothing)$ and $\Pi_{-1-1}(B) \geq \Pi_{11}(B)$.

Case: $q_0 \geq q^* > q_{-1-1}$. The incentive constraints $\Pi_{11}(\varnothing) \geq \Pi_{-1-1}(\varnothing)$ and $\Pi_{-1-1}(B) \geq \Pi_{11}(B)$ are:

$$\begin{aligned} & 2q_0 \Delta\lambda \left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}} \right) + \Delta\lambda \left((1 - \pi_{11})(q_{11} - q_0) x - 2q_{11} \left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}} \right) \right) \\ \geq \; & (1 - \pi_{-1-1})(\lambda_B + q_0 \Delta\lambda) \left(x - \frac{\overline{w}}{\lambda_B + q_0 \Delta\lambda} \right) \\ \geq \; & \Delta\lambda \left((1 - \pi_{11})(q_{11} - q_0) x - 2q_{11} \left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}} \right) \right). \end{aligned}$$

For $\alpha \to 0$, the latter constraint reduces to $(\lambda_B + q_0 \Delta\lambda) x \geq w$, which is satisfied, as $q_0 \geq q^*$. Denoting with α_{u3} the lowest value of α for which the constraint continues to be satisfied at least weakly, we obtain that a sufficient condition for which it is satisfied is that $\alpha \in [0, \alpha_{u3}]$. However, if $\alpha \to 0$, the former constraint is not satisfied, but the difference between the left- and the right-hand side of the inequality is increasing in α. Thus, if the constraint is satisfied, there is a threshold α_{l1}, such that it is satisfied for $\alpha > \alpha_{l1}$. Numerically, it can be verified that, for example, for $\beta = 0.8$, $\lambda_B = 0.4$, $\Delta\lambda = 0.5$, $x = 100$, and $\overline{w} = 80$, there is a wide range of "intermediate" values for α that satisfy all incentive constraints.

Case $q_{-1-1} \geq q^*$. Finally, the incentive constraints that an uninformed speculator will not play the strategy of a negatively informed speculator

$$\begin{aligned} & 2q_0\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}}\right) + \Delta\lambda\left((1-\pi_{11})(q_{11}-q_0)x - 2q_{11}\left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}}\right)\right) \\ \geq & \left((1-\pi_{-1-1})(q_0 - q_{-1-1})\Delta\lambda x - 2(q_0 - q_{-1-1})\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right)\right). \end{aligned}$$

For $\alpha \to 0$, this constraint is satisfied with equality, and it increase in α. Thus, there is a α_{u4}, the incentive constraint is satisfied for $\alpha \leq \alpha_{u4}$.

The negatively informed speculator will not play the strategy of the positively informed speculator are

$$\begin{aligned} & (1-\pi_{-1-1})(q_0 - q_{-1-1})\Delta\lambda x - 2(0 - q_{-1-1})\Delta\lambda\left(x - \frac{\overline{w}}{\lambda_B + q_{-1-1}\Delta\lambda}\right) \\ \geq & \ \Delta\lambda\left((1-\pi_{11})(q_{11}-q_0)x - 2q_{11}\left(x - \frac{\overline{w}}{\lambda_B + \Delta\lambda q_{11}}\right)\right). \end{aligned}$$

The latter constraint reduces to $(\lambda_B + q_0\Delta\lambda)x \geq w$ for $\alpha \to 0$. Denoting with α_{u5} the lowest value of α for which the constraint continues to be satisfied at least weakly, we obtain that a sufficient condition for which it is satisfied is that $\alpha \in [0, \alpha_{u5}]$. Numerically, it can be verified that, for example, for $\beta = 0.8$, $\lambda_B = 0.4$, $\Delta\lambda = 0.5$, $x = 100$, $q_0 = 0.6$, and $\overline{w} = 40$, there is a wide range of "intermediate" values for α that satisfy all incentive constraints. **Q.E.D.**

Lemma C.5 *There is an equilibrium in which the speculator buys at $t = 1$ and does not trade at $t = 2$ if $s \in \{G, \varnothing\}$ and sells at $t = 1$ and $t = 2$ if $s = B$. There are thresholds $\underline{\alpha}_{10}$, $\overline{\alpha}_{10}$ and $\overline{w}^*_{10}$, such that these equilibria can be supported if the probability that the speculator is informed is intermediate*

$$\alpha \in [\underline{\alpha}_{10}, \overline{\alpha}_{10}], \tag{C.17}$$

and $\overline{w} < \overline{w}^*_{10}$. It holds that $\underline{\alpha}_{10} > \underline{\alpha}_{11}, \overline{\alpha}_{10} > \overline{\alpha}_{11}$.

Proof of Lemma C.5. We consider, next, the equilibria in which the speculator buys at $t = 1$ and does not trade at $t = 2$ ($D_1 = 1, D_2 = 0$) if she observes $s \in \{G, \varnothing\}$. There are again four possible such equilibria that differ in whether the speculator trades in one, both or none of the trading dates if $s = B$. We present in detail again only the proof for the case in which $D_1 = D_2 = -1$ if $s = B$ and focus on the case in which $q_0 < q^*$. Extending the proof to the case in which $q_0 \geq q^*$ follows the same steps as the proof of Lemma C.4.

Since the proof is very similar to that the proof of Proposition 1, we only explain the differences. From expressions (C.1) and (C.2), the market maker's posterior belief that the firm-specific shock is $\omega = G$ is $q_{10} = q_{11}$, $\pi_{10} = \pi_{11}$, q_{-1-1} is the same as above, and $q_{D_1 D_2} = q_0$ for all other orders D_1 and D_2. The stakeholders join only if $\alpha > \alpha_{11}^*$. Furthermore, the prices at $t = 2$ and $t = 1$ are

$$\begin{aligned} &p_1 = \pi_{10}\left(\lambda_B + q_{10}\Delta\lambda\right)\left(x - \Delta R\right) && \text{if } D_1 = 1 \\ &p_{D_1} = p_{D_1 D_2} = 0 && \text{if } D_1 \in \{-1, 0\} \text{ or } D_2 \in \{-1, 1\}. \end{aligned}$$

The speculator's equilibrium expected payoff is given by expression (C.5). It holds that $\Pi(B) = 0$ (i.e., if $s = B$). Furthermore

$$\begin{aligned} \Pi_{10}(s) &= \left(\lambda_B + q(s)\Delta\lambda\right)(x - w) - p_{D_1} \\ &= \left(\left(q(s) - q_{10}\right)\Delta\lambda + \left(1 - \pi_{10}\right)\lambda_B\right)(x - \Delta R). \end{aligned} \tag{C.18}$$

Since $q(s) = 1$, if $s = G$, the speculator's expected payoff is positive if she observes $s = G$. However, this profit is lower than in the proof of Proposition 1, as the speculator makes a profit only on her first trade, which is at the same price as in the proof of Proposition 1. If the speculator observes $s = \varnothing$, $q(s) = q_0$ and we obtain again that $\Pi_{10}(\varnothing) > 0$ if and only if $\alpha < \overline{\alpha}_{10}$, where $\overline{\alpha}_{10}$ is a threshold implicitly defined by $\Pi_{10}(\varnothing) = 0$. The uninformed speculator's profit is higher than in the equilibrium in the proof of Proposition 1 since she trades at $t = 1$ at the same price but does not make a loss from trading at date $t = 2$. Thus, we have that $\overline{\alpha}_{10} > \overline{\alpha}_{11}$. Once again, we have that the set $[\alpha_{11}^*, \overline{\alpha}_{10}]$ is not empty if $w < \overline{w}_{10}^*$, where $\overline{w}_{10}^*$ is implicitly defined by $\alpha_{11}^* \equiv \overline{\alpha}_{10}$.

The argument that after playing $D_1 = 1$ at $t = 1$, the speculator cannot benefit from trading as a noise trader at $t = 2$ is identical to that in Step 2 of the proof of Proposition 1. The only differences are that the speculator's equilibrium expected payoff is given by (C.18) if $s \in \{\varnothing, G\}$ and that the deviations in this case are to $D_2 \in \{-1, 1\}$. The speculator's expected payoff from such deviations is negative or zero, which is (weakly) less than what she obtains in equilibrium.

Similarly, the argument that there are no profitable deviations at $t = 1$ is identical to Step 3 of the proof of Proposition 1. The only difference is that a speculator who has observed $s = B$ does not mimic $s = G$ by playing $D_1 = 1$ and $D_2 = 0$ if and only if $\alpha > \underline{\alpha}_{10}$, where α_{10} is implicitly defined by $\Pi_{10}(B) = 0$. Defining $\underline{\alpha}_{10} \equiv \max\{\alpha_{10}, \alpha_{10}^*\}$, we obtain that there is no profitable deviation from the proposed equilibrium if $\alpha \in [\underline{\alpha}_{10}, \overline{\alpha}_{10}]$. Finally, as argued above, $\Pi_{10}(B)$ is higher than in the proof of Proposition 1. Thus, it holds that $\underline{\alpha}_{10} > \underline{\alpha}_{11}$.

Modifying this proof to show that there are equilibria in which the speculator buys at $t = 1$ and does not trade at $t = 2$ if $s \in \{G, \varnothing\}$ and does not trade in one or both trading periods if $s = B$ is again nearly identical to the proof above. **Q.E.D.**