Trading Ahead of Barbarians' Arrival at the Gate: Insider Trading on Non-Inside Information[☆]

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Abstract

Privately informed about firm fundamentals, corporate insiders detect activism-motivated trades better than other traders. This paper solves the model of this novel form of insider trading motivated by non-insider information and presents empirical evidence. Corporate insiders preserve their ownership (restraining from selling or buying more) before activist interventions go public to benefit from price appreciation and to defend their private benefits of control. Surveillance technology facilitates response to pre-disclosure activist trading, especially when positive information about firm fundamentals is absent, supporting the mechanism that insiders attribute order flows to activist interest when speculation on fundamentals can be ruled out.

Key words: Insider trading; activism; market surveillance

1. Introduction

Informed trading is one of the key drivers of market efficiency, enabling value-relevant information to be incorporated into prices and directing resource allocation based on market signals. However, there is widespread agreement that unrestricted trading of a public company's securities by individuals with access to material, nonpublic information is inherently unjust to other investors. The prevalence of such trades drains market participation and liquidity and eventually stunts economic growth as outside investors lose confidence in the levelness of the playing field (Bhattacharya and Daouk, 2002). For this reason, all major securities markets have developed laws, rules, and systems that regulate trades by insiders (which usually include senior management, board directors, and controlling shareholders, among others) and their affiliates who have privileged access to material nonpublic information and criminalize insider trades that are based on or misappropriate such information.

While the theory and practice of insider trading laws and regulations have evolved over time, the boundary of insider trading remains blurry and becomes more so with new developments in the market. In this study, we explore a novel, previously unexplored channel through which insiders gain an informational advantage that allows them to defend against shareholder activism. By leveraging their privileged knowledge of firm fundamentals, insiders (e.g., CEOs) can more accurately assess the likelihood of trades by activists. They can then use these probabilities, which do not constitute insider information, to make informed trading decisions that help mitigate the impact of shareholder activism.

Shareholder activism, aggressively pursued by hedge funds or hedge fund-like institutional investors, has become a mainstream venue of non-control-based corporate governance (see a recent review by Brav, Jiang, and Li, 2021b). Compared with other forms

of informed trading by outsiders (such as those betting on takeover prospects or earnings surprises), activists are better positioned to camouflage their trades, except during the last ten days prior to disclosure, reflecting their ability to spread trades to time market liquidity (Collin-Dufresne and Fos, 2015). Although the insider does not have direct information indicating the arrival of the "barbarians at the gate,"[1] privileged information about her own firm's fundamentals helps her filter public information and eventually trade on that information with a distinct advantage, due to both incentives and capabilities.

First, insiders have stronger incentives than general investors to be informed about activist plans. Information about an upcoming Schedule 13D filing[2] is valuable to general investors—especially large shareholders, including insiders—because of the significantly positive average announcement return and ensuing changes in firms' operation and performance (Brav, Jiang, Partnoy, and Thomas (2008)). Because job turnover increases and compensation drops for senior executives in targeted firms, hedge fund activism often meets resistance from management.[3] Being prepared is a prerequisite for effective defense. Companies that recognize their vulnerability to activist targeting will want to detect activist moves ahead of the public, often with the help of financial advisors and other intermediaries. Second, insiders enjoy an indirect informational advantage. Although both insiders and market makers observe the same order flows and trades, insiders have more refined information about firm fundamentals, such as earnings or sales growth. This information allows insiders to gauge the potential trades motivated by fundamentals, which

[1] This term was coined in the namesake book by Burrough and Helyar (1990) in corporate raiders. More recently, media have likened hedge fund activists to a new class of barbarians at the gate. See, e.g., "The Barbarians Return to the Gate," in *Financial Times*, April 24, 2014.

[2] A 13D filing is a disclosure document required by the SEC for any investor that acquires more than 5% beneficial ownership of a company's shares, often serving as the primary announcement of hedge fund activism.

[3] According to Brav et al. (2008), activists were outright "hostile" or openly confrontational in about a quarter of cases, and target firm managers accommodated activist requests without significant resistance in fewer than 30% of cases.

allows them to filtrate activist trades.

Two institutional features are key in making insiders' monitoring of and response to activist interest feasible. First, an insider's trade based on inferred information does not violate any insider trading rule because the nonpublic information about firm fundamentals do not directly motivate trade; on the contrary, they would buy shares to counter against activists precisely when there is a lack of private positive information about firm fundamentals. Second, technological improvements have made real-time trades/orders essentially public information. In fact, the current theoretical microstructure literature commonly assumes that agents observe order flows at the same level as market makers. Insiders who wish to monitor order flows could be served by emerging market surveillance firms that specialize in analyzing electronic orders and trade books to form predictions about the motives of trades, stock price directions, and ownership changes.

In a motivating empirical diagnostic test, we show that corporate insiders engage in abnormal share purchases on days when activists trade. This coincidence is intriguing given that activist trading is not publicly observable in real time. We thus present a stylized model that underscores the mechanism. A simple economy in our model, lasting over three dates, is populated by an activist, a company insider, the market maker, and a stock picker, who speculates based on a noisy but informative signal about fundamentals. The activist can potentially increase cash flows on Date 2 by intervention and buys shares on Date 0. The order flow on Date 0 is comprised of the activist's and stock picker's demands, with the latter being imperfectly correlated with cash flows and hence also serving as noise trades. The insider, who suffers disutility under activist dominance, makes a trading decision on Date 1 after observing the order flow. Our model predicts that insider exhibits net-buying (including abstaining from selling) of shares when the probability of activist trading is high. This strategy serves as a defensive tactic, as a marginal change in ownership on either side

could be pivotal when ownership stakes are close.[4]

Our empirical findings support the predictions of the model. First, the likelihood that insider buying (selling) occurs is 13 (78) basis points higher (lower) inside the 60-day window prior to a Schedule 13D filing than outside it.[5] The difference, which is statistically significant, amounts to 15% (37%) of the normal pace of insider buying (selling). The combination of more buying and less selling leaves more shares, and hence voting and control power, in the hands of management at the dawn of an activist campaign. We further rule out the alternative hypothesis that the concurrence of activist and insider trading could be the result of activists piggybacking on insider buying as the latter might be motivated by privately-held positive information about the firm. Under the T+3 settlement rule that prevailed during most of our sample period (up to 2017),[6] change of ownership could be revealed three days after the trade. We find that insider buying is significantly higher (at the 5% level) than usual on T+3 days relative to activist trading; but there is no significant correlation between activist trading and insider trading any days earlier. Therefore, activist trades seem to be the source, while insiders trade in response.

Second, we present empirical tests on the key mechanism by which insiders are able to respond to activist trading more decisively precisely when there is an absence of upcoming positive news about the firm's performance, about which insiders are most likely to be informed ahead of the public. We find that the abnormal insider buying that we observe on the days when activist trading occurs is driven solely by the subsample that lacks positive earnings surprises (hence buy orders are less likely to be fundamental news driven).

[4] Fos and Jiang (2016) report that activist and insider blocks in proxy contests are 9.6% and 10.9%, respectively, on average.

[5] The 60-day window is dictated by the SEC rule that Schedule 13D filers are required to disclose trading during the previous 60 days.

[6] A transaction will complete the ownership record change three days after the trade. In the reverse direction, activists could potentially be informed of trades placed by insiders after just two days, given that insider trading requires disclosure within 48 hours.

This test affirmatively differentiates insider buying (and not selling) in response to activist interest from conventional insider trading based on private information on fundamentals.

Finally, we affirm that financial gains constitute a motive for insider trading ahead of activist arrival, in addition to defense of control. Not only do we confirm a common finding from existent literature on the positive abnormal return around announcement of activism (the filing of 13D), but we also show that the announcement return is significantly higher when insiders engage more in excess share purchasing and when they refrain more from selling. In other words, insiders can, at least to some extent, predict the potential value enhancement from activist intervention and make investment decisions to gain from the appreciation.

While this study's main contribution is to present and test a novel form of insider trading without insider information regarding the direct motive to trade, we also aim to achieve a better understanding of corporate strategies when facing activist attacks, a relatively understudied corner of the activism literature, as most of that literature takes the perspective of activist investors and other institutional investors as estimates of the impact on target firms. A few studies adopt the lens of the defensive side. Fos and Jiang (2016) show that CEOs in firms that are the target of proxy contests change their option exercise patterns to preserve voting power. Bourveau and Schoenfeld (2017) show how firms that are vulnerable to activist attacks increase and strategize voluntary disclosure. Fos (2018) and Gantchev et al. (2018) both show that firms start taking corrective measures after their peers have been targeted by activists. Our study differs from these earlier papers in that we model insider responses to activist plans that are not yet public and cannot be predicted from public information, presenting new evidence that a corporate defense starts before the opponents' arrival at the gate.

2. Institutional Background

2.1. Informed and insider trading around Schedule 13D filings

In the United States, Sections 16(b) and 10(b) of the Securities Exchange Act of 1934 serve as the basis for regulating insider trading. According to the current interpretation of the law, anyone who misappropriates material nonpublic information and trades while in possession of such information may be guilty of insider trading.[7] Activist investing introduces novel nuances to insider trading. The first new question is whether information about an activist's plan to target a company constitutes material, nonpublic information. On the surface, such information predicts stock returns (hence its materiality) and is not known to the public until the filing of a Schedule 13D (hence its nonpublic nature).[8] Although some observers have advocated for extending insider information to activists even before Schedule 13D filings, information about activists does not originate from the firm and is not obtained through or with any breach of trust or duty. Instead, the information is created by the activists themselves, who are outsiders when accumulating shares; moreover, the information concerns activists' plans and so is not proprietary to the firm.[9]

The second new issue, which this study exposes, is that corporate insiders may have an advantage in filtering public information with the help of their private information about firm fundamentals. Even if insiders and outside speculators observe the same trade flows, the private knowledge of fundamental information (such as earnings and sales growth) enables insiders to rule in or rule out trades motivated by fundamentals and, therefore, to better estimate the likelihood that activist interests are in play. If insiders trade (or change

[7]Where illegal insider trading is concerned, "insiders," despite the term, does not mean only corporate officials/directors and large shareholders but can include any individual who trades shares while in possession of material nonpublic information about the firm (the issuer) obtained in some direct or imputed duty of trust.

[8]Schedule 13D is an SEC form serving to disclose beneficial ownership that captures more than 5% of shares outstanding; filing is mandated within ten days after an investor crosses that threshold.

[9]See Back, Collin-Dufresne, Fos, Li, and Ljungqvist (2018) for a theoretical model for such a setting.

preexisting trading plans) because of assessed activist interests, such trades are innocent when viewed through the conventional lens of insider trading because activist interests do not constitute insider information (as discussed above). This situation is compounded by the safe harbor that allows insiders to cancel precommitted trades (e.g., via 10b-5 Plans, which allow insiders to buy and sell—usually sell—shares according to preset plans to clear themselves of insider trading liabilities), reflecting the U.S. Supreme Court's holding that there can be no liability for insider trading without an actual securities transaction. Lenkey (2019) and Fos and Jiang (2016) provide theoretical predictions and empirical evidence on the cancellation of planned trading by informed insiders. Our setting incorporates both insider trading based on non-insider information (but with better filtering of public information) and informed non-trading (i.e., insiders refrain from routine selling because of such information).

2.2. Market surveillance and insider response to activist buying: Motivating empirical pattern

Figure 1, shown below, provides motivating evidence that corporate insiders seem to trade in response to activist trading, although the latter is not public information in real time. Because Schedule 13D filing requires that the filer retrospectively disclose all transactions in the firm's securities during the sixty-day window leading to the filing, we are able to classify activist trading ex post for research purposes. By merging these data with insider trading data from Form-4 filings, we are able to juxtapose transactions from both groups. In Section 4 we describe the data sources and sample construction in greater detail, while we highlight the findings herein.

Days when Schedule 13D filers trade are associated with increased trading activity. Consistent with Collin-Dufresne and Fos (2015), we find that daily turnover rises from 0.63% in the full sample to 1.23% on these days (see Table 2 in Section 4). Although spikes

in daily turnover are not uncommon (with a standard deviation of 0.89%), about a third of this increase can be attributed to activist trading. Specifically, Schedule 13D turnover rises from 0.00% in the full sample to 0.23% on days when these filers trade.

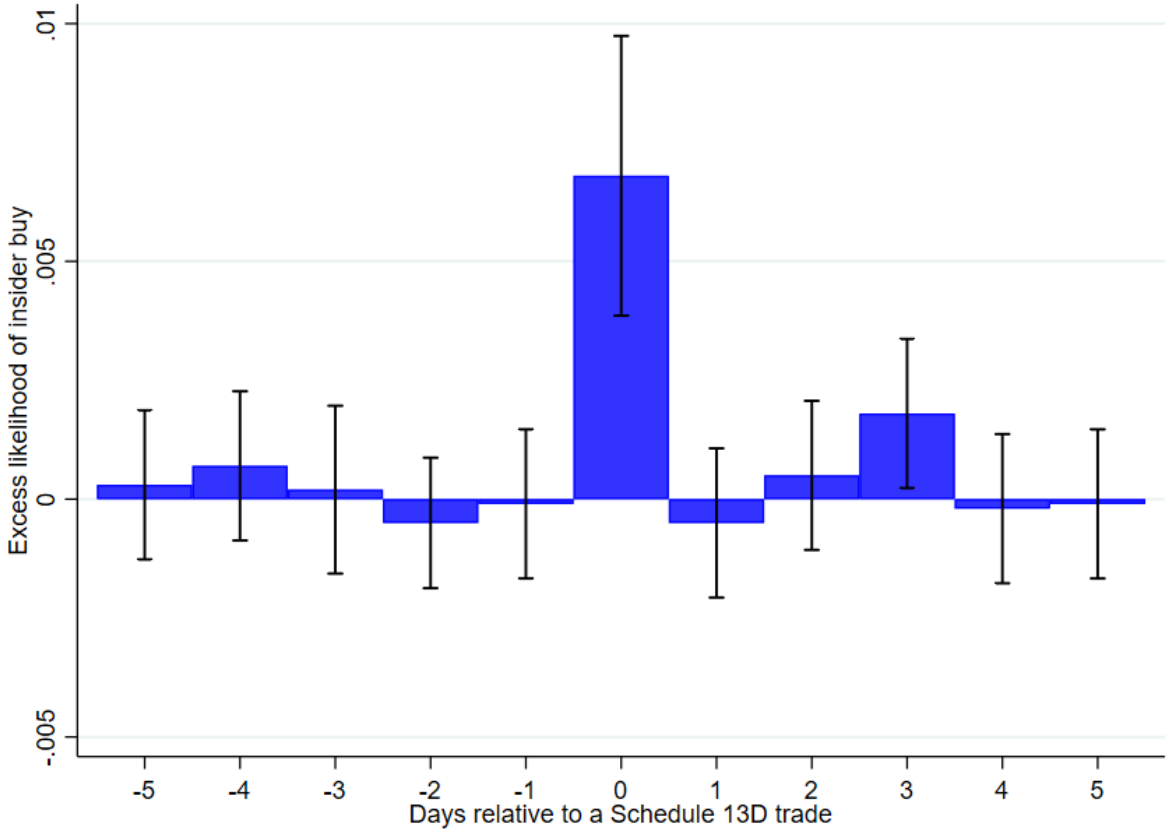

Figure 1: **Concurrence of insider and Schedule 13D trading.**

Figure 1 reveals the excess probability that an insider will buy shares in her own firm from five days prior to an activist purchase as disclosed in Schedule 13D ("Schedule 13D trading") to five days afterward. The benchmark is the unconditional average: The average daily probability that insiders buy shares in their own firms is 0.80%. There is no abnormal trading by insiders during the ten-day window, except on two of those days: The same day that the activist trades occur and three days later. On these two days, the probabilities that insider buys occur are 0.68 and 0.18 basis points higher than the normal level, both

differences being significant at the 5% level and economically meaningful relative to the unconditional average. The three-day interval also looks fortuitous as it coincides with the $T+3$ settlement that prevailed until 2017, which covers most of our sample. The pattern suggests that it is *as if* insiders are able to discern activist trades from order flows or settlements, as upcoming 13Ds are not public information before the filings.[10]

A quick response by insiders to activist interests does not require that insiders themselves monitor order flows in real time. Instead, a burgeoning industry, in the form of software or investor relations services, has emerged to provide real-time trade surveillance for trading pattern recognition to help firms respond to activism faster. Such systems, originally developed for the purpose of compliance, risk management, fraud detection, and regulatory supervision, have quickly become a toolkit for activism defense.[11] Activist buying is associated with price appreciation leading to the 13D filing date—in fact, the bulk of the abnormal return associated with Schedule 13D filing occurs during the ten-day window prior to filing (Brav et al., 2008; Collin-Dufresne and Fos, 2015). Therefore, it is rational for insiders to make same-day purchases if they wish to respond.

3. Model

3.1. Model overview

This section presents a parsimonious theoretical model that explains the economic mechanism underlying the finding in Figure 1 and generates additional testable empirical implications. The gist of the model is that insiders' informational advantage enables them to detect and respond to stock buying by activists. Our model differs from those of the

[10] Section 5.3.2 discusses possible information leakage by activists or their intermediaries, such as prime brokers.

[11] As of 2024, leading players in this market include Nasdaq IR Intelligence (which includes an "activism unit" with "surveillance analysts"), S&P Global's "Real-time visibility into the actions of activists" and a few specialized firms such as Diligent market Intelligence, FIS, and Q4.

existing literature in three ways. First, we highlight a novel source of the insider's advantage over the market maker because order flows generate valuable information for the insider that is not contained in the firm's fundamentals. Second, our model involves three investors with nested information sets. Third, the model describes how insiders fight off activist attacks using their informational advantage.

3.2. Model setup: Players, incentives, and information structure

We consider an economy with three dates, $t = 0, 1, 2$, and four types of investors: the activist (with subscript A), the insider (I), the stock picker or speculator (N), and the market maker (M). The firm, in the absence of an activist intervention, pays final dividend D_2 on date $t = 2$, where D_2 equals $D_H > 0$ with probability π_D or $D_L = 0$ with probability $1 - \pi_D$. The insider represents agents who run the firm and who enjoy the benefits of control; such agents include managers and board members. The activist can acquire shares in the firm and boost its output by bringing new skills, reducing inefficiencies, or monitoring the insiders' performance. Specifically, by acquiring the stock holding θ_A in the firm, the activist increases the firm's output by $\psi\nu\theta_A$, where ν is a random variable representing the activist's ability to increase the output that takes the values of 0 and 1 with certain probabilities, and ψ is a constant. Consequently, the firm's cash flow in the presence of activism is $D_2 + \psi\nu\theta_A$.[12] Finally, the stock picker receives an informative but noisy signal of D_2.

The type of firm is given by $s \in \{L, H\}$, which indicates whether it generates high or low dividends; at $t = 0$, this information is known only to the activist and the insider.[13] The

[12]The value creation by activists is supported by the prevailing evidence across different time periods and markets. See a survey of existing evidence and an updated analysis in Brav et al. (2021b).

[13]Activist investors intensively research potential targets. Prominent activists such as Trian Partners and Starboard Value are known for presenting in-depth reports running hundreds of pages at the launching of campaigns and for uncovering issues that even the company's managers were not aware of. In practice, insiders may have access to information that is not readily available to activists. Nevertheless, the precise

insider understands that a skilled activist can increase the firm's value by $\psi\theta_A$. However, the insider cannot determine whether such an activist is present in the market (i.e., whether $\nu = 0$ or $\nu = 1$). Therefore, the perceived improvement is random and is given by $\psi\theta_A\nu$.

We assume that the insider cannot implement the improvement herself. First, the insider may lack the necessary skills for value-enhancing actions. Boyson et al. (2022) show that the skills of activist hedge funds contribute to successful outcomes and that such skills are accumulated from previous campaigns and previous work experiences. Second, insiders can avoid shareholder-friendly actions if they entail personal costs, such as losing control benefits (Fos and Jiang, 2016). Finally, institutional constraints, such as labor negotiations (Brav et al., 2015), departmental bargaining (Vantrappen and Wirtz, 2023), and internal culture, can limit their ability to implement changes.

The market maker filters out information about D_2 and ν while the insider focuses on learning ν from the observables. We note that $\mathcal{F}_M \subset \mathcal{F}_I \subset \mathcal{F}_A$, where $\mathcal{F}_A$, $\mathcal{F}_I$, and $\mathcal{F}_M$ denote the investor information sets. The information wedge between insiders and market makers is crucial for understanding the empirical evidence in Figure 1. Without this wedge, the prices set by the market maker might not be favorable for insiders.

The joint distribution of the activist improvement ν and dividend D_2 is given by

$$\begin{aligned} \text{Prob}(\nu = 1, D_2 = D_H) &= \eta_1, \qquad \text{Prob}(\nu = 0, D_2 = D_H) &= 0, \\ \text{Prob}(\nu = 1, D_2 = D_L) &= \eta_2, \qquad \text{Prob}(\nu = 0, D_2 = D_L) &= \eta_3. \end{aligned} \tag{1}$$

Equation (1) implies that the activist can always create additional value for a "good" firm but may not be able to save a fundamentally "bad" firm. Such a structure captures a

intersection of the activists' and insiders' information sets is not crucial for our model. The pivotal point is that both activists and insiders are more informed than the market maker. Therefore, for simplicity, we assume that activists have the same level of information as insiders about the firm's fundamentals.

realistic situation, as argued by Brav et al. (2008), in which activists create value by bringing expertise and by mitigating agency problems, but cannot rescue a firm from distress due to fundamental business issues. The structure of probability $\text{Prob}(\nu, D_2)$ makes the firm fundamentals relevant for filtering out information about activist trades, and hence, endows insiders with an informational advantage over market makers.

For tractability, we assume that the activist and the insider have binary strategies. The activist only buys or abstains from trading, so $\theta_A \in \{0, \bar{\theta}\}$, which we motivate by the fact that activists acquire most of their stakes in firms within a few months prior to targeting (Brav et al., 2008; Collin-Dufresne and Fos, 2015). Moreover, we study activists who benefit from value improvement and would not short the stock. The insider either sells or stays put, so that $\theta_I \in \{-\bar{\theta}, 0\}$. The latter strategy captures the empirical regularity that insiders routinely sell but infrequently buy stocks in their own firms. This is because managers and board members receive a significant portion of their compensation in the form of shares and options and, hence, sell for the sake of liquidity and diversification.

The stock picker, N, plays the dual role of a partially informed trader and a noise trader, preventing prices and order flows from being fully revealing. Following Lambert, Ostrovsky, and Panov (2018), we assume that the orders submitted by this trader are not completely uninformative and are (imperfectly) correlated with the dividend D_2. The stock picker's trades take the full range of values, $\theta_{N,t} \in \{-\bar{\theta}, 0, \bar{\theta}\}$ on date t.[14]

[14]In practice, stock pickers may possess information that is unavailable to insiders. As a result, insiders can gain valuable insights about the fundamentals from market signals, potentially leading to better investment decisions (Chen et al., 2007). However, when it comes to detecting activism, insiders are likely to have exclusive information on signs of activist interest, such as website traffic and attendance at events like earnings calls. Moreover, the core aspect of our model that insiders have more refined information than market makers is not affected by the degree of information asymmetry between stock pickers and insiders.

The conditional probabilities of particular orders on dates $t = 0, 1$ are given by

$$\text{Prob}(\theta_{N,0} = k\bar{\theta}|D_s) = \pi_k^s, \quad \text{Prob}(\theta_{N,1} = k\bar{\theta}|D_s) = \tilde{\pi}_k^s, \tag{2}$$

where $s \in \{L, H\}$ is the firm's type, and $k \in \{-1, 0, 1\}$. To capture the idea that stock pickers possess some information about firm type $s \in \{L, H\}$, we assume that when the type is good (i.e., $s = H$) they buy more frequently than sell, so that $\pi_1^H \geq \pi_0^H \geq \pi_{-1}^H$ and $\tilde{\pi}_1^H \geq \tilde{\pi}_0^H \geq \tilde{\pi}_{-1}^H$, and vice versa when the type is bad (i.e., $s = L$). Moreover, they are more likely to buy in a good state and more likely to sell in a bad state, so that $\pi_1^H \geq \pi_1^L$ and $\pi_{-1}^L \geq \pi_{-1}^H$, and similarly, in the second period, $\tilde{\pi}_1^H \geq \tilde{\pi}_1^L$ and $\tilde{\pi}_{-1}^L \geq \tilde{\pi}_{-1}^H$. The positive correlation between stock pickers' trades and firm fundamentals gives the insider an informational advantage over the market maker regarding the presence of activism.

The market maker is risk-neutral and trades with the activist on date $t = 0$ and then with the insider on date $t = 1$ and sets prices to the expected values

$$p_1(\theta_A + \theta_{N,0}) = \mathbb{E}\Big[D_2 + \psi\nu\theta_A|\theta_A + \theta_{N,0}\Big], \tag{3}$$

$$p_2(\theta_I + \theta_{N,1}, \theta_A + \theta_{N,0}) = \mathbb{E}\Big[D_2 + \psi\nu\theta_A|\theta_I + \theta_{N,1}, \theta_A + \theta_{N,0}\Big]. \tag{4}$$

Such sequential trading allows us to model the optimal response of the insider to the activist's trading. We note that both trading dates may fall within the same calendar day.

The activist solves the following optimization at $t = 0$:

$$\max_{\theta_A \in \{0,\bar{\theta}\}} \mathbb{E}\Big[(D_2 + \psi\nu\theta_A)\theta_A - \theta_A p_1(\theta_A + \theta_{N,0})|\mathcal{F}_A\Big], \tag{5}$$

where $\mathcal{F}_A$ is the activist's information set, which includes information about D_2 and ν. We set the activist's initial stock holding to 0, as supported by empirical evidence.

The insider trades on date-0 conditional order flows. The insider also suffers a disutility from activism due to the reduction of private benefits through monitoring,[15] and solves the following optimization problem:

$$\max_{\theta_I \in \{-\bar{\theta},0\}} \mathbb{E}\left[(D_2 + \psi\nu\theta_A)\theta_I - \phi\theta_A(-\theta_I) - \theta_I p_2(\theta_I + \theta_{N,1}, \theta_A^* + \theta_{N,0})|\mathcal{F}_I\right], \tag{6}$$

where $\mathcal{F}_I$ is the insider's information set. The second term in (6), $-\phi\theta_A(-\theta_I)$, captures the disutility of the insider from activism. This disutility is greater when the activist acquires a higher stake (θ_A) and when the insider sells more shares (i.e., if $\theta_I = -\bar{\theta}$).

We note that the literature has shown that price-based signals are more informative about private information than quantity-based signals in some settings (Kacperczyk and Pagnotta, 2019). In this paper, we focus on learning from order flows for three reasons. First, in our model, prices are functions of order flows and thus do not provide additional information. Second, insiders can anticipate the order flows of stock pickers, which provides them with a specific informational advantage. Finally, activists' private information is endogenous. Their intention and action (instead of firm proprietary data) create private information. In such a scenario, Back et al. (2018) demonstrate that the relationship between informed order flows, liquidity, and prices differs from standard informed trading frameworks.[16]

Insiders, as significant shareholders themselves, benefit from the value improvement brought about by activism. Therefore, they fight mainly to retain their jobs and benefits

[15] Brav et al. (2008) show that CEO turnover rates more than double and their compensation experiences significant decreases after a firm is targeted by an activist. Fos and Jiang (2016) find that in extreme cases the insiders of firms targeted by activists exercise options out of money to boost their voting power prior to a proxy contest, providing sufficient evidence of the private benefits of control.

[16] Kacperczyk and Pagnotta (2019) also discuss the ability of financial regulators to trace abnormal behavior in stocks and options markets to insider trading, which is consistent with our argument that insiders can monitor market data by hiring specialized firms.

rather than to thwart value-enhancing plans. This balance is often achieved in their negotiations or settlements with activists (Corum, 2020). The private benefits of control and the financial gains due to value-improving activism are two distinct economic channels that induce the insider to trade in the same direction as the activist. The former factor induces the insider to hold more shares whenever there is a substantial possibility of activism, whereas the latter channel is activated when the insider enjoys an informational advantage sufficient to give rise to a gap between the asset price and the fundamental value, which allows the insider to make a financial profit.

3.3. Trading strategies and equilibrium

We start by solving the first-stage equilibrium on date $t = 0$ when the activist trades with the market maker in the presence of the stock picker. We conjecture a trading strategy of the activist, verify that it is an equilibrium strategy under certain conditions, and derive the equilibrium stock prices. We show that the activist always trades in the good state, but trades in the bad state only when $\nu = 1$. Because we focus on the second stage equilibrium, the first-stage strategies and prices are presented in the Online Appendix A.

In the second stage, starting with date $t = 1$, the insider filters out the information about θ_A using the date $t = 0$ order flow $\theta_A+\theta_{N,0}$, the fundamentals D_2, and the distribution of stock-picker demands given by equation (2). Then, the insider chooses the trading strategy θ_I that maximizes the objective function (6). In Proposition 1 below, we conjecture a trading strategy for the insider and derive the stock price implied by that strategy. We then show that the conjectured strategy is an equilibrium under some model parameters.

Proposition 1. *Consider the trading strategy of the insider, given by*

$$\theta_I^* = \begin{cases} 0, & D_2 = D_H; \\ -\bar{\theta}, & D_2 = D_L, \quad \theta_A^* + \theta_{N,0} = -\bar{\theta}; \\ -\bar{\theta}, & D_2 = D_L, \quad \theta_A^* + \theta_{N,0} = 0; \\ 0, & D_2 = D_L, \quad \theta_A^* + \theta_{N,0} = \bar{\theta}; \\ -\bar{\theta}, & D_2 = D_L, \quad \theta_A^* + \theta_{N,0} = 2\bar{\theta}. \end{cases} \tag{7}$$

The corresponding second-stage stock price $p_2(\theta_I + \theta_{N,1}, \theta_A + \theta_{N,0})$ *is given by equation* (B7) *in the Online Appendix B. Moreover, strategy* (7) *is in equilibrium if and only if conditions* (B21) *in the Online Appendix B are satisfied.*

The trading strategy (7) is conditional on the insider's private information about the fundamentals and the information learned from the order flow in period 1. The second-period price p_2 aggregates information from the order flows in both periods 1 and 2.

The highlight of the model is the following: strategy (7) shows how the insider's informational advantage regarding her own firm's fundamentals enables her to detect and optimally respond to activist trading, about which the insider has no more direct information than any other non-activists. Such a filtration manifests itself in the contingency of insider trading on the realization of the aggregate order flow even when the insider already knows that the firm's fundamentals are weak, i.e., $D_2 = D_L$. In this situation, the insider sells when $\theta_A^* + \theta_{N,0} = 0$ and does not sell when $\theta_A^* + \theta_{N,0} = \bar{\theta}$. The intuition is that the insider deduces that the activist is more likely to be present in the latter case. Knowing that the fundamentals are weak, the insider down-weights the probability that a buy order might originate with the stock picker (who has an informative

albeit noisy signal), leaving a greater chance that the positive order flow was generated by the activist (who buys in case the firm is fixable, i.e., $\nu = 1$). An activist buy in this scenario is more likely than in the scenario of zero aggregate order flow, which could reflect either the offsetting of the activist's buy order by the bearish stock picker (when the activist can improve the firm's value and the stock picker draws a negative signal) or no action by both (when the activist knows she cannot fix the firm and the stock picker did not receive a directional signal).

An important feature of the insider strategy (7) is that the insider action is nonmonotonic in the aggregate order flow. The nonmonotonicity highlights the pivotal role played by private managerial information regarding firm fundamentals, which could not be replicated by market surveillance alone (i.e., inferring corporate actions based on abnormalities in trading volume and order flow, which we control for in empirical tests).

3.4. Economic and empirical implications

We now summarize the main economic and empirical implications of our model. First, the model highlights two (related) sources of the informational advantage that insiders enjoy over market makers, the knowledge of firm fundamentals, D_2, and the ability to efficiently separate activist trades from trades by the stock picker, given by equation (2), because the latter trades are correlated with D_2, which the market maker does not observe.

Second, the model predicts that the insider does not trade in response to observed total order flows (which is public information) per se, but to activist share purchases (which are not publicly observable), as shown in Figure 1. Naturally, the order flow $\theta_A + \theta_{N,0}$ contains information about activist trading, but the insider filtering is much more refined because of her knowledge about firm dividends, D_2, as long as the stock picker's trades are

somewhat informative about the fundamentals.[17] Furthermore, in reality, activist trades remain mostly below 30% of the total daily trading volume (Collin-Dufresne and Fos, 2015) and hence the pattern revealed in Figure 1 requires the help of additional filtering. Empirically, our model thus predicts that insiders are better able to detect, and hence respond to activist trading where there is a lack of positive information about fundamentals such as earnings.

Third, the model incorporates the insider's dual motive to exploit mispricing by the uninformed market maker and to mitigate her disutility from activism. Empirically, this motive predicts that insiders are more sensitive to activist trades when additional ownership stakes are more important for control and the expected gains from activism are higher.

4. Data and Overview

4.1. Data sources

The construction of the key data sample for this study follows the methodology developed in Collin-Dufresne and Fos (2015). We start with a universe of Schedule 13D filings from the SEC EDGAR website spanning 1996-2018. We then exclude filings by corporate insiders as well as filings that result from non-market transactions (e.g., conversion of preheld securities, private placements, negotiated block transactions, and gifts of shares), and require that an investor must cross the 5% threshold by purchasing shares in the open market. Finally, we exclude cases where derivatives (such as options) count toward the 5% ownership threshold because our setup focuses on trades by activists and insiders in the public equity market. Our preliminary sample contains about 3,100

[17] Assume that the stock picker's signal is pure noise, such that the stock picker degenerates into a noise trader. Then, $\text{Prob}(\theta_{N,0} = \bar{\theta}|D_s) = \text{Prob}(\theta_{N,0} = 0|D_s) = \text{Prob}(\theta_{N,0} = -\bar{\theta}|D_s) = 1/3$. At such a limit, equation (A1) for the activist trading strategy θ_A and equation (B19) in the Online Appendix imply that, for example, $\text{Prob}(\theta_A = \bar{\theta}|D_L, \theta_A + \theta_{N,0} = x) = \text{Prob}(\theta_A = \bar{\theta}|D_L)$, where $x \in \{0, \bar{\theta}\}$, and hence the information in the order flow is redundant for predicting the probability that activist buying occurs.

Schedule 13D filings.

For each event, we have access to the usual information on the activist's identity, the filing date, the disclosure trigger date (the 5% crossing date), and the disclosed ownership stake. The key input from the 13D filings for this project is the information indicating all trades made by the filers during the 60-day period prior to filing. We are left with 2,847 Schedule 13D filings for which information regarding activist trading is disclosed. The sample corresponds to 115,841 observations (2,847 times the number of trading days during the 60-calendar-day window). For each trade disclosed in Schedule 13D, we know the date of trading (and hence we also know the dates when there is no activist trading), the number of shares in every transaction (which could be buys or sells, the great majority being buys), and the average daily price paid or received.

We then merge the manually collected data with standard databases to obtain stock- and firm-level information (from CRSP and Compustat) as well as insider trading information (from Thomson Reuters). We use purchase and sell transactions reported on Form 4 for directors (role codes CB, D, DO, H, OD, and VC) and officers (role codes AV, CEO, CFO, CI, CO, CT, EVP, O, OB, OP, OT, OS, OX, P, S, SVP, and VP).

4.2. Sample overview and summary statistics

Our Schedule 13D trading sample consists of 2,847 Schedule 13D filings with information on activist trades ("events"). Figure C2 in the Online Appendix shows the time-series distribution of events. The number of events ranges from 64 during 2004 to 185 during 2007, with an average of 124 events per year. During a typical event, Schedule 13D filers trade on 29.2% of the trading days in the 60-day window, suggesting that they trade on selective days rather than continuously. When Schedule 13D filers trade, they capture a large fraction of the trading activity. Specifically, the average traded shares are 26. 3% of the daily turnover during the 60-day window; the proportion rises to 30.1% during the last

ten days before filing. However, because activists tend to trade in a way that best conceals their actions (Collin-Dufresne and Fos, 2015), it is hard to predict when a Schedule 13D filing event occurs or on which days Schedule 13D filers trade using public information, including order flows.

We next turn our attention to Thomson Reuters data on corporate insider trading. Our sample contains 31.9 million firm-trading-day observations. The summary statistics are reported in Table 2, after Table 1, where we define all the variables. The results, reported in Panel A, indicate that the average probability that insider trading (buy or sell) occurs on a given day is 2.97%, with the majority of insider trades being sell transactions, as insiders need to cash out their equity-based compensation for liquidity and diversification. For Panel B of Table 2, we restrict the sample to days when Schedule 13D filers trade. The results indicate that the probability of insider buys is 1.22% on days when activists trade, compared to 0. 80% on an average day (Panel A); on the selling front, the probability is 1.64% on activist trading days, lower than the unconditional average of 2. 16%. Thus, descriptive statistics provide the first indication of a relationship between insider and activist trades: insiders buy to a greater extent and sell to a lesser extent on days when activists trade.

[Insert Table 1 here.]

[Insert Table 2 here.]

In Panel C of Table 2 we report summary statistics for days with insider trading. Consistent with our earlier discussion, we find that insiders are more likely to sell (73%) than to buy (27%) when trading. Daily returns are higher on days when insiders trade than in the full sample. Finally, we note that a lack of insider trades could reflect imposed restrictions. For this reason, in our empirical analysis, we control for the limitations imposed on trading by the common blackout windows, during which insiders are not

allowed to conduct discretionary trades in anticipation of upcoming releases of material information (e.g., earnings). The blackout windows for individual firms are not publicly disclosed in the filings. We therefore calibrate the upper bound and lower bound based on the survey conducted by Bettis et al. (2000). Specifically, we code [t+4,t+14] relative to quarterly disclosure as the *Free trade* window and [t-14,t+2] as the *Not free trade* window. The results reported in Panel C indicate that trading intensity is 20.4% during the *Free trade* window and 6.9% during the *Not free trade* window, indicating that insider trading restrictions affect the likelihood that insider trading occurs in an expected way.[18]

5. Empirical Tests and Results

5.1. Insider response to activist trades

5.1.1. Insider buy and buy in relation to the 60-day window prior to 13D filing

In this section, we present the main evidence on the relation between insider and activist trades. In Table 3, we present univariate results that signify abnormal insider trading prior to Schedule 13D filings. Specifically, we compare insider trades during the 60-day window prior to Schedule 13D filings with those outside the window. The 60-day window is special not only because the SEC rule requires that Schedule 13D filers disclose trading during the previous 60 days, but it is also a period during which activists amass a significant portion (over 50%) of their stakes without public knowledge. We find that the frequency of insider buy increases by 13 basis points or by 17% over the usual level. In contrast, insider selling slows by 0.77 percentage points or by 36%. Both differences are statistically significant at less than the 1% level. The combination of more buying and

[18]Insider trading still occurs during the *Not free trade* window because pre-committed trades, especially those authorized by plans that are compliant with Rule 10b5-1, are not restricted. At the same time, such preplanned transactions can be canceled and, therefore, insiders can still manage "net selling" during the restricted windows. (see Fos and Jiang, 2016; Lenkey, 2019).

less selling prior to Schedule 13D filings leaves more shares, and hence voting and control power, in the hands of management at the dawn of an activist campaign.

[Insert Table 3 here.]

Next, we present analyses in the regression framework to connect insider and activist trades while controlling for firm- and stock-level characteristics that are relevant to trading. Saturated fixed effects are deployed to subsume unobserved firm heterogeneity and market dynamics. In the first step, we compare insider trades executed during the 60-day window prior to Schedule 13D filings (which are not publicly known in real time) with those executed outside the window. The regression is as follows:

$$y_{it} = \alpha_i + \alpha_{ym} + \gamma_1 SC13D\ 60\text{-}day\ window_{it} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}, \quad (8)$$

where y_{it} is a measure of insider trading activity on day t for firm i, α_i represents firm fixed effects and α_{ym} represents the year-month fixed effect which absorbs market-wide dynamics. Among the independent variables, *SC13D 60-day window* is an indicator of the 60-day window prior to Schedule 13D filings, $Return_{it}$ is the stock return on day t for firm i, and $Turnover\ rate_{it}$ is the share turnover rate on day t for firm i. Standard errors are clustered at the firm level. Firm and monthly fixed effects absorb unobserved firm-level characteristics and market conditions at the monthly level. The results are reported in Table 4.

[Insert Table 4 here.]

When we consider insider stock purchases (columns 1 and 2) and sales (columns 3 and 4), we find that the change in the likelihood that insider trading occurs is driven by the slowing of insider selling by 0.91 percentage points (relative to the normal level of 2.16%).

That is, insiders who wish to preserve their ownership facing activists accomplish this end mainly by refraining from selling. For this reason, we empirically examine the outcome of *Insider net sales* (i.e., the difference between sells and buys) and report the results in columns 5 and 6. During the 60-day window prior to the Schedule 13D filings, insiders significantly (at the 1% level) reduce net selling by 0.83 to 0.93 percentage points below the normal level.

The slowdown of insider selling corroborates the theoretical predictions of Levit et al. (2021) that there is an equilibrium voting premium, and the empirical findings in Fos and Jiang (2016) that CEOs exercise options to a lesser extent after proxy contests are announced. Both results indicate insiders' desire to preserve their stock holdings (hence their voting rights or controlling power in general) when they face challenges from activist shareholders. Nevertheless, the two settings are critically different. The earlier papers show insider responses after public announcements of activism (proxy contests), while in this paper's setting we discover that some insiders seem to respond to activists before the latter's arrival at the gate.

Based on the previous regression's finding that the 60-day window prior to Schedule 13D filings is where the action is, the next regression zooms in on this window.

$$y_{it} = \alpha_{iym}(\text{or, } \alpha_i + \alpha_{ym}) + \gamma_1 SC13D\ trade_{it} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}, \quad (9)$$

where $t \in [-60, -1]$, and y_{it} and the two control variables are the same as in equation (8). The new key independent variable, *SC13D trade*, is an indicator of days when Schedule 13D filers trade. Importantly, the regression incorporates (firm $\times$ month) fixed effects, which absorb unobserved and time-varying (up to the monthly frequency) firm-level characteristics, as well as real-time market conditions at the monthly level. Standard errors

are clustered at the firm level. The results are reported in Table 5.

[Insert Table 5 here.]

In Table 5, the results reported in columns 1 and 2 indicate that insiders are more likely to buy on days when Schedule 13D filers trade. Specifically, the likelihood that insider buying occurs is 62-69 basis points (or about 80%) higher on days when Schedule 13D filers trade than on other days. This relationship, which is significant at the 1% level, incorporates controls for stock returns and turnover rates, as well as firm × month fixed effects. Unsurprisingly, insider net selling (as reported in columns 5-6) mostly mirrors insider buying because there is no relationship between insider selling and Schedule 13D trades—presumably the slowdown in selling can manifest itself only over a period of time and is hard to measure at daily frequency.

After documenting insiders' trading in tandem with activists' trading at the extensive margin, we quantify the relationship at the intensive margin. We repeat the analysis associated with the first two columns of Table 5 but change the dependent variable to equal the number of insider purchase of shares scaled by the outstanding shares. The estimation method switches to a tobit regression to reflect that the dependent variables are left-censored at zero. The results indicate that on days when activists trade, insiders buy an additional 0.21% to 0.24% of shares outstanding, a statistically significant and economically sizable amount given the proximity of ownership stakes between the two blocks.[19]

5.1.2. Last ten days prior to 13D filing

Prior literature shows that activist trades do not incur significant price impacts before reaching the disclosure trigger threshold of 5%, as investors can accumulate shares quietly over an extended period. However, the last ten days before the 13D filing are unique within

[19]For details, please see Online Appendix Table C1.

the 60-day period leading up to the disclosure. During the ten-day window, activists face a fixed deadline to finalize their position, often leading to accelerated buying activity. This urgency can generate upward price pressures as the activist rushes to reach their desired ownership level before the mandatory disclosure, contrasting with the relatively subdued price impact observed earlier in the accumulation phase.

For this reason, we repeat the analysis associated with Table 5 separately for the separate periods $[-60, -11]$ and $[-10, -1]$. These results are reported in Table 6. The concurrence of insider buys and activist trades remains and is significant in both samples. Unsurprisingly, the relationship is stronger in the final ten-day window, when activist footprints become easier to detect. However, the fact that the result remains robust in the earlier window supports both an insider information advantage and the competency of market surveillance technologies, as activist trades are well-camouflaged from outside market participants during this earlier period.

[Insert Table 6 here.]

The combined results reported in the last two subsections indicate that insiders seem to buy in tandem with the accumulation of shares by activists. Moreover, the likelihood of insider selling is lower during the 60-day window prior to Schedule 13D filings (relative to days outside that window). The difference in insider selling and buying results can be attributed to the fact that insider selling is bounded by zero (that is, the most an insider can do is not to sell at all) and inaction is difficult to detect at the high daily frequency given the low unconditional rates. On the other hand, insider buying is more easily detectable at high frequency. The net sell results are consistent between the daily frequency (Table 5) and the 60-day frequency (Table 4). It should be noted that the average daily return is 0.25% (significantly different from zero at 1%) on days when Schedule 13D filers buy

(while the average of other days is −0.01%). Thus, an insider who becomes informed about activist trading has the financial incentive to buy as soon as possible.

5.2. Reinforcing the relationship between activist and insider trades

5.2.1. Who leads the trade?

So far, the evidence shows that insiders and activists tend to trade on the same day during the 60 days leading to Schedule 13D filings. While certain market conditions, such as stock price changes and trading liquidity, could induce both parties to trade, the concurrence that survives when we control for such conditions (and include stock-month fixed effects) suggests that the coincidence is likely to reflect non-random factors. This finding, while intriguing, does not tell us which party leads the trade. Although we hypothesize that insiders respond to activist buying, the same evidence could also be construed as indicating that activists piggyback on insider buying, as the latter could be motivated by positive information about the firm that is known privately to insiders (e.g., Foroughi et al., 2021). To separate insider defensive buying (in response to activist trading) from activist buying that follows insiders (whose buying could be informed),[20] we need to step back and ask how information about trading by insiders or activists could be transmitted in the market place. There are potentially three sources.

The first is "tape watching," that is, virtually all equipped market participants could observe real-time order flows and try to discern unusual trading. If insiders or activists suspect that the other side is buying, they can react to the positive signal. The flow of information in either direction could produce the correlation of trades between two parties on the same day. The second source would be a record change. According to the T + 3 settlement rule that prevailed during most of our sample period (up until 2017), a

[20] Foroughi et al. (2021) provides evidence that hedge funds (not activist funds specifically) tend to trade in the same direction as insiders when insider trades are likely driven by information.

transaction finishes an ownership record change three days after the trade. If companies actively monitor their ownership changes—a common practice in activism defense that often involves intermediaries such as proxy solicitors—then they might become informed on T+3, when the records are updated. If insiders buy in response to activist trades, we could observe a significant response on T+3. Finally, insider-initiated transactions are disclosed (in Form 4) within two days. If activists buy in response to insider trades, we could observe a response on T+2.

We first evaluate possible insider responses to activist trades with the following regression:

$$Insider\ trade_{it} = \alpha_{iym} + \sum_{\tau=-5}^{5} \gamma_{1,\tau} SC13D\ trade_{it+\tau} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}, \tag{10}$$

where $SC13D\ trade_{it+\tau}$ is an indicator of τ days relative to the day when a Schedule 13D filer trades. All other variables are the same as in regression (9). We report the results in Panel A of Table 7.

The results reported in column 1 of Panel A indicate that insiders conduct abnormally high volumes of share purchases (0.68 percentage points, or 85%, above the normal level) on exactly the same day as activists. At the same time, abnormal selling was close to zero in magnitude and significance (column 2). As a result, net selling (column 3) provides essentially a negative image of buying. Activist buying is associated with price appreciation that leads to Schedule 13D filing dates; in fact, the bulk of the abnormal returns associated with Schedule 13D filings occur during the ten-day window prior to filing (Brav et al., 2008; Collin-Dufresne and Fos, 2015). Therefore, it is rational for insiders to make same-day purchases if they wish to respond. The main result remains robust if we control for more lagged returns in the regression to include $Return_i, t-1$, $Return_i, t-2$, and $Return_i, t-3$,

suggesting that insider trades are not motivated by stock returns.[21]

[Insert Table 7 here.]

An interesting additional result emerges indicating that insider buys (but not sells) are significantly higher (at the 5% level) than usual on T+3 days relative to activist trading. Thus, the evidence is consistent with the idea that insiders trade in response to activist trading. Figure 1 visualizes the relationship presented in Table 7, Panel A. It is hard to argue that the observed insider trading is not a response to activist trading given the two significant bars on day 0 and day 3 and the near-zero levels everywhere else. Because the trading relationship we uncover in Tables 5 and 7 holds at daily frequency with a lead-lag specification, it is important to ensure that the relationship is not confounded by multiday sequential trades by activists. In a sensitivity check, we confirm that the results reported in the two tables remain robust and qualitatively similar if we exclude observations of activist trades involving the same activist-firm pair within two days before or after the focal trade.[22]

In the reverse direction, we estimate the following regression.

$$SC13D\ trade_{it} = \alpha_{iym} + \sum_{\tau=-5}^{5} \gamma_{1,\tau} Insider\ trade_{it+\tau} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}, \tag{11}$$

where $Insider\ trade_{it+\tau}$ is an indicator of τ days after a day when an insider trades. All other variables are the same as in regression (9). If activists trade in response to insider trades, then we should observe abnormal activist trading two days after insider trading, when the trades are disclosed. In Panel B of Table 7, we find no significant correlation of activist trading with insider trading on any days before or after days when insiders trade,

[21] For details, please see Online Appendix Table C2.
[22] For details, please see Online Appendix Table C3.

including on $T + 2$.[23] The combined results of the dual regressions support the hypothesis that the source trades are placed by activists and insiders trade in response.

5.2.2. Restrictions on insider trading

Insiders face extensive restrictions on their trading due to their privileged access to firm information. Naturally, we should consider the limitations imposed on trading, especially the blackout windows during which insiders are not allowed to conduct discretionary trades. Based on the discussion in Section 4.2, we code [t+4,t+14] as the *Free trade* window and [t-14,t+2] as the *No free trade* window, where t is the date of the earnings announcement. We also include in the regression an indicator of the 30-day period prior to earnings announcements. Table 8 reports the results. We find that both *Free trade* and *No free trade* have the expected impact on insider trading, consistent with the findings by Kacperczyk and Pagnotta (2024) that insiders internalize legal risk in their trading. Importantly, the relationships between insider and activist trades barely change from those indicated in Table 5, suggesting that insiders respond to activist trade within the constraints of restrictions on their transactions.

[Insert Table 8 here.]

Because insiders face trading restrictions during blackout windows, we examine the possibility that activists may strategically time their trading periods to overlap with the "not free date" period for insiders. In our full sample of activist trade observations, a daily observation stands a 14.2% probability to fall into the "not free date" if the observation belongs to a 60-day period prior to 13D filing (i.e., activist situation), but only 11.2% if

[23] While the SEC rule mandates that insiders disclose their trades within 48 hours, some may choose to do so immediately—which may blur the relationship between activist trades and insider trades two days prior to fillings. In the Online Appendix Table C4, we rerun the analysis while excluding insider trades that are disclosed early. The results continue to support the absence of a relationship.

the observation is out of the 60-day period (i.e., non-activist situation). The difference is highly statistically significant. Such a difference suggests that activists do try to time their pre-13D trading on days that are inconvenient for insiders to counter-trade. On the other hand, such an offset is far from complete as the timing of activist trades is primarily driven by their game plan and market conditions especially liquidity.

5.3. Insider learning about activist trading: Channels

The body of tests presented in the previous section provides strong evidence that some insiders seem to be informed of the imminent arrival of activists ahead of public knowledge. Although our model attributes this foreknowledge to the insider's ability to separate activists' trades from speculators based on private information about firm fundamentals, we do not rule out other information channels. In this section, we provide a direct test that affirms information filtering, followed by discussion of the two most plausible alternative explanations: Leak of activist plans and estimated vulnerability to activism.

5.3.1. Insider information filtering

We start with testing the central mechanism of insider information filtering. Insiders are better able to separate unusual trades by activists from those motivated by leakage of or speculation about firm fundamentals, about which insiders have superior information. According to this hypothesis, insiders should be able to respond to activist trading more decisively precisely when there is an absence of upcoming positive news about the firm's performance. We test such a hypothesis in the context of earnings surprises. Insiders are likely to be better and earlier informed about these than the investor public.[24]

To operationalize, we construct a standard unexpected earnings (SUE) measure,

[24] Bernard et al. (2023) conduct a field study based on more than 650 US public company executives and find that the executives' predictions of the reaction of the stock price to earnings announcements are correct in two thirds of cases.

(*Actual earnings* − *Expected earnings*)/*Stock price*. *Actual earnings* is announced earnings in quarterly disclosures. *Expected earnings* is the analyst consensus forecast, defined as the average of all *non-updated* forecasts made by the analysts in the IBES database during the 90 days before the earnings announcement. When a firm is not covered by the IBES, we adopt the standard practice in the accounting literature and impute the expected earnings in quarter t using past quarterly earnings with both seasonal and drift adjustment, calculated as $EPS_{t-4} \times \Sigma_{i=1}^{4} EPS_{t-i} / \Sigma_{i=5}^{8} EPS_{t-i}$. Finally, *Stock price* is the closing price at the end of the quarter. We cross-check the summary statistics to ensure that they are consistent with those reported in the literature (e.g., Livnat and Mendenhall, 2006). The average (median) SUE in our sample is –0.06% (0.03%), with an interquartile range of –0.15% to 0.25%.

For Table 9 we repeat the exercise associated with Table 5 but decompose the subsample with analyst coverage into one with positive upcoming earnings surprises (defined as 30-day periods prior to positive earnings surprises) and one without negative or neutral news. Insiders are likely to know about positive earnings news or lack thereof prior to the earnings announcement. The results show that abnormal insider net-sell (driven by insider buy trades, as shown in Table 5) on days when activist trading occurs are driven solely by the subsample that *lacks* positive SUE. The relation between insider response to activist trade and the lack of positive fundamental news is a unique implication from information filtering. In contrast, within the subsample with positive SUE, there are no significant insider trades (buys or sells) concurrent with activists' trades. This contrast cannot be explained by alternative channels of information leakage (such as the EDGAR search activities analyzed in Flugum et al. (2023)).

[Insert Table 9 here.]

Our model and empirical tests focus primarily on firm fundamentals, particularly

earnings, as the source of the insider information advantage. However, the model's core concept also accommodates other types of information that insiders may possess, which are incremental to the information set of market makers and non-activist outside investors. For example, Eldar et al. (2022) demonstrate that hedge fund "clicks" of corporate filings predict future activism.[25] Signals of activist interest, such as website traffic and attendance at events such as earnings calls, are typically not available concurrently to market makers. This contributes to the additional advantage insiders have, allowing them to make more refined inferences about the motives behind trade flows.

5.3.2. Alternative information channels: Leak in the market and vulnerability to activism

The growing literature uncovers ways for activists' plans to be leaked in the marketplace prior to public disclosure. The source of leakage could be brokers (Barnon et al., 2019) who tip their favored investor clients or even be the activists themselves (usually after the lead activist reaches the desired ownership stake) for the purpose of building up "wolfpacks" or to trade favors with like-minded fellow investors (Wong, 2020; Flugum et al., 2023; Brav et al., 2021a).[26] In both cases, certain parties receive knowledge about upcoming activism before the stock price fully reflects the value improvement, so those parties enjoy financial gains with implied trades-of-favor: More commissioned business from the tipped clients or supportive votes from like-minded investors.

Neither of the alternative channels would predict a concurrence of trades by insiders and activists at the daily frequency. In addition, the economic reasoning in this line of research suggests that incumbent managers are the least likely to be "tipped off" with this information. Brokers incur significantly higher reputation damage or even legal liabilities if

[25] An article by Nasdaq IR Intelligence also speaks to this effect.

[26] Callen et al. (2023) present related evidence that institutional investors, in contrast to retail investors, trade on leaked information.

they leak activist plans to the plans' adversaries. Furthermore, the activists tipping off their own opponents contradicts the playbook of the barbarians.[27] To assess the possibility of the leakage of the activist plan, we conducted a sensitivity check with the subsample of hostile engagements, i.e., activist campaigns that are openly confrontational with firm management based on the classification developed in Brav et al. (2008). When the engagements are adversarial, activists are most likely to ensure that their opponents are not informed, and hence are underprepared before they choose to make the knowledge public. We find that the relationship between insider buys and activist trades during the 60-day window remains robust and significant with this subsample.[28]

In a related test, we examine the timing of the formation of ownership blocks in the targeted firms. During our sample period, only 0.04% of the 177,520 newly formed institutional investor blocks (based on 13F data) were established during the quarter just preceding a Schedule 13D filing. The frequency of new block formation during the focal time period for "tipping" activities is not statistically different from a level under the null. The results are similar if we lower the threshold from 3% to 2% or 1%.

Second, firms that are prone to activist attacks could be, with the help of an intermediary, conducting vulnerability tests from time to time and actively monitoring the formation of shareholder blocks that could turn activist. If insider knowledge about activist arrivals comes from such monitoring activities, we would expect insider responses to activist trades to be stronger when firm vulnerability is higher. We estimate vulnerability using the predicted probability that activism occurs based on a set of firm-level characteristics and performance variables following Brav et al. (2008) and sort the entire sample into

[27]Elliott Management, a prominent activist fund, is known to call the CEOs of the target firms as a "courtesy" just moments before their 13D filings. See "Doomsday Investor" by Paul Singer, https://www.newyorker.com/magazine/2018/08/27/paul-singer-doomsday-investor.

[28]For details, see Online Appendix Table C5.

high and low vulnerability subsamples at the median value. Interestingly, the insider response to activist trading is stronger in the low-vulnerability subsample, suggesting that insider knowledge of activist plans goes beyond what general vulnerability monitoring would typically reveal.[29]

5.3.3. The dual motives of insiders: Control and financial gains

Insiders have dual motives when responding to the accumulation of shares by activists. First, they seek to preserve their ownership stakes to counteract activist influence and protect their private benefits of control. This effect is well documented in the literature, which is affirmed by a new test we provide: By separately analyzing "true" corporate insiders (i.e., senior executives and board members whose careers are directly impacted by activism) from other "legal insiders" (such as outside investors holding over a 10% block), we demonstrate that only the first group exhibits counter-trades against activists.[30]

What has been overlooked in the literature is that insiders also benefit from the value improvements brought about by activist intervention, meaning their trades could be motivated by financial gains in addition to concerns over control. Insiders are likely to be aware of the potential for improvement within the firm, some of which could be related to the rents they themselves have been enjoying. This suggests that insider trading prior to Schedule 13D filings could have predictive power for returns following Schedule 13D announcements if financial motives play a role in insider trading ahead of activist disclosures.

In Table 10 we report the results of putting this prediction to the test. For this table, the sample is the cross section of all Schedule 13D filings in our full sample. The dependent variable is stock returns in excess of the market (defined as the value-weighted CRSP total

[29]For details, see Online Appendix Table C6.
[30]For details, see Online Appendix Table C7.

market return) during the $[-5, +5]$ day window, where day 0 marks the filing of a Schedule 13D. The two key independent variables are *Excess insider buy*, which indicates whether insiders engage in abnormal share purchases during the 60-day window prior to a filing of Schedule 13D, and, in contrast, *Shortfall in insider sell*, which indicates cases where insiders engage in an abnormally small number of share sales during the 60-day window prior to a filing of Schedule 13D. Finally, we report results with and without controls for firm-level characteristics.

[Insert Table 10 here.]

The results reported in column 1 of Table 10 indicate that when insiders engage in excess share purchases during the [-60, -1] day window relative to the Schedule 13D filing, the Schedule 13D announcement return is on average 1.76% higher than returns on Schedule 13D filings before which insiders did not engage in excess share purchases, and the effect is statistically significant at the 1% level. Equally informative is the insider's selling behavior. The results reported in column 2 indicate that when there is a shortfall in insider sales, the Schedule 13D announcement return is on average 0.97% lower than the returns on Schedule 13D filings before which there was no shortfall in insider sales, and the effect is statistically significant at the 5% level.

Note that about 70% of insider trading involves selling, as insiders such as executives and directors need to dispose of their shares acquired as compensation to achieve liquidity and diversification. Hence, any slowdown in selling is isomorphic to buying, as they both reflect a desire to accumulate more shares. To this point, Fos and Jiang (2016) document that CEOs significantly slow share sales from option exercises when faced with proxy contests. This duality also emerges in our setting: when anticipating a Schedule 13D filing with a strong positive market reaction, insiders buy more *and* sell less during the 60-day window, allowing them to ride the market response to activism more profitably, in

addition to strengthening their own ownership stakes as well as their bargaining and voting power vis-a-vis the activists at the gate.

The results reported in column 4 indicate that the Schedule 13D announcement return is higher when activists accumulate a larger number of shares during the 60-day window. Specifically, the announcement returns are 0.17% percentage points higher when activists accumulate an additional 1% of shares outstanding. Finally, the results reported in column 5 indicate that our main findings hold when we include firm-level characteristics in the regression.

The fact that insiders are able to predict, and hence are knowledgeable about gains from activist intervention begs the questions as to why insiders have not implemented actions to improve firm values themselves. Three factors are at play. First, insiders may lack the skill to implement the specific value-enhancing actions. Boyson et al. (2022) show that the skills of activist hedge funds contribute to successful outcomes and that such skills are accumulated from previous campaigns, as well as their own work experience as investment bankers, private equity investors, and restructuring specialists. Such skills are usually not common among corporate executives. Second, insiders may knowingly avoid actions that increase shareholder value because such actions impose personal cost, such as loss of private benefit of control (Fos and Jiang, 2016). Finally, insiders may face institutional constraints to make aggressive changes. Such constraints include bargaining with labor (Brav et al., 2015), and balancing winning with losing departments from the proposed changes (Vantrappen and Wirtz, 2023). Internal culture also plays a role. For example, directors admit that they are willing to sacrifice shareholder value to avoid controversy (Edmans et al., 2024).

We acknowledge that insiders sometimes make improvements that deter activism. This is confirmed by both academic studies (e.g. Fos, 2018; Gantchev et al., 2018),

as well as the practice of "self-assessment" and "preemptive activism" as popular advice provided by advisors to corporations on activist situations. The strategy involves companies proactively evaluating their operations and strategies as an activist investor could, with the aim of identifying potential weaknesses or opportunities for improvement.[31] The continued emphasis on this strategy by a leading advisory until the current date suggests that it remains challenging for insiders to effectively implement these measures. On the other hand, insiders who successfully engage in pre-emptive activism would have escaped our sample of activism cases.

6. Conclusion

We show empirically and theoretically that corporate insiders are better equipped to detect activist trading than outsider investors prior to Schedule 13D filings. While the existing literature shows that insiders have incentives to detect activist trading because they recognize their vulnerability to activist targeting and resort to various defensive tactics (from poison pills to campaigning), this paper is the first to provide a novel channel, both theoretically and empirically, through which insiders can learn about and act on activist trading. Our key insight is that, though both insiders and outsiders observe the same order flows and trades, insiders have more refined information filtration to isolate trades potentially generated by activist interests from those motivated by leakage of or speculation about firm fundamentals, such as earnings in upcoming quarters. This paper focuses on interactions between corporate insiders and activist investors, but the implications apply to general settings in which insiders obtain an informational advantage via better filtering of public information so that they are able to conduct informed trading that is not based

[31] This approach was summarized in the BCG Report in 2021. See "To Defeat an Activist Investor, Think Like One".

directly on insider information.

In addition to shareholder activism, our paper expands the rich literature in economics and finance that investigates how valuable information can be extracted from prices and order flows (Kyle, 1985, 1989; Rochet and Vila, 1994). Our analysis incorporates a new layer of trading between market makers and activists and examines how insiders can learn about outside trades. Finally, the paper showcases a "feedback effect" (e.g., Chen et al. (2007); survey by Bond et al. (2012)) in which company insiders benefit from the information obtained from market signals. Specifically, in our model, the insider, despite being more informed than the outsiders overall, can still learn from the stock market in critical ways about the opportunities for external intervention.

References

Amihud, Y., 2002. Illiquidity and stock returns: Cross-section and time-series effects. Journal of Financial Markets 5 (1), 31–56.

Back, K., Collin-Dufresne, P., Fos, V., Li, T., Ljungqvist, A., 2018. Activism, strategic trading, and liquidity. Econometrica 86, 1431–1643.

Barnon, A., Di Maggio, M., Franzoni, F., Landier, A., 2019. Brokers and order flow leakage: Evidence from fire sales. The Journal of Finance 74 (6), 2707–2749.

Bernard, D., Juliani, E. M., Lawrence, A., 2023. Can executives predict how firm news maps to stock price? a field study at the onset of covid-19. Review of Accounting Studies, 1–42. URL https://api.semanticscholar.org/CorpusID:261038300

Bettis, J., Coles, J., Lemmon, M., 2000. Corporate policies restricting trading by insiders. Journal of Financial Economics 57 (2), 191–220.

Bhattacharya, U., Daouk, H., 2002. The world price of insider trading. The Journal of Finance 57 (1), 75–108.

Bond, P., Edmans, A., Goldstein, I., 2012. The real effects of financial markets. Annual Review of Financial Economics 4, 339–360.

Bourveau, T., Schoenfeld, J., 2017. Shareholder activism and voluntary disclosure. Review of Accounting Studies 22 (3), 1307–1339.

Boyson, N. M., Ma, L., Mooradian, R. M., 2022. How does past experience impact hedge fund activism? Journal of Financial and Quantitative Analysis 57 (4), 1279–1312.

Brav, A., Dasgupta, A., Mathews, R., 2021a. Wolf pack activism. Management Science 68 (8), 5557–5568.

Brav, A., Jiang, W., Kim, H., 2015. The real effects of hedge fund activism: Productivity, asset allocation, and labor outcomes. Review of Financial Studies 28 (10), 2723–2769.

Brav, A., Jiang, W., Li, R., 2021b. Governance by persuasion: Hedge fund activism and market-based shareholder influence. Oxford Research Encyclopedia of Economics and Finance forthcoming.

Brav, A., Jiang, W., Partnoy, F., Thomas, R., 2008. Hedge fund activism, corporate governance, and firm performance. Journal of Finance 63 (4), 1729–1775.

Burrough, B., Helyar, J., 1990. Barbarians at the gate. New York: Harper & Row.

Callen, J., Kaniel, R., Segal, D., 2023. Filing speed, information leakage, and price formation. Review of Accounting Studies 28, 1618–1656.

Chen, Q., Goldstein, I., Jiang, W., 2007. Price informativeness and investment sensitivity to stock price. The Review of Financial Studies 20 (3), 619–650.

Collin-Dufresne, P., Fos, V., 2015. Do prices reveal the presense of informed trading? The Journal of Finance 70 (4), 1555–1582.

Corum, A. A., 2020. Activist settlements. Available at SSRN 3082886.

Edmans, A., Gosling, T., Jenter, D., 2024. CEO compensation: Evidence from the field, working paper.

Eldar, O., Kirmse, T., Wittry, M., 2022. The rise of anti-activist poison pills, working paper.

Flugum, R., Lee, C., Souther, M. E., 2023. Shining a light in a dark corner: Does edgar search activity reveal the strategically leaked plans of activist investors? Journal of Financial and Quantitative Analysis 58 (7), 2820–2851.

Foroughi, P., Rui, Y., Parwada, J., Shen, J., 2021. Hedge funds are on the ball when insiders trade, working paper.

Fos, V., 2018. The disciplinary effects of proxy contests. Management Science 63 (3), 655–671.

Fos, V., Jiang, W., 2016. Out-of-the-money CEOs: Private control premium and option exercises. The Review of Financial Studies 29 (6), 1549–1585.

Gantchev, N., Gredil, O. R., Jotikasthira, C., 2018. Governance under the gun: Spillover effects of hedge fund activism. Review of Finance 23 (6), 1031–1068.

Kacperczyk, M., Pagnotta, E. S., 2019. Chasing private information. The Review of Financial Studies 32 (12), 4997–5047.

Kacperczyk, M., Pagnotta, E. S., 2024. Legal risk and insider trading. The Journal of Finance 79 (1), 305–355.

Kyle, A. S., 1985. Continuous auctions and insider trading. Econometrica 53, 1315–1335.

Kyle, A. S., 1989. Informed speculation with imperfect competition. Review of Economic Studies 56, 317–356.

Lambert, N. S., Ostrovsky, M., Panov, M., 2018. Strategic trading in informationally complex environments. Econometrica 86 (4), 1119–1157.

Lenkey, S. L., 2019. Cancellable insider trading plans: An analysis of SEC rule 10b5-1. The Review of Financial Studies 32 (12), 4947–4996.

Levit, D., Malenko, N., Maug, E. G., 2021. The voting premium. European Corporate Governance Institute–Finance Working Paper (720).

Livnat, J., Mendenhall, R. R., 2006. Comparing the post–earnings announcement drift for surprises calculated from analyst and time series forecasts. Journal of Accounting Research 44 (1), 177–205.

Rochet, J.-C., Vila, J.-L., 1994. Insider trading without normality. Review of Economic Studies 61, 131–152.

Vantrappen, H., Wirtz, F., 2023. CEOs can make (or break) an organization redesign. MIT Sloan Management Review (Fall 2023 Issue).

Wong, Y. T. F., 2020. Wolves at the door: A closer look at hedge fund activism. Management Science 66 (6), 2347–2371.

Table 1: **Variable Definitions.**

Variable	Definition
Insider trade	Equals one on days when an insider trades and zero otherwise.
Insider buy	Equals one on days when an insider purchases shares and zero otherwise.
Excess insider buy	Equals one if the average of *Insider buy* during the 60-day window is higher than the average of *Insider buy* during the same calendar window one year prior to a Schedule 13D filing.
Insider sell	Equals one on days when an insider sells shares and zero otherwise.
Shortfall in insider sell	Equals one if the average of insider sales during the 60-day window is lower than the average of insider sales during the same calendar window one year prior to a Schedule 13D filing.
Net insider sell	Equals one (minus one) on days when an insider sells (buys) shares and zero otherwise.
SC13D 60-day window	Equals one during the 60-day window prior to a Schedule 13D filing and zero otherwise.
SC13D trade	Equals one on days when a Schedule 13D filer trades and zero otherwise.
SC13D turnover	The ratio of the number of shares traded by a Schedule 13D filer to the number of shares outstanding.
SC13D turnover during SC13D 60-day window	The sum of *SC13D turnover* during the 60-day window prior to a Schedule 13D filing.
Daily returns	Daily stock returns from CRSP.
Daily turnover	The ratio of daily trading volume to the number of shares outstanding.
Pre-SUE month	Equals one during the 30-day window prior to an earnings announcement and zero otherwise.
Free trade	Equals one during the [t+4,t+14] window around an earnings announcement and zero otherwise.
Not free trade	Equals one during the [t-14,t+2] window around an earnings announcement and zero otherwise.
Market cap	Market capitalization in $ millions.
Firm age	Number of years since the stock's first appearance on CRSP.
Q	The ratio of the market value of assets to the book value of assets.
Previous year stock return	The arithmetic mean of the preceding calendar year's monthly returns.
Sales growth	Annual sales growth over the calendar year.
Amihud illiquidity	The average of all the calendar year's daily statistics: 1000*sqrt(abs(ret)/(abs(prc)*vol)).
Analyst	Number of IBES analysts covering the stock.

Table 2: **Summary statistics.** This table reports summary statistics. Panel A reports summary statistics for the full sample. Panel B reports summary statistics for the subsample of trading days when Schedule 13D filers trade. Panel C reports summary statistics for the subsample of trading days when insiders trade. All variables are defined in Table 1.

Variable	N	Mean	STD	p1	p25	p50	p75	p99
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Full sample								
Insider trade	31,899,356	2.97%	16.98%	0.00%	0.00%	0.00%	0.00%	100.00%
Insider buy	31,899,356	0.80%	8.92%	0.00%	0.00%	0.00%	0.00%	0.00%
Insider sell	31,899,356	2.16%	14.55%	0.00%	0.00%	0.00%	0.00%	100.00%
Insider net sell	31,899,356	1.36%	17.16%	0.00%	0.00%	0.00%	0.00%	100.00%
SC13D 60-day window	31,899,356	0.36%	6.02%	0.00%	0.00%	0.00%	0.00%	0.00%
SC13D trade	31,899,356	0.12%	3.43%	0.00%	0.00%	0.00%	0.00%	0.00%
SC13D turnover	31,899,356	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
Daily returns	31,363,966	0.04%	3.30%	-10.86%	-1.28%	0.00%	1.23%	12.60%
Daily turnover	31,371,402	0.63%	0.89%	0.00%	0.11%	0.32%	0.75%	5.54%
Pre-SUE month	31,899,356	19.36%	39.51%	0.00%	0.00%	0.00%	0.00%	100.00%
Free trade	31,899,356	7.13%	25.73%	0.00%	0.00%	0.00%	0.00%	100.00%
Not free trade	31,899,356	11.18%	31.51%	0.00%	0.00%	0.00%	0.00%	100.00%
Panel B: Days when Schedule 13D filers trade								
Insider trade	37,513	2.86%	16.68%	0.00%	0.00%	0.00%	0.00%	100.00%
Insider buy	37,513	1.22%	10.96%	0.00%	0.00%	0.00%	0.00%	100.00%
Insider sell	37,513	1.64%	12.69%	0.00%	0.00%	0.00%	0.00%	100.00%
Insider net sell	37,513	0.42%	16.88%	-100.00%	0.00%	0.00%	0.00%	100.00%
SC13D turnover	37,513	0.23%	0.34%	0.00%	0.03%	0.10%	0.26%	1.51%
Daily returns	37,495	0.24%	3.30%	-10.42%	-0.97%	0.00%	1.17%	12.60%
Daily turnover	37,495	1.23%	1.42%	0.02%	0.29%	0.68%	1.53%	5.54%
Pre SUE month	37,513	23.82%	42.60%	0.00%	0.00%	0.00%	0.00%	100.00%
Free trade	37,513	9.44%	29.25%	0.00%	0.00%	0.00%	0.00%	100.00%
Not free trade	37,513	14.17%	34.88%	0.00%	0.00%	0.00%	0.00%	100.00%
Panel C: Days when insiders trade								
Insider buy	947,758	26.97%	44.38%	0.00%	0.00%	0.00%	100.00%	100.00%
Insider sell	947,758	72.79%	44.50%	0.00%	0.00%	100.00%	100.00%	100.00%
SC13D 60-day window	947,758	0.28%	5.32%	0.00%	0.00%	0.00%	0.00%	0.00%
SC13D trade	947,758	0.11%	3.36%	0.00%	0.00%	0.00%	0.00%	0.00%
SC13D turnover	947,758	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%
Daily returns	942,533	0.32%	3.29%	-9.87%	-1.11%	0.11%	1.57%	12.60%
Daily turnover	943,790	0.94%	1.10%	0.01%	0.26%	0.58%	1.15%	5.54%
Pre SUE month	947,758	11.28%	31.64%	0.00%	0.00%	0.00%	0.00%	100.00%
Free trade	947,758	20.36%	40.27%	0.00%	0.00%	0.00%	0.00%	100.00%
Not free trade	947,758	6.91%	25.37%	0.00%	0.00%	0.00%	0.00%	100.00%

Table 3: **Insider trading prior to Schedule 13D filing: Univariate analyses.** Panel A reports the average likelihood of insider buys, insider sells, and the average of insider net sells. The unit of observation is firm-trading day. In Panel B, we compare these likelihoods during the 60-day window prior to a Schedule 13D filing and trading days outside this window.

Transaction type:	Insider buy (1)	Insider sell (2)	Insider net sell (3)
Panel A			
Average	0.80%	2.16%	1.36%
N	31,899,356	31,899,356	31,899,356
Panel B			
SC13D 60-day window	0.93%	1.39%	0.46%
N	115,841	115,841	115,841
Outside SC13D 60-day window	0.80%	2.17%	1.36%
N	31,783,515	31,783,515	31,783,515
difference	0.12%	-0.78%	-0.90%
t-statistic	4.17	-22.49	-20.13

Table 4: **Insider trading prior to Schedule 13D filings: Regression analyses.** The table reports estimates of regression (8): $y_{it} = \alpha_i + \alpha_{ym} + \gamma_1 SC13D\ 60\text{-}day\ window_{it} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}$, where y_{it} is a measure of insider trading activity on day t for firm i, α_i is firm fixed effects, α_{ym} is year-month fixed effects, *SC13D 60-day window* is an indicator of the 60-day window prior to Schedule 13D filings, $Return_{it}$ is stock returns on day t for firm i, and $Turnover\ rate_{it}$ is the share turnover rate on day t for firm i. The sample covers all firm-trading day observations during 1996-2018. All variables are defined in Table 1. Standard errors are reported in brackets and are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
SC13D 60-day window	0.0006	0.0002	-0.0077***	-0.0091***	-0.0083***	-0.0093***
	[0.0005]	[0.0005]	[0.0008]	[0.0008]	[0.0010]	[0.0010]
Return		0.0070***		0.0529***		0.0459***
		[0.0009]		[0.0015]		[0.0018]
Turnover rate		0.2182***		0.6866***		0.4684***
		[0.0058]		[0.0174]		[0.0184]
R^2	0.017	0.018	0.045	0.046	0.039	0.039
N	31,899,356	31,363,930	31,899,356	31,363,930	31,899,356	31,363,930
Fixed effects:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: **Concurrence of insider and activist trades: 60-day window prior to Schedule 13D.** The table reports estimates of regression (9): $y_{it} = \alpha_i + \alpha_{ym} + \alpha_{iym} + \gamma_1 SC13D\ trade_{it} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}$, where y_{it} is a measure of insider trading activity on day t for firm i, α_i is firm fixed effects, α_{ym} is year-month fixed effects, α_{iym} is firm-year-month fixed effects, *SC13D trade* is an indicator of days when Schedule 13D filers trade, $Return_{it}$ is stock returns on day t for firm i, and $Turnover\ rate_{it}$ is the share turnover rate on day t for firm i. The sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
SC13D trade	0.0062***	0.0069***	0.0004	0.0002	-0.0057***	-0.0066***
	[0.0014]	[0.0016]	[0.0011]	[0.0012]	[0.0018]	[0.0020]
Return	0.0165	0.0130	0.0248**	0.0214*	0.0083	0.0086
	[0.0110]	[0.0106]	[0.0115]	[0.0113]	[0.0162]	[0.0157]
Turnover rate	0.2868***	0.2167***	0.4135***	0.4476***	0.1267*	0.2299***
	[0.0411]	[0.0430]	[0.0625]	[0.0661]	[0.0757]	[0.0802]
R^2	0.098	0.193	0.132	0.228	0.119	0.213
N	115,712	115,499	115,712	115,499	115,712	115,459
Fixed effects:						
Firm	Yes	No	Yes	No	Yes	No
Year-Month	Yes	No	Yes	No	Yes	No
Firm x Year-month	No	Yes	No	Yes	No	Yes

Table 6: **Concurrence of insider and activist trades: Decomposing 60-day window.** The table repeats the analysis in Table 5 for two subperiods. In Panel A, the sample covers all firm-trading day observations during the [t-60,t-11] window prior to Schedule 13D filings. In Panel B, the sample covers all firm-trading day observations during the [t-10,t-1] window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: [t-60,t-11] window prior to Schedule 13D filings						
SC13D trade	0.0053***	0.0063***	-0.0006	-0.0007	-0.0059***	-0.0069***
	[0.0015]	[0.0016]	[0.0012]	[0.0014]	[0.0019]	[0.0021]
Return	0.0095	0.0109	0.0203	0.0171	0.0109	0.0062
	[0.0110]	[0.0112]	[0.0126]	[0.0126]	[0.0170]	[0.0171]
Turnover rate	0.3085***	0.2495***	0.3794***	0.4138***	0.0709	0.1643*
	[0.0463]	[0.0483]	[0.0670]	[0.0733]	[0.0830]	[0.0892]
R^2	0.103	0.186	0.143	0.23	0.127	0.211
N	96,587	96,191	96,587	96,191	96,587	96,191
Panel B: [t-10,t-1] window prior to Schedule 13D filings						
SC13D trade	0.0104***	0.0118***	0.0018	0.0005	-0.0086**	-0.0113**
	[0.0031]	[0.0034]	[0.0025]	[0.0027]	[0.0040]	[0.0044]
Return	0.0338	0.0194	0.0459*	0.0438	0.0121	0.0245
	[0.0321]	[0.0328]	[0.0270]	[0.0274]	[0.0414]	[0.0423]
Turnover rate	0.0909	0.0489	0.5344***	0.6215***	0.4436***	0.5726***
	[0.1008]	[0.1040]	[0.1252]	[0.1369]	[0.1635]	[0.1736]
R^2	0.296	0.349	0.354	0.386	0.326	0.371
N	19,121	18,849	19,121	18,849	19,121	18,849
Fixed effects:						
Firm	Yes	No	Yes	No	Yes	No
Year-Month	Yes	No	Yes	No	Yes	No
Firm x Year-month	No	Yes	No	Yes	No	Yes

Table 7: **The dynamic relationship between insider and Schedule 13D trading.** Panel A reports estimates of regression (10): $y_{it} = \alpha_{iym} + \sum_{\tau=-5}^{5} \gamma_{1,\tau} SC13D\ trade_{it+\tau} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}$, where $SC13D\ trade_{it+\tau}$ is an indicator of τ days after a day when a Schedule 13D filer trades. All other variables are as in table 5. Panel B reports estimates of regression (11): $SC13D\ trade_{it} = \alpha_{iym} + \sum_{\tau=-5}^{5} \gamma_{1,\tau} Insider\ trade_{it+\tau} + \gamma_2 Return_{it} + \gamma_3 Turnover\ rate_{it} + \varepsilon_{it}$, where $Insider\ trade_{it+\tau}$ is an indicator of τ days after a day when an insider trades. All other variables are as in Panel A. The sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A

Dependent variable:	Insider buy (1)	Insider sell (2)	Insider net sell (3)
SC13D trade (t-5)	0.0003	-0.0008	-0.0011
	[0.0008]	[0.0010]	[0.0012]
SC13D trade (t-4)	0.0007	-0.0013	-0.0021*
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t-3)	0.0002	-0.0001	-0.0004
	[0.0009]	[0.0009]	[0.0013]
SC13D trade (t-2)	-0.0005	-0.0004	0.0001
	[0.0007]	[0.0009]	[0.0012]
SC13D trade (t-1)	-0.0001	0.0013	0.0015
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t)	0.0068***	0.0003	-0.0064***
	[0.0015]	[0.0011]	[0.0019]
SC13D trade (t+1)	-0.0005	-0.0018*	-0.0012
	[0.0009]	[0.0009]	[0.0013]
SC13D trade (t+2)	0.0005	-0.0006	-0.0013
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t+3)	0.0018**	0.0005	-0.0012
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t+4)	-0.0002	-0.0002	0.0000
	[0.0008]	[0.0010]	[0.0013]
SC13D trade (t+5)	-0.0001	0.0003	0.0004
	[0.0008]	[0.0010]	[0.0013]
Return	0.0124	0.0211*	0.0089
	[0.0106]	[0.0114]	[0.0157]
Turnover rate	0.2204***	0.4578***	0.2365***
	[0.0435]	[0.0668]	[0.0810]
R^2	0.191	0.228	0.212
N	115,110	115,110	115,110
Fixed effects:			
Firm-Year-Month	Yes	Yes	Yes

(Table continues...)

Table 7: continued

Panel B

Dependent variable:	SC13 trade
	(1)
Insider trade day (t-5)	0.0030
	[0.0088]
Insider trade day (t-4)	0.0001
	[0.0085]
Insider trade day (t-3)	0.0130
	[0.0084]
Insider trade day (t-2)	0.0029
	[0.0087]
Insider trade day (t-1)	-0.0006
	[0.0093]
Insider trade day (t)	0.0475***
	[0.0128]
Insider trade day (t+1)	0.0131
	[0.0091]
Insider trade day (t+2)	0.0023
	[0.0087]
Insider trade day (t+3)	0.0083
	[0.0094]
Insider trade day (t+4)	0.0042
	[0.0087]
Insider trade day (t+5)	0.0029
	[0.0092]
Return	0.1356***
	[0.0413]
Turnover rate	11.0502***
	[0.2301]
R^2	0.427
N	115,070
Fixed effects:	
Firm-Year-Month	Yes

Table 8: **Insider trading restrictions.** This table repeats the analysis from Table 5 while adding the following control variables to the regression: *Free trade*, which equals one during the [t+4,t+14] window around an earnings announcement and zero otherwise, *No free trade*, which equals one during the [t-14,t+2] window around an earnings announcement and zero otherwise, and *Pre-SUE month*, which equals one during the 30-day window prior to an earnings announcement and zero otherwise. Sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
SC13D trade	0.0066***	0.0065***	0.0000	-0.0001	-0.0066***	-0.0066***
	[0.0016]	[0.0015]	[0.0012]	[0.0012]	[0.0020]	[0.0020]
Return	0.0123	0.0128	0.0206*	0.0210*	0.0082	0.0083
	[0.0106]	[0.0106]	[0.0113]	[0.0113]	[0.0157]	[0.0157]
Turnover rate	0.2249***	0.2108***	0.4588***	0.4434***	0.2339***	0.2326***
	[0.0431]	[0.0427]	[0.0660]	[0.0662]	[0.0802]	[0.0802]
Free trade	0.0156***	0.0143***	0.0083***	0.0068**	-0.0074*	-0.0075*
	[0.0027]	[0.0027]	[0.0028]	[0.0028]	[0.0040]	[0.0040]
Not free date	-0.0058***	-0.0045***	-0.0101***	-0.0087***	-0.0043*	-0.0042*
	[0.0015]	[0.0014]	[0.0020]	[0.0020]	[0.0024]	[0.0024]
Pre-SUE month		-0.0061***		-0.0067***		-0.0006
		[0.0016]		[0.0017]		[0.0023]
R^2	0.195	0.195	0.229	0.229	0.213	0.213
N	115,459	115,459	115,459	115,459	115,459	115,459
Fixed effects:						
Firm-Year-Month	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: **The role of upcoming earnings surprises.** This table repeats the analyses of *Insider net sell* in Table 5 while considering the effect of insider trading restrictions during the 30-day period prior to earnings announcements. All variables are defined in Table 1. In column 1, the sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. In column 2, we restrict the sample to firms with analyst coverage. In column 3, the sample is limited to 30-day periods prior to positive earnings surprises during the 60-day window prior to Schedule 13D filings. *Earnings surprise* is the difference between the actual EPS and the median EPS forecast in the one-quarter period before the earnings announcement (source: IBES). In column 4, the sample excludes 30-day periods prior to positive earnings surprises during the 60-day window prior to Schedule 13D filings. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Sample:	Full sample (1)	Analyst coverage sample (2)	Positive SUE sample (3)	Drop positive SUE sample (4)
SC13D trade	-0.0066***	-0.0047*	-0.0009	-0.0084**
	[0.0020]	[0.0025]	[0.0033]	[0.0038]
Return	0.0086	0.0297	0.018	0.0385
	[0.0157]	[0.0244]	[0.0304]	[0.0372]
Turnover rate	0.2299***	0.4072***	0.3947*	0.4240**
	[0.0802]	[0.1492]	[0.2094]	[0.2150]
R^2	0.213	0.285	0.267	0.299
N	115,459	27,977	13,614	14,361
Fixed effects:				
Firm-Year-Month	Yes	Yes	Yes	Yes

Table 10: **Activism CARs and changes in insider ownership.** This table reports estimates of cross-sectional regressions, where the dependent variable is the stock return in excess of the market (defined as the value-weighted CRSP total market return) during the $[-5, +5]$ day window, where day 0 marks the filing of a Schedule 13D. All variables are defined in Table 1. Firm characteristics are measured at the end of the fiscal year that precedes a Schedule 13D filing. Heteroscedasticity-robust standard errors are reported in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: Schedule 13D filing CAR	(1)	(2)	(3)	(4)	(5)
Excess insider buy	0.0176***		0.0171***	0.0180***	0.0142**
	[0.0054]		[0.0054]	[0.0054]	[0.0057]
Shortfall in insider sell		0.0097**	0.0092**	0.0083**	0.0076*
		[0.0038]	[0.0038]	[0.0038]	[0.0042]
SC13D turnover during SC13D 60-day window				0.1723**	0.1822**
				[0.0746]	[0.0826]
Market cap (lagged log)					-0.0011
					[0.0020]
Firm age (lagged)					-0.0002
					[0.0001]
Q (lagged)					-0.0014
					[0.0010]
Previous year stock return					-0.2118***
					[0.0560]
Sales growth (lagged)					0.0022
					[0.0035]
Amihud illiquidity (lagged)					-0.0013
					[0.0054]
Analyst (lagged)					0.0001
					[0.0003]
Constant	0.0254***	0.0252***	0.0232***	0.0179***	0.0328***
	[0.0018]	[0.0020]	[0.0020]	[0.0028]	[0.0114]
R^2	0.004	0.002	0.006	0.009	0.021
N	2,823	2,823	2,823	2,823	2,449

Online Appendix for the paper

"Insider Trading Ahead of Barbarians' Arrival at the Gate: Insider Trading on Non-Insider Information"

Appendix A. First-stage equilibrium

We here solve the first-stage equilibrium on date $t = 0$ when the activist trades with the market maker in the presence of the stock picker. We conjecture a trading strategy on the part of the activist, verify that it is an equilibrium strategy under certain conditions, and then derive the equilibrium stock prices. Proposition A1 summarizes our results.

Proposition A1. *Consider the following trading strategy of the activist on date $t = 0$:*

$$\theta_A^*(D_2, \nu) = \begin{cases} \bar{\theta}, & \text{if} \quad D_2 = D_H; \\ \bar{\theta}, & \text{if} \quad D_2 = D_L, \ \nu = 1; \\ 0, & \text{if} \quad D_2 = D_L, \ \nu = 0. \end{cases} \tag{A1}$$

Then, for sufficiently large $\bar{\theta} \geq d$, where d is given by equation (B6) in Appendix B, θ_A^* is the unique equilibrium strategy, and the equilibrium first-stage price $p_1(x)$ is given by

$$p_1(x) = \begin{cases} 0, & x = -\bar{\theta}; \\ D_H \dfrac{\pi_{-1}^H \pi_D}{\pi_{-1}^H \pi_D + \pi_{-1}^L \eta_2 + \pi_0^L \eta_3} + \psi\bar{\theta} \dfrac{\pi_{-1}^H \eta_1 + \pi_{-1}^L \eta_2}{\pi_{-1}^H \eta_1 + \pi_{-1}^L \eta_2 + \pi_0^L \eta_3}, & x = 0; \\ D_H \dfrac{\pi_0^H \pi_D}{\pi_0^H \pi_D + \pi_0^L \eta_2 + \pi_1^L \eta_3} + \psi\bar{\theta} \dfrac{\pi_0^H \eta_1 + \pi_0^L \eta_2}{\pi_0^H \eta_1 + \pi_0^L \eta_2 + \pi_1^L \eta_3}, & x = \bar{\theta}; \\ D_H \dfrac{\pi_1^H \eta_1}{\pi_1^H \eta_1 + \pi_1^L \eta_2} + \psi\bar{\theta}, & x = 2\bar{\theta}. \end{cases} \tag{A2}$$

While the proof is provided in Appendix B, we outline the intuition herein. First, the activist's trading strategy is straightforward. Because she can always increase the value of a firm in the good state (see condition (1)), the activist always buys when the firm type is $s = H$. If the firm is of type $s = L$, though, the activist can improve the firm only at some probability and consequently buys only when she can implement the improvement ($\nu = 1$).[32]

[32]From the equation for the first-stage price (A2), we observe that the probabilities π_k can be chosen such that there is one-to-one mapping between prices and order flows $\theta_A + \theta_{N,0}$ on date $t = 0$. Hence, the insider can observe $\theta_A + \theta_{N,0}$ via her observation of the stock price.

Second, we note that the realization of the order flow $\theta_A + \theta_{N,0} = -\bar{\theta}$ is fully revealing. Specifically, given the structure of the trading strategy (A1), the latter order flow implies that $\theta_A = 0$ and hence $s = L$. Consequently, the market maker infers that $\theta_A = 0$ and $D_2 = 0$ and sets the price to zero. Similarly, the order flow $\theta_A + \theta_{N,0} = 2\bar{\theta}$ reveals that $\theta_A = \bar{\theta}$. There is, however, some uncertainty remaining about whether the firm is of type L or H. When $\theta_A + \theta_{N,0} \in \{0, \bar{\theta}\}$, the market maker needs to make an inference about both the firm type and the activist's trading by taking into account the structure of θ_A in (A1) and the conditional probabilities (2) describing the stock picker's trading activity. Consequently, even zero order flow $\theta_A + \theta_{N,0} = 0$ causes the insider and the market maker to update their information sets.

Appendix B. Proofs

Proof of Proposition A1. There are 4 possible combinations $\theta_A^* + \theta_{N,0} \in \{-\bar{\theta}, 0, \bar{\theta}, 2\bar{\theta}\}$. Assume that the trading strategy of the activist is given by equation (A1). Note that two states $\theta_A^* + \theta_{N,0} \in \{-\bar{\theta}, 2\bar{\theta}\}$ are fully revealing because $\theta_A^* \in \{0, \bar{\theta}\}$. In particular, $\theta_A^* + \theta_{N,0} = -\bar{\theta}$ implies that $\theta_A^* = 0$, and so from equation (A1) we observe that the latter trading strategy implies $\nu = 0$. Consequently, the market maker sets the price equal to $p(-\bar{\theta}) = D_L = 0$. Similarly, $\theta_A^* + \theta_{N,0} = 2\bar{\theta}$ implies that $\theta_A^* = \bar{\theta}$ and $\theta_{N,0}^* = \bar{\theta}$, and hence

$$P(2\bar{\theta}) = \mathbb{E}[D_2 = D_H | \theta_A^* = \bar{\theta}, \theta_{N,0}^* = \bar{\theta}] + \psi\bar{\theta} = \frac{D_H \pi_1^H \eta_1}{\pi_1^H \eta_1 + \pi_1^L \eta_2} + \psi\bar{\theta}.$$

Suppose $\theta_A^* + \theta_{N,0} = 0$. We note the following conditional probabilities.

$$\begin{aligned} \text{Prob}(\theta_{N,0} = -\bar{\theta} | \theta_A = \bar{\theta}) &= \text{Prob}(\theta_{N,0} = -\bar{\theta} | \theta_A = \bar{\theta}, D_H) \, \text{Prob}(D_H | \theta_A = \bar{\theta}) \\ &\quad + \text{Prob}(\theta_{N,0} = -\bar{\theta} | \theta_A = \bar{\theta}, D_L) \, \text{Prob}(D_L | \theta_A = \bar{\theta}) \\ &= \frac{\pi_{-1}^H \eta_1 + \pi_{-1}^L \eta_2}{\eta_1 + \eta_2}. \end{aligned} \tag{B1}$$

This is because $\text{Prob}(D_H | \theta_A = \bar{\theta}) = \text{Prob}(D_H | \nu = 1)$ since $\theta_A = \bar{\theta}$ is observed if and only if $\nu = 1$. Then, from equation (1) we observe that $\text{Prob}(D_H | \nu = 1) = \eta_2/(\eta_1 + \eta_2)$. $\text{Prob}(D_H | \theta_A = \bar{\theta})$ is computed in a

similar way. The next probability is computed similarly:

$$\begin{aligned}\text{Prob}(\theta_{N,0}=0|\theta_A=0) &= \text{Prob}(\theta_{N,0}=0|\theta_A=0,D_H)\underbrace{\text{Prob}(D_H|\theta_A=0)}_{=0} \\ &\quad + \text{Prob}(\theta_{N,0}=0|\theta_A=0,D_L)\underbrace{\text{Prob}(D_L|\theta_A=0)}_{=1} \\ &= 0+\pi_0^L=\pi_0^L.\end{aligned} \tag{B2}$$

Using the latter two equations, (B1) and (B2), we obtain:

$$\begin{aligned}\text{Prob}(\theta_A=\bar{\theta}|\theta_A+\theta_{N,0}=0) &= \frac{\text{Prob}(\theta_A+\theta_{N,0}=0|\theta_A=\bar{\theta})\,\text{Prob}(\theta_A=\bar{\theta})}{\text{Prob}(\theta_A+\theta_{N,0}=0)} \\ &= \frac{\text{Prob}(\theta_A+\theta_{N,0}=0|\theta_A=\bar{\theta})\,\text{Prob}(\theta_A=\bar{\theta})}{\text{Prob}(\theta_{N,0}=-\bar{\theta}|\theta_A=\bar{\theta})\,\text{Prob}(\theta_A=\bar{\theta})+\text{Prob}(\theta_{N,0}=0|\theta_A=0)\,\text{Prob}(\theta_A=0)} \\ &= \frac{\pi_{-1}^H\eta_1+\pi_{-1}^L\eta_2}{\pi_{-1}^H\eta_1+\pi_{-1}^L\eta_2+\pi_0^L\eta_3}.\end{aligned}$$

Here we use $\text{Prob}(\theta_A+\theta_{N,0}=0|\theta_A=\bar{\theta})=\text{Prob}(\theta_{N,0}=-\bar{\theta}|\theta_A=\bar{\theta})$ and then use equation (B1).

Next, we compute the conditional probability $\text{Prob}(D_H|\theta_A+\theta_{N,0}=0)$. Before that, we compute two auxiliary probabilities below.

$$\text{Prob}(\theta_{N,0}=-\bar{\theta}|D_H)=\pi_{-1}^H. \tag{B3}$$

$$\begin{aligned}\text{Prob}(\theta_A+\theta_{N,0}=0|D_L) &= \text{Prob}(\theta_A+\theta_{N,0}=0|D_L,\theta_A=\bar{\theta})\,\text{Prob}(\theta_A=\bar{\theta}|D_L) \\ &\quad + \text{Prob}(\theta_A+\theta_{N,0}=0|D_L,\theta_A=0)\,\text{Prob}(\theta_A=0|D_L) \\ &= \frac{\pi_{-1}^L\eta_2+\pi_0^L\eta_3}{\eta_2+\eta_3}.\end{aligned} \tag{B4}$$

Using the latter two equations, (B3) and (B4), we obtain:

$$\begin{aligned}\text{Prob}(D_H|\theta_A+\theta_{N,0}=0) &= \frac{\text{Prob}(\theta_A+\theta_{N,0}=0|D_H)\pi_D}{\text{Prob}(\theta_A+\theta_{N,0}=0|D_H)\pi_D+\text{Prob}(\theta_A+\theta_{N,0}=0|D_L)(1-\pi_D)} \\ &= \frac{\pi_{-1}^H\pi_D}{\pi_{-1}^H\pi_D+\pi_{-1}^L\eta_2+\pi_0^L\eta_3}.\end{aligned}$$

Using probabilities $\text{Prob}(D_H|\theta_A+\theta_{N,0}=0)$ and $\text{Prob}(\theta_A=\bar{\theta}|\theta_A+\theta_{N,0}=0)$, we obtain:

$$\begin{aligned} P(0) &= D_H\,\text{Prob}(D_H|\theta_A+\theta_{N,0}=0)+\psi\bar{\theta}\,\text{Prob}(\theta_A=\bar{\theta}|\theta_A+\theta_{N,0}=0) \\ &= \frac{D_H\pi_{-1}^H\pi_D}{\pi_{-1}^H\pi_D+\pi_{-1}^L\eta_2+\pi_0^L\eta_3}+\psi\bar{\theta}\frac{\pi_{-1}^H\eta_1+\pi_{-1}^L\eta_2}{\pi_{-1}^H\eta_1+\pi_{-1}^L\eta_2+\pi_0^L\eta_3}. \end{aligned}$$

Price $P(\bar{\theta})$ can be found analogously.

Now we derive constant d such that the trading strategy is the equilibrium when $\bar{\theta}\geq d$. Rewrite the price function (A2) as follows

$$p_1(x)=\begin{cases} 0, & x=-\bar{\theta}; \\ D_Ha_0+\psi\bar{\theta}b_0, & x=0 \\ D_Ha_1+\psi\bar{\theta}b_1, & x=\bar{\theta} \\ D_Ha_2+\psi\bar{\theta}b_2, & x=2\bar{\theta}, \end{cases} \tag{B5}$$

where a_k and b_k are coefficients that match the corresponding coefficients in (A2). Substituting (B5) and (A1) into the activist's optimization problem (5), we obtain the following conditions for (A1) to be the equilibrium strategy.

$$\begin{aligned} D_H+\psi\bar{\theta} &\geq D_H\mathbb{E}^H[a]+\psi\bar{\theta}\mathbb{E}^H[b] \quad (\theta_A=\bar{\theta}\text{ is optimal when } D_2=D_H), \\ \psi\bar{\theta} &\geq D_H\mathbb{E}^L[a]+\psi\bar{\theta}\mathbb{E}^L[b] \quad (\theta_A=\bar{\theta}\text{ is optimal when } D_2=D_L,\nu=1), \\ 0 &\leq D_H\mathbb{E}^L[a]+\psi\bar{\theta}\mathbb{E}^L[b] \quad (\theta_A=0\text{ is optimal when } D_2=D_L,\nu=0), \end{aligned}$$

where $\mathbb{E}^s[x]=\pi_{-1}^sx_0+\pi_0^sx_1+\pi_1^sx_2$, $s=H,L$. The first and third of the above inequalities are always satisfied because $0<a_k\leq 1$ and $0<b_k\leq 1$. From the second inequality we obtain that

$$\bar{\theta}\geq dD_H,\quad d=\frac{\mathbb{E}^L[a]}{1-\mathbb{E}^L[b]}\frac{1}{\psi}. \quad \blacksquare \tag{B6}$$

Proof of Proposition 1. Take trading strategies (A1) and (7) as given. Then we show that the price

function $p_2(x,y)$ is given by:

$$p_2(x,y) =$$

$$\begin{cases} 0, & y=-\bar{\theta}; \\ \psi\bar{\theta}\frac{\pi_{-1}^L\eta_2}{\pi_{-1}^L\eta_2+\pi_0^L\eta_3}, & x=-2\bar{\theta}, y=0; \\ D_H\frac{\tilde{\pi}_i^H\pi_{-1}^H\pi_D}{\tilde{\pi}_i^H\pi_{-1}^H\pi_D+\tilde{\pi}_{i+1}^L(\pi_{-1}^L\eta_2+\pi_0^L\eta_3)} & \\ \quad +\psi\bar{\theta}\frac{\pi_{-1}^H\eta_1+\pi_{-1}^L\eta_2}{\pi_{-1}^H\eta_1+\pi_{-1}^L\eta_2+\pi_0^L\eta_3}\frac{\tilde{\pi}_i^Hv_0+\tilde{\pi}_{i+1}^L(1-v_0)}{\tilde{\pi}_i^Hu_0+\tilde{\pi}_{i+1}^L(1-u_0)}, & x=i\bar{\theta}, y=0; \\ D_H+\psi\bar{\theta}, & x=\bar{\theta}, y=0; \\ \psi\bar{\theta}\frac{\pi_0^L\eta_2}{\pi_0^L\eta_2+\pi_1^L\eta_3}, & x=-2\bar{\theta}, y=\bar{\theta}; \\ D_H\frac{\tilde{\pi}_j^H\pi_0^H\pi_D}{\tilde{\pi}_j^H\pi_0^H\pi_D+\tilde{\pi}_j^L(\pi_0^L\eta_2+\pi_1^L\eta_3)} & \\ \quad +\psi\bar{\theta}\frac{\pi_0^H\eta_1+\pi_0^L\eta_2}{\pi_0^H\eta_1+\pi_0^L\eta_2+\pi_1^L\eta_3}\frac{\tilde{\pi}_j^Hv_1+\tilde{\pi}_j^L(1-v_1)}{\tilde{\pi}_j^Hu_1+\tilde{\pi}_j^L(1-u_1)}, & x=j\bar{\theta}, y=\bar{\theta}; \\ \psi\bar{\theta}, & x=-2\bar{\theta}, y=2\bar{\theta}; \\ D_H\frac{\tilde{\pi}_i^H\pi_1^H\pi_D}{\tilde{\pi}_i^H\pi_1^H\pi_D+\tilde{\pi}_{i+1}^L\pi_1^L\eta_2}+\psi\bar{\theta}, & x=i\bar{\theta}, y=2\bar{\theta}, \\ D_H+\psi\bar{\theta}, & x=\bar{\theta}, y=2\bar{\theta}, \end{cases} \tag{B7}$$

where $i=-1,0$ and $j=-1,0,1$, and u_k and v_k are given by:

$$u_k = \text{Prob}(D_H|\theta_A+\theta_{N,0}=k\bar{\theta}) = \frac{\pi_{k-1}^H\pi_D}{\pi_{k-1}^H\pi_D+\pi_{k-1}^L\eta_2+\pi_k^L\eta_3}, \tag{B8}$$

$$v_k = \text{Prob}(D_H|\theta_A+\theta_{N,0}=k\bar{\theta},\theta_A=\bar{\theta}) = \frac{\pi_{k-1}^H\pi_D}{\pi_{k-1}^H\pi_D+\pi_{k-1}^L\eta_2}, \tag{B9}$$

for $k=0,1$. Equations (B8) and (B9) can be derived using Bayes' theorem, and the derivation is omitted for brevity.

We provide the derivation of the price function only for the case $x=i\bar{\theta}$, $y=0$. All other cases can be studied analogously. First we need to find two conditional probabilities: $\text{Prob}(D_2=D_H|\theta_I+\theta_{N,1}=$

$i\bar{\theta}, \theta_A + \theta_{N,0} = 0)$ and $\text{Prob}(\theta_A = \bar{\theta}|\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0)$.

$$\text{Prob}(D_2 = D_H|\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0) =$$

$$\frac{\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0|D_H)\pi_D}{\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0|D_H)\pi_D + \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0|D_L)(1-\pi_D)} \tag{B10}$$

$$\frac{\text{Prob}(\theta_{N,1} = i\bar{\theta}, \theta_{N,0} = -\bar{\theta}|D_H)\pi_D}{\text{Prob}(\theta_{N,1} = i\bar{\theta}, \theta_{N,0} = -\bar{\theta}|D_H)\pi_D + \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0|D_L)(1-\pi_D)},$$

where the third line of derivations uses the fact that $\theta_I = 0$ and $\theta_A = \bar{\theta}$ when $D_2 = D_H$. In the latter equation,

$$\text{Prob}(\theta_{N,1} = i\bar{\theta}, \theta_{N,0} = -\bar{\theta}|D_H) = \tilde{\pi}_i^H \pi_{-1}^H, \tag{B11}$$

because $\theta_{N,0}$ and $\theta_{N,1}$ are uncorrelated conditional on D_H. Moreover,

$$\begin{aligned}
&\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0|D_L) \\
&= \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0, D_L)\,\text{Prob}(\theta_A + \theta_{N,0} = 0|D_L) \\
&= \text{Prob}(\theta_{N,1} = (i+1)\bar{\theta}|D_L)\Big[\text{Prob}(\theta_A + \theta_{N,0} = 0|\nu = 1, D_L)\,\text{Prob}(\nu = 1|D_L) + \\
&\quad \text{Prob}(\theta_A + \theta_{N,0} = 0|\nu = 0, D_L)\,\text{Prob}(\nu = 0|D_L)\Big] \\
&= \tilde{\pi}_{i+1}^L \Big[\pi_{-1}^L \frac{\eta_2}{\eta_2 + \eta_3} + \pi_0^L \frac{\eta_3}{\eta_2 + \eta_3}\Big].
\end{aligned} \tag{B12}$$

Here we used the fact that $\theta_I = -\bar{\theta}$ when $D_2 = D_L$ and $\theta_A + \theta_{N,0} = 0$.

Substituting (B11) and (B12) into (B10), we obtain

$$\text{Prob}(D_2 = D_H|\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0) = \frac{\tilde{\pi}_i^H \pi_{-1}^H \pi_D}{\tilde{\pi}_i^H \pi_{-1}^H \pi_D + \tilde{\pi}_{i+1}^L (\pi_{-1}^L \eta_2 + \pi_0^L \eta_3)}. \tag{B13}$$

Next, we compute the conditional probability

$$\begin{aligned}
&\text{Prob}(\theta_A = \bar{\theta}|\theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0) \\
&= \frac{\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta})\,\text{Prob}(\theta_A = \bar{\theta}|\theta_A + \theta_{N,0} = 0)}{\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0)}.
\end{aligned} \tag{B14}$$

In the above equation (B14),

$$\begin{aligned}
&\text{Prob}(\theta_A = \bar{\theta}|\theta_A + \theta_{N,0} = 0) \\
&= \frac{\text{Prob}(\theta_A + \theta_{N,0} = 0|\theta_A = \bar{\theta})\,\text{Prob}(\theta_A = \bar{\theta})}{\text{Prob}(\theta_{N,0} = -\bar{\theta}|\theta_A = \bar{\theta})\,\text{Prob}(\theta_A = \bar{\theta}) + \text{Prob}(\theta_{N,0} = 0|\theta_A = 0)\,\text{Prob}(\theta_A = 0)} \\
&= \frac{\pi^H_{-1}\eta_1 + \pi^L_{-1}\eta_2}{\pi^H_{-1}\eta_1 + \pi^L_{-1}\eta_2 + \pi^L_0\eta_3}.
\end{aligned} \tag{B15}$$

$$\begin{aligned}
&\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}) = \\
&= \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}, D_H)\,\text{Prob}(D_H|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}) \\
&+ \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}, D_L)\,\text{Prob}(D_L|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}) \\
&= \text{Prob}(\theta_{N,1} = i\bar{\theta}|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}, D_H)\,\text{Prob}(D_H|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}) \\
&+ \text{Prob}(\theta_{N,1} = (i+1)\bar{\theta}|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}, D_L)\,\text{Prob}(D_L|\theta_A + \theta_{N,0} = 0, \theta_A = \bar{\theta}) \\
&= \tilde{\pi}^H_i v_0 + \tilde{\pi}^L_{i+1}(1 - v_0),
\end{aligned} \tag{B16}$$

where v_0 is given by equation (B9). The last equation again uses the fact that D_H and D_L provide most

complete information needed to compute $\theta_{N,1}$. No other variable provides additional information.

$$\begin{aligned}
&\text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta} | \theta_A + \theta_{N,0} = 0) = \\
&= \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta} | \theta_A + \theta_{N,0} = 0, D_H) \, \text{Prob}(D_H | \theta_A + \theta_{N,0} = 0) \\
&+ \text{Prob}(\theta_I + \theta_{N,1} = i\bar{\theta} | \theta_A + \theta_{N,0} = 0, D_L) \, \text{Prob}(D_L | \theta_A + \theta_{N,0} = 0) \\
&= \text{Prob}(\theta_{N,1} = i\bar{\theta} | \theta_A + \theta_{N,0} = 0, D_H) \, \text{Prob}(D_H | \theta_A + \theta_{N,0} = 0) \\
&+ \text{Prob}(\theta_{N,1} = (i+1)\bar{\theta} | \theta_A + \theta_{N,0} = 0, D_L) \, \text{Prob}(D_L | \theta_A + \theta_{N,0} = 0) \\
&= \tilde{\pi}_i^H u_0 + \tilde{\pi}_{i+1}^L (1 - u_0),
\end{aligned} \tag{B17}$$

where u_0 is given by equation (B8).

Substituting probabilities (B15)–(B17) into (B14), we obtain:

$$\begin{aligned}
&\text{Prob}(\theta_A = \bar{\theta} | \theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0) = \\
&\frac{\pi_{-1}^H \eta_1 + \pi_{-1}^L \eta_2}{\pi_{-1}^H \eta_1 + \pi_{-1}^L \eta_2 + \pi_0^L \eta_3} \frac{\tilde{\pi}_i^H v_0 + \tilde{\pi}_{i+1}^L (1 - v_0)}{\tilde{\pi}_i^H u_0 + \tilde{\pi}_{i+1}^L (1 - u_0)}.
\end{aligned} \tag{B18}$$

The price is given by

$$P(i\bar{\theta}, 0) = \mathbb{E}[D_2 | \theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0)] + \psi\bar{\theta}\mathbb{E}[\theta_A | \theta_I + \theta_{N,1} = i\bar{\theta}, \theta_A + \theta_{N,0} = 0)].$$

Substituting (B13) and (B18) into the above equation, we obtain the third line of the price function (B7). Other cases are considered analogously.

Finding $\hat{\theta}_{\mathbf{A}} = \mathbb{E}[\theta_{\mathbf{A}}^* | \mathbf{D_2}, \theta_{\mathbf{A}}^* + \theta_{\mathbf{N.0}}]$. Solving the optimization problem of the insider also requires the knowledge of $\widehat{\theta}_A = \mathbb{E}[\theta_A | D_2, \theta_A + \theta_{N,0}]$, which is the insider's expectation of the activist's optimal strategy. From equation (A1) for θ_A it can be easily observed that $\mathbb{E}[\theta_A | D_H] = \bar{\theta}$, $\mathbb{E}[\theta_A | D_L, 2\bar{\theta}] = \bar{\theta}$, $\mathbb{E}[\theta_A | D_L, -\bar{\theta}] = 0$. It remains to compute $\mathbb{E}[\theta_A | D_L, \theta_A + \theta_{N,0} = 0]$ and $\mathbb{E}[\theta_A | D_L, \theta_A + \theta_{N,0} = \bar{\theta}]$. We show how to calculate

the first of these expectations, and the second can be computed analogously.

$$\begin{aligned}
&\text{Prob}(\theta_A = \bar{\theta}|D_L, \theta_A + \theta_{N,0} = 0) = \\
&\frac{\text{Prob}(\theta_A + \theta_{N,0} = 0|D_L, \theta_A = \bar{\theta})\,\text{Prob}(\theta_A = \bar{\theta}|D_L)}{\text{Prob}(\theta_A + \theta_{N,0} = 0|D_L, \theta_A = \bar{\theta})\,\text{Prob}(\theta_A = \bar{\theta}|D_L) + \text{Prob}(\theta_A + \theta_{N,0} = 0|D_L, \theta_A = 0)\,\text{Prob}(\theta_A = 0|D_L)} \\
&= \frac{\text{Prob}(\theta_{N,0} = -\bar{\theta}|D_L)\,\text{Prob}(\theta_A = \bar{\theta}|D_L)}{\text{Prob}(\theta_{N,0} = -\bar{\theta}|D_L)\,\text{Prob}(\theta_A = \bar{\theta}|D_L) + \text{Prob}(\theta_{N,0} = 0|D_L)\,\text{Prob}(\theta_A = 0|D_L)} \\
&= \frac{\pi^L_{-1}\eta_2}{\pi^L_{-1}\eta_2 + \pi^L_0\eta_3}.
\end{aligned} \tag{B19}$$

Consequently,

$$\mathbb{E}[\theta_A|D_L, \theta_A + \theta_{N,0} = 0] = \bar{\theta}\frac{\pi^L_{-1}\eta_2}{\pi^L_{-1}\eta_2 + \pi^L_0\eta_3}.$$

Summarizing all cases, when $D_2 = D_H$ then $\hat{\theta}_A = \bar{\theta}$ and when $D_2 = D_L$

$$\widehat{\theta}_A(x) = \begin{cases} 0, & D_2 = D_L,\ \theta_A + \theta_{N,0} = -\bar{\theta}; \\ \bar{\theta}\dfrac{\pi^L_{-1}\eta_2}{\pi^L_{-1}\eta_2 + \pi^L_0\eta_3}, & D_2 = D_L,\ \theta_A + \theta_{N,0} = 0; \\ \bar{\theta}\dfrac{\pi^L_0\eta_2}{\pi^L_0\eta_2 + \pi^L_1\eta_3} & D_2 = D_L,\ \theta_A + \theta_{N,0} = \bar{\theta}; \\ \bar{\theta} & D_2 = D_L,\ \theta_A + \theta_{N,0} = 2\bar{\theta}. \end{cases}, \tag{B20}$$

where $x \in \{-\bar{\theta}, 0, \bar{\theta}, 2\bar{\theta}\}$.

Conditions for equilibrium. Next we derive the condition under which (7) is an equilibrium strategy. Let $\theta^*_A + \theta_{N,0} = x$. The insider's utility is zero when $\theta_I = 0$ and $(D_2 + (\psi + \phi)\widehat{\theta}_A - p_2(-2\bar{\theta}, x)\pi^k_{-1} - p_2(-\bar{\theta}, x)\pi^k_0 - p_2(0, x)\pi^k_1)(-\bar{\theta})$ when $\theta^*_I = -\bar{\theta}$, where $k = L$ or $k = H$ depending on the type of the firm. We also note that price (B7) can be represented as $p_2 = a_{ij}D_H + b_{ij}\psi\bar{\theta}$, where index $i = -1, 0, 1, 2$ corresponds to $\theta^*_A + \theta_{N,0} \in \{-\bar{\theta}, 0, \bar{\theta}, 2\bar{\theta}\}$ and $j = -2, -1, 0, 1$ corresponds to $\theta^*_I + \theta_{N,1} \in \{-2\bar{\theta}, -\bar{\theta}, 0, \bar{\theta}\}$.

First we check under what conditions $\theta_I = 0$ is equilibrium if $D_2 = D_H$. The insider's utility of not

selling exceeds the utility of selling if and only if

$$0 \geq (D_2 + (\psi + \phi)\widehat{\theta}_A - p_2(-2\bar{\theta}, x)\tilde{\pi}^H_{-1} - p_2(-\bar{\theta}, x)\tilde{\pi}^H_0 - p_2(0, x)\tilde{\pi}^H_1)(-\bar{\theta}).$$

From the price, (B7), it can be easily observed that in its representation $p_2 = a_{ij}D_H + b_{ij}\psi\bar{\theta}$, the parameters are such that $0 \leq a_{ij} \leq 1$ and $0 \leq b_{ij} \leq 1$. Moreover, when $D_2 = D_H$ we have $\hat{\theta}_A = \bar{\theta}$ because the activist always invests. Hence, the above inequality is satisfied when $\phi \geq 0$.

Next, suppose that $D_2 = D_L$ and $\theta^*_A + \theta_{N,0} = x$. When $x = -\bar{\theta}$ the equilibrium is fully revealing, so that $\theta^*_A = 0$ and $D_2 = D_L$ are known to the market maker. Consequently, the market maker sets the price equal to zero. The insider is then indifferent between selling or not selling, and hence our strategy is consistent with equilibrium. For other values of x, the strategy (7) is in equilibrium if and only if the following conditions are satisfied:

$$\begin{aligned}
&(\psi + \phi)\hat{\theta}_A(0) - p_2(-2\bar{\theta}, 0)\tilde{\pi}^L_{-1} - p_2(-\bar{\theta}, 0)\tilde{\pi}^L_0 - p_2(0, 0)\tilde{\pi}^L_1 \leq 0,\\
&(\psi + \phi)\hat{\theta}_A(\bar{\theta}) - p_2(-2\bar{\theta}, \bar{\theta})\tilde{\pi}^L_{-1} - p_2(-\bar{\theta}, \bar{\theta})\tilde{\pi}^L_0 - p_2(0, \bar{\theta})\tilde{\pi}^L_1 \geq 0,\\
&(\psi + \phi)\hat{\theta}_A(2\bar{\theta}) - p_2(-2\bar{\theta}, 2\bar{\theta})\tilde{\pi}^L_{-1} - p_2(-\bar{\theta}, 2\bar{\theta})\tilde{\pi}^L_0 - p_2(0, 2\bar{\theta})\tilde{\pi}^L_1 \leq 0. \quad \blacksquare
\end{aligned} \tag{B21}$$

B1. Discussion of fully revealing order flows

If the order flow is $\theta^*_A + \theta_{N,0} = -\bar{\theta}$, then the equilibrium is fully revealing. Both the insider and the market maker infer that $\theta^*_A = 0$. Further, the market maker learns with certainty that $s = L$, because $\theta^*_A = 0$ is possible only for the bad type of firm, as can be seen from the activist's strategy, (A1). Consequently, the fundamental value and the price are equal to zero, $p_2 = D_2 + \psi\widehat{\theta}_A = 0$, where $\widehat{\theta}_A$ represents the insider's best estimate of the activist's strategy. In this case, the insider is indifferent between keeping shares or selling because the price is fair. For modelling simplicity, we assume that the insider sells when she is indifferent with respect to trading profits as a result of her motivation to diversify her portfolio, which is not formally modeled in our set-up. The selling motive in this situation can also be attributed to the general desire among investors to avoid the (unmodelled) costs of carrying on with a bad firm.

Finally, when the insider and the market maker observe $\theta^*_A + \theta_{N,0} = 2\bar{\theta}$ and the type is $s = L$, they can both infer that $\theta^*_A = \bar{\theta}$, but they nevertheless valuate the firm differently. The market maker, who does

not know the true state of the firm, would set the price to $\mathbb{E}[D_2|\mathcal{F}_M]+\psi\bar{\theta}$. On the other hand, the insider's valuation is $D_L + \psi\bar{\theta} < \mathbb{E}[D_2|\mathcal{F}_M] + \psi\bar{\theta}$, because she knows that the firm's type is L. Consequently, the firm is overvalued from the insider's point of view, and the insider therefore prefers to sell in this case, despite the activist's buying. We observe that the market maker overvalues the fundamental value D_2 but prices the additional value $\psi\bar{\theta}$ created by the activist correctly. Consequently, by selling, the insider profits from the mispriced fundamental value D_2 and is fairly compensated for the additional value $\psi\bar{\theta}$.[33]

Admittedly, the fully revealing cases in the model arise as a result of our tractability-related restriction that trading strategies take only two values for both the activist (who can stay put or buy) and the insider (who can stay put or sell). Although the parameterization is motivated by institutional features and empirical regularities in the insider trading and activism setting, we acknowledge that the fully revealing states are unlikely to arise in a more general setting with a full range of trading strategies. Lemma A1 below shows formally that the fully revealing order flow $\theta_A^* + \theta_{N,0} = 2\bar{\theta}$ is less likely to occur than the order flows $\theta_A^* + \theta_{N,0} = 0$ and $\theta_A^* + \theta_{N,0} = \bar{\theta}$ under the assumption that the stock picker's signal is informative so that they are more likely to sell than buy or do nothing when the firm type is bad.

Lemma A1. *The distribution of observed order flows $\theta_A^* + \theta_N$, conditional on the bad type of firm is as follows:*

$$\text{Prob}(\theta_A^* + \theta_N = x|D_L) = \begin{cases} \dfrac{\eta_3}{\eta_2+\eta_3}\pi_{-1}^L, & x = -\bar{\theta}, \\ \dfrac{\eta_3}{\eta_2+\eta_3}\pi_0^L + \dfrac{\eta_2}{\eta_2+\eta_3}\pi_{-1}^L, & x = 0, \\ \dfrac{\eta_3}{\eta_2+\eta_3}\pi_1^L + \dfrac{\eta_2}{\eta_2+\eta_3}\pi_0^L, & x = \bar{\theta}, \\ \dfrac{\eta_2}{\eta_2+\eta_3}\pi_1^L, & x = 2\bar{\theta}. \end{cases} \tag{B22}$$

[33]The investor may abstain from selling if parameter ϕ, capturing the disutility of selling, is very large. However, for the ranges of ϕ considered in our calibrations in subsection B2, the investor chooses to sell shares. The situation in which the insider buys shares when $\theta_A^* + \theta_{N,0} = 2\bar{\theta}$ requires unrealistically large values of ϕ.

Moreover, under the model assumptions that $\pi_{-1}^L > \pi_0^L > \pi_1^L$*, we have:*

$$\text{Prob}(\theta_A^* + \theta_{N,0} = 0|D_L) > \text{Prob}(\theta_A^* + \theta_{N,0} = \bar{\theta}|D_L) > \text{Prob}(\theta_A^* + \theta_{N,0} = 2\bar{\theta}|D_L). \tag{B23}$$

Proof of Lemma A1. We prove for $x = 0$, and the other cases are analogous.

$$\begin{aligned}\text{Prob}(\theta_A^* + \theta_N = 0|D_L) &= \text{Prob}(\theta_A^* = 0, \theta_N = 0|D_L) + \text{Prob}(\theta_A^* = \bar{\theta}, \theta_N = -\bar{\theta}|D_L) \\ &= \frac{\eta_3}{\eta_2 + \eta_3}\pi_0^L + \frac{\eta_2}{\eta_2 + \eta_3}\pi_{-1}^L.\end{aligned}$$

Inequality (B23) directly follows from (B22) and (B23). ■

B2. Parametric restrictions

As the model has many free parameters, we set probabilities to $\pi_1^H = \tilde{\pi}_1^H = 2/3$, $\pi_0^H = \tilde{\pi}_0^H = 1/6$, $\pi_{-1}^H = \tilde{\pi}_{-1}^H = 1/6$, $\pi_1^L = \tilde{\pi}_1^L = 1/6$, $\pi_0^L = \tilde{\pi}_0^L = 5/12$, $\pi_{-1}^L = \tilde{\pi}_{-1}^L = 5/12$, $\eta_1 = 0.1$, $\eta_2 = 0.3$, $\eta_3 = 0.6$, $\pi_d = \eta_1$, and $\phi = 0.1$. Next, we vary parameter ψ and look at the ranges of $\bar{\theta}/D_H$ such that conditions (B21), under which the equilibrium strategy of the insider is given by (7), are satisfied. Figure A1 shows the set of parameters ψ and $x = \bar{\theta}/D_H$ for which conditions (B21) are satisfied. In particular, for $\psi = 1$ the existence range is $\bar{\theta}/D_H \in (0.35, 0.6)$, for $\psi = 1.5$ the range is $\bar{\theta}/D_H \in (0.37, 0.8)$, and for $\psi = 0.75$ the range is $\bar{\theta}/D_H \in (0.4, 0.6)$.

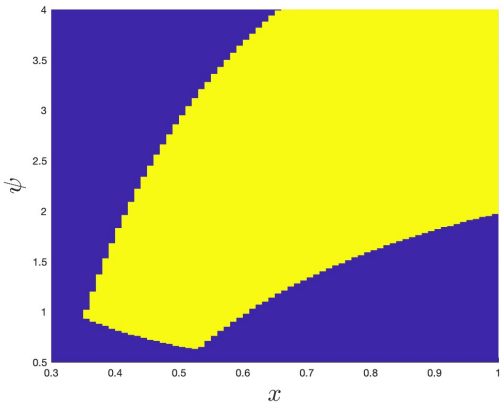

Figure A1: **Parametric restrictions.** The yellow region shows the space of parameters ψ and $x = \bar{\theta}/D_H$ under which the trading strategy of the insider is given by equation (7).

Appendix C. Supplemental Results

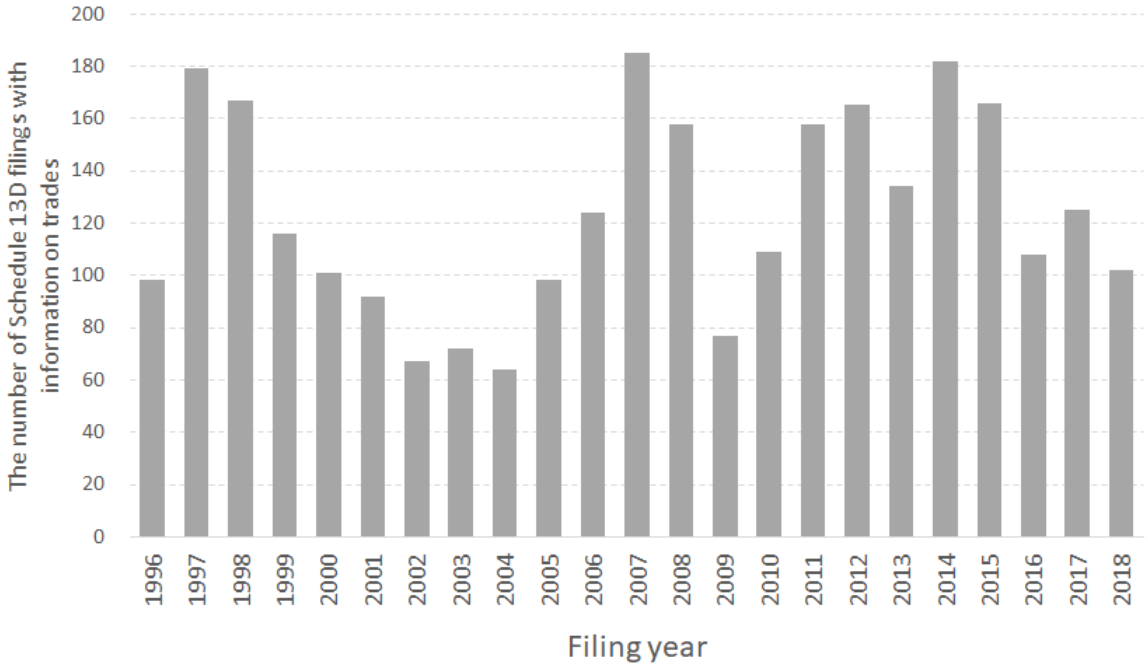

Figure C2: **Sample of Schedule 13D filings** The figure reports the time-series distribution of 2,847 Schedule 13D filings that constitute our sample.

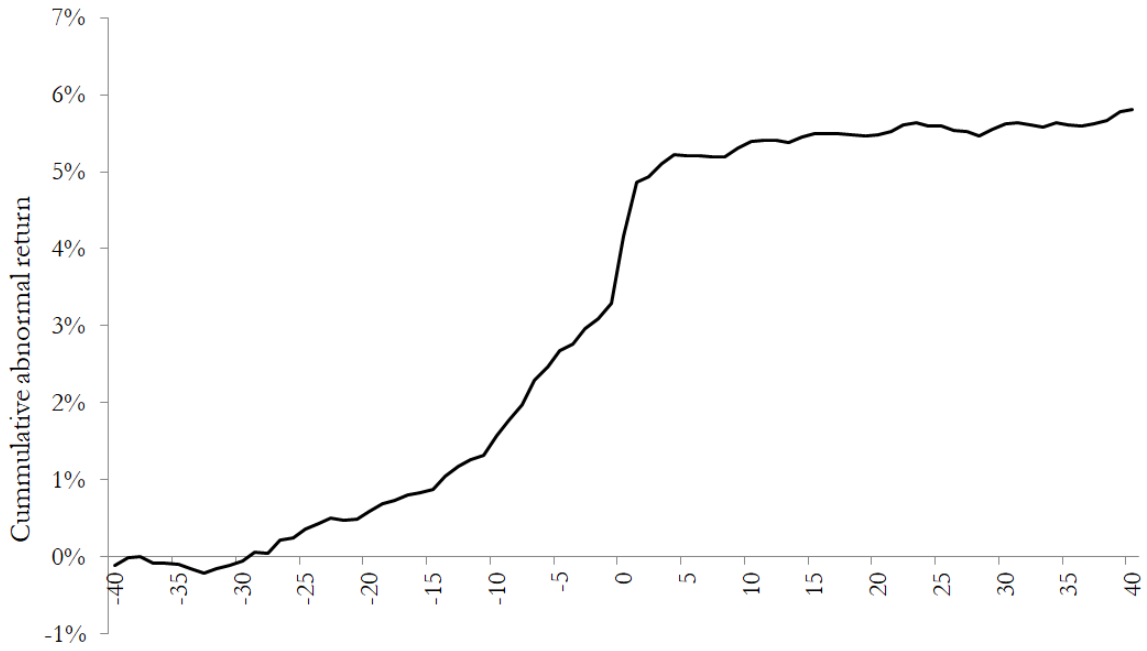

Figure C3: **Buy-and-hold abnormal returns around Schedule 13D filings.** This figure plots the average buy-and-hold returns in excess of the Fama-French Three-Factor Model around Schedule 13D filing dates, from 40 days prior to the filing date to 40 days afterwards.

Table C1: **Do insiders trade more when Schedule 13D filers trade?** The table reports estimates of a tobit regression of the insider buying quantity on *SC13D trade*, an indicator of days when Schedule 13D filers trade. *Insider buying quantity* is the number of shares purchased by the insider, scaled by the number of shares outstanding, multiplied by 100. All other variables are as defined in Table 5. The sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buying quantity		
	(1)	(2)	(3)
SC13D trade	0.2438***	0.2090***	0.2368***
	[0.0747]	[0.0715]	[0.0744]
Return		1.1998*	0.9717*
		[0.6640]	[0.5584]
Turnover rate		5.6803***	6.7410***
		[2.0191]	[2.0325]
R^2	0.006	0.006	0.087
N	115,799	115,713	115,713
Fixed effects:			
Year-Month	No	No	Yes

Table C2: **The role of lagged returns and trading activity.** This table repeats the analysis from Table 7 while controlling for three lags of stock returns and turnover. Sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy (1)	Insider sell (2)	Insider net sell (3)
SC13D trade (t-5)	0.0003	-0.0008	-0.0011
	[0.0008]	[0.0010]	[0.0012]
SC13D trade (t-4)	0.0008	-0.0013	-0.0021*
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t-3)	0.0002	-0.0001	-0.0003
	[0.0009]	[0.0009]	[0.0013]
SC13D trade (t-2)	-0.0006	-0.0004	0.0001
	[0.0007]	[0.0009]	[0.0012]
SC13D trade (t-1)	-0.0003	0.0013	0.0015
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t)	0.0068***	0.0003	-0.0064***
	[0.0015]	[0.0011]	[0.0019]
SC13D trade (t+1)	-0.0005	-0.0017*	-0.0011
	[0.0009]	[0.0009]	[0.0013]
SC13D trade (t+2)	-0.0003	-0.0007	-0.0004
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t+3)	0.0011	0.0003	-0.0008
	[0.0008]	[0.0009]	[0.0013]
SC13D trade (t+4)	-0.0003	-0.0002	0.0001
	[0.0008]	[0.0010]	[0.0013]
SC13D trade (t+5)	0.0000	0.0003	0.0003
	[0.0008]	[0.0010]	[0.0013]
Return	0.0128	0.0253**	0.0125
	[0.0118]	[0.0119]	[0.0169]
Return (lag 1)	0.0075	0.0233**	0.0158
	[0.0130]	[0.0107]	[0.0168]
Return (lag 2)	-0.0201	0.0205*	0.0407**
	[0.0135]	[0.0108]	[0.0175]
Return (lag 3)	-0.0073	0.0099	0.0172
	[0.0135]	[0.0100]	[0.0170]
Turnover rate	0.2066***	0.4611***	0.2545***
	[0.0453]	[0.0653]	[0.0808]
Turnover rate (lag 1)	-0.0420	-0.0346	0.0074
	[0.0384]	[0.0569]	[0.0700]
Turnover rate (lag 2)	0.1868***	-0.0065	-0.1933***
	[0.0454]	[0.0543]	[0.0708]
Turnover rate (lag 3)	0.1284***	0.0325	-0.0959
	[0.0425]	[0.0580]	[0.0723]
R^2	0.191	0.228	0.212
N	115,055	115,055	115,055
Fixed effects:			
Firm x Year-month	Yes	Yes	Yes

Table C3: **The role of consequent trades.** In Panel A, we repeat the analysis from Table 5 while restricting the analysis to Schedule 13D trades that are preceded and followed by at least two days with no Schedule 13D trading. In Panel B, we impose a similar restriction on Schedule 13D trades and repeat the analysis in Panel A of Table 7. The sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy (1)	Insider sell (2)	Insider net sell (3)
Panel A			
SC13D trade	0.0086**	-0.0021	-0.0106**
	[0.0038]	[0.0029]	[0.0048]
Return	0.0101	0.0128	0.0027
	[0.0136]	[0.0140]	[0.0198]
Turnover rate	0.3714***	0.4992***	0.1278
	[0.0809]	[0.1071]	[0.1347]
R^2	0.199	0.278	0.247
N	52,546	52,546	52,546
Panel B			
SC13D trade (t-5)	0.0013	0.0001	-0.0012
	[0.0015]	[0.0017]	[0.0022]
SC13D trade (t-4)	-0.0012	-0.0021	-0.0009
	[0.0016]	[0.0016]	[0.0022]
SC13D trade (t-3)	0.0006	-0.0010	-0.0016
	[0.0018]	[0.0019]	[0.0026]
SC13D trade (t)	0.0093**	-0.0021	-0.0114**
	[0.0038]	[0.0029]	[0.0049]
SC13D trade (t+3)	0.0042*	0.0010	-0.0032
	[0.0023]	[0.0020]	[0.0031]
SC13D trade (t+4)	-0.0002	0.0004	0.0006
	[0.0018]	[0.0019]	[0.0026]
SC13D trade (t+5)	-0.0007	0.0018	0.0026
	[0.0017]	[0.0021]	[0.0028]
Return	0.0103	0.0108	0.0005
	[0.0136]	[0.0139]	[0.0197]
Turnover rate	0.3644***	0.4952***	0.1308
	[0.0816]	[0.1077]	[0.1356]
R^2	0.195	0.278	0.245
N	52,436	52,436	52,436
Fixed effects:			
Firm x Year-month	Yes	Yes	Yes

Table C4: **The role of insider trading disclosure.** This table repeats the analysis from Table 7 while excluding insider trades that are disclosed to the SEC on the same day. The sample covers all firm-trading day observations during the 60-day window prior to Schedule 13D filings. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy (1)	Insider sell (2)	Insider net sell (3)
SC13D trade (t-5)	0.0005	-0.0008	-0.0012
	[0.0007]	[0.0009]	[0.0012]
SC13D trade (t-4)	0.0006	-0.0005	-0.0011
	[0.0007]	[0.0009]	[0.0011]
SC13D trade (t-3)	0.0005	-0.0006	-0.0011
	[0.0009]	[0.0009]	[0.0013]
SC13D trade (t-2)	-0.0008	-0.0006	0.0002
	[0.0007]	[0.0009]	[0.0011]
SC13D trade (t-1)	0.0005	0.0016*	0.0010
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t)	0.0063***	0.0008	-0.0055***
	[0.0014]	[0.0011]	[0.0018]
SC13D trade (t+1)	-0.0007	-0.0013	-0.0006
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t+2)	0.0006	-0.0005	-0.0011
	[0.0008]	[0.0009]	[0.0011]
SC13D trade (t+3)	0.0017**	0.0004	-0.0013
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t+4)	-0.0005	-0.0003	0.0002
	[0.0008]	[0.0009]	[0.0012]
SC13D trade (t+5)	0.0004	0.0005	0.0001
	[0.0008]	[0.0010]	[0.0012]
Return	0.0114	0.0185*	0.0072
	[0.0102]	[0.0109]	[0.0150]
Turnover rate	0.1971***	0.4264***	0.2293***
	[0.0417]	[0.0649]	[0.0783]
R^2	0.184	0.211	0.199
N	114,863	114,863	114,863
Fixed effects:			
Firm x Year-month	Yes	Yes	Yes

Table C5: **The role of hostile campaigns.** This table repeats the analysis from Table 5 for the subsample of hostile engagements by activist hedge funds. Hostile engagements are Schedule 13D filings filed by activist hedge funds who are confrontational with firm management based on the classification developed in Brav et al. (2008). All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
SC13D trade	0.0040**	0.0037*	-0.0011	-0.0005	-0.0051	-0.0042
	[0.0018]	[0.0021]	[0.0030]	[0.0033]	[0.0033]	[0.0037]
Return	0.0393	0.0195	0.0072	0.0060	-0.0322	-0.0135
	[0.0382]	[0.0355]	[0.0409]	[0.0411]	[0.0618]	[0.0585]
Turnover rate	0.2635**	0.3055**	0.4342***	0.4267**	0.1706	0.1212
	[0.1337]	[0.1394]	[0.1628]	[0.1740]	[0.2172]	[0.2304]
R^2	0.121	0.179	0.112	0.145	0.105	0.145
N	11,661	11,634	11,661	11,634	11,661	11,634
Fixed effects:						
Firm	Yes	No	Yes	No	Yes	No
Year-Month	Yes	No	Yes	No	Yes	No
Firm x Year-month	No	Yes	No	Yes	No	Yes

Table C6: **The role of the likelihood of Schedule 13D filing.** This table repeats the analysis from Table 5 for two subsamples. The subsamples are generated based on the likelihood of a Schedule 13D filing, which is estimated using the following firm characteristics: market value of equity (log), equity book-to-market ratio, average of monthly returns during the fiscal year, firm age (measured as the number of years since the firm appears on CRSP), the Herfindahl index of sales among all firms in the same SIC 3-digit industry, share of institutional ownership, the Herfindahl index of institutional ownership, the Amihud (2002) illiquidity ratio, book leverage ratio, total payouts to net income ratio, and ROA. In Panel A, the sample covers observations with a low likelihood of a Schedule 13D filing. In Panel B, the sample covers observations with a high likelihood of a Schedule 13D filing. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Low likelihood of a Schedule 13D filing						
SC13D trade	0.0116**	0.0132***	0.0013	0.0008	-0.0103	-0.0124*
	[0.0048]	[0.0049]	[0.0040]	[0.0041]	[0.0063]	[0.0064]
Return	0.0005	-0.0076	0.0288	0.0277	0.0283	0.0353
	[0.0310]	[0.0292]	[0.0336]	[0.0328]	[0.0467]	[0.0448]
Turnover rate	0.2803*	0.2374	1.0809***	0.9936***	0.8006**	0.7562**
	[0.1589]	[0.1575]	[0.2739]	[0.2766]	[0.3264]	[0.3234]
R^2	0.123	0.192	0.137	0.206	0.136	0.208
N	19,636	19,588	19,636	19,588	19,636	19,588
Panel B: High likelihood of a Schedule 13D filing						
SC13D trade	0.0025	0.0024	0.0038	0.0046	0.0013	0.0022
	[0.0034]	[0.0038]	[0.0029]	[0.0032]	[0.0045]	[0.0051]
Return	0.0192	0.0076	-0.0093	-0.0109	-0.0285	-0.0185
	[0.0344]	[0.0306]	[0.0340]	[0.0337]	[0.0499]	[0.0458]
Turnover rate	0.7090***	0.6413***	0.4280***	0.3014*	-0.281	-0.3399
	[0.1668]	[0.1724]	[0.1610]	[0.1617]	[0.2397]	[0.2461]
R^2	0.115	0.184	0.174	0.254	0.149	0.222
N	19,633	19,580	19,633	19,580	19,633	19,580
Fixed effects:						
Firm	Yes	No	Yes	No	Yes	No
Year-Month	Yes	No	Yes	No	Yes	No
Firm x Year-month	No	Yes	No	Yes	No	Yes

Table C7: **Insider type.** This table repeats the analysis from Table 5 for two subsamples. The subsamples are generated based on insider type. In Panel A, the sample covers observations C-level executives and board members. In Panel B, the sample covers observations all other insiders. All variables are defined in Table 1. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	Insider buy		Insider sell		Insider net sell	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: C-level executives and board members.						
SC13D trade	0.0068***	0.0075***	0.0001	0.0001	-0.0067***	-0.0074***
	[0.0014]	[0.0016]	[0.0010]	[0.0011]	[0.0018]	[0.0019]
Return	0.0213**	0.0171*	0.0148	0.0123	-0.0065	-0.0049
	[0.0105]	[0.0103]	[0.0097]	[0.0094]	[0.0143]	[0.0139]
Turnover rate	0.2476***	0.1758***	0.3291***	0.3516***	0.0815	0.1759**
	[0.0389]	[0.0408]	[0.0535]	[0.0568]	[0.0668]	[0.0712]
Constant	0.0042***	0.0046***	0.0064***	0.0062***	0.0023***	0.0016*
	[0.0006]	[0.0006]	[0.0005]	[0.0006]	[0.0008]	[0.0008]
R^2	0.100	0.194	0.126	0.229	0.115	0.212
N	114,553	114,301	114,553	114,301	114,553	114,301
Panel B: All other insiders.						
SC13D trade	-0.0003	-0.0003	0.0003	0.0000	0.0006	0.0003
	[0.0003]	[0.0003]	[0.0007]	[0.0008]	[0.0008]	[0.0008]
Return	-0.0051	-0.0043	0.0188**	0.0171*	0.0240**	0.0214**
	[0.0051]	[0.0052]	[0.0088]	[0.0089]	[0.0102]	[0.0103]
Turnover rate	0.0784***	0.0698***	0.1930***	0.2099***	0.1146**	0.1401***
	[0.0176]	[0.0176]	[0.0451]	[0.0471]	[0.0485]	[0.0505]
R^2	0.050	0.117	0.098	0.176	0.090	0.165
N	101,966	101,741	101,966	101,741	101,966	101,741
Fixed effects:						
Firm	Yes	No	Yes	No	Yes	No
Year-Month	Yes	No	Yes	No	Yes	No
Firm x Year-month	No	Yes	No	Yes	No	Yes