

Selective Disclosure, Expertise Acquisition and Price Informativeness*

Bjorn N. Jorgensen[†], Jing Li[‡], Nahum D. Melumad[§]

Abstract

We examine how a firm's disclosure-audience policy affects investors' expertise acquisition and price informativeness in the market. We distinguish the investors' information advantage due to superior access from that due to superior ability to process information. We show that targeted selective disclosure to sophisticated investors may encourage greater expertise acquisition on the part of investors and leads to more informative prices than either public disclosure or untargeted selective disclosure, because the value of expertise is maximized if sophisticated investors gain exclusive information access at a relatively low cost. These results illuminate the persistence of private communications between investors and firms in the post-Regulation Fair Disclosure era and provide implications for regulators in addressing increasing concerns raised about the enforcement of Regulation Fair Disclosure.

Keywords: Selective disclosure, Information access cost, Expertise acquisition, Price informativeness

JEL classification: G14, M41

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[†]Professor of Accounting, Copenhagen Business School and Hanken School of Economic, bnj.acc@cbs.dk.

[‡]Faculty of Business and Economics, The University of Hong Kong, acjli@hku.hk

[§]James L. Dohr Professor of Accounting and Business Law, Columbia University, deceased.

1. Introduction

The literature on disclosure has focused on such questions as whether to disclose, what to disclose, and, more recently, how to do so.¹ However, the choice of disclosure audience, i.e., to whom to disclose, has been neglected. When firms can choose their disclosure audience, they may disseminate information to a limited group of investors through private communication or to a broad audience through public disclosure. Historically, private disclosure to financial analysts or institutional investors prevailed among public companies, and the practice raised regulatory concerns about loss of investors' confidence in the integrity and fairness of capital markets.² Regulation Fair Disclosure (Reg FD), passed in 2000, prohibits firms from selectively disclosing nonpublic material information to a small group of market participants without concurrent widespread public disclosure.³ However, empirical evidence suggests frequent private communications between company managers and investors still occur through various channels in the post-Reg FD period, and these private communications contain information that can move the market or generate trading profits for some investors.⁴

One important regulatory consideration for Reg FD is that privileged investors profit from their informational edge due to “superior access to corporate insiders, rather than from their skill, acumen, or diligence.”⁵ However, noticeably, firms' private disclosure audiences are often sophisticated investors who are better at processing and interpreting the informa-

¹See Verrecchia (2001) and Dye (2001, 2017) for detailed reviews of the analytical disclosure literature. Li (2011) provides a review of the growing literature that focuses on textual analyses of corporate disclosures.

²For example, Bushee, Matsumoto, and Miller (2003) document that about 45% of their firms conducted closed conference calls, instead of open ones, despite advances in information technology that allow firms to provide broader access.

³In Europe, the Market Abuse Directive (2014/57/EU) was introduced to ensure the integrity of and enhance investor confidence in integrated European financial markets by establishing higher standards for common implementation and enforcement.

⁴For example, Dong, Li, Ramesh, and Shen (2015) document information leakage through the priority dissemination practice, that is, when firms give a broad group of sophisticated market participants earlier access to all corporate press releases than they do to the general public. Solomon and Soltes (2015) find that investors make more informed trades after private meetings with management. Bushee, Jung, and Miller (2017) document that investors benefit from selective access at invitation-only conferences, where one-on-one meetings with managers occur throughout the day and breakout sessions with managers happen after webcast presentations. Bushee, Gerakos, and Lee (2018) use corporate jet-flight patterns to identify private meetings with investors in roadshows that provide participating investors an advantage over nonparticipating ones. Brown, Call, Clement, and Sharp (2019) and Campbell, Twedt, and Whipple (2021) provide additional recent evidence of private communication.

⁵See <https://www.sec.gov/rules/final/33-7881.htm>

tion than the average investor. Thus superior access and sophisticated processing skills are intertwined in pre-Reg FD selective disclosure practices. In this paper, we examine the impact of a firm’s disclosure-audience policy on expertise acquisition and market efficiency (or price informativeness) in a rational expectation model with different types of investors. We highlight the importance of differentiating information access and expertise acquisition—the former gives investors an advantage over other traders due to superior access to the firm, and the latter gives them a superior ability to generate valuable insights after receiving firm information.

In the public disclosure regime, with free access to information, an investor (a “trader” in our model) simply makes *one* decision—whether to acquire expertise. In a selective disclosure regime, the trader’s decision depends on whether the firm can identify sophisticated traders. The separation of information access and expertise acquisition allows us to examine two types of selective disclosures. The first is “*targeted selective disclosure*” through which a firm can identify sophisticated traders and disclose exclusively to them. In this regime, investors decide whether to acquire both information access and expertise or neither. The second is “*untargeted selective disclosure*” through which a firm discloses information to anyone who pays for access. In this regime, each trader faces a two-step decision: first to decide whether to obtain access and next to decide whether to acquire expertise. The untargeted selective-disclosure regime is arguably a hybrid of the other two regimes. At one extreme, the equilibrium outcome is the same as that in the public disclosure regime if the information access cost is so small that all traders choose to gain access. At the other, the equilibrium outcome is the same as that in the targeted selective-disclosure regime when the information access cost is so high that no traders choose to gain access.⁶

We find that, if traders in the market were endowed with exogenous levels of expertise, price would always become more informative if the disclosure audience were broader—i.e., public disclosure leads to the most efficient price because information is available to all investors. However, with endogenous acquisitions of expertise and information access, tar-

⁶We take a static approach in comparing three regimes, but, in practice, a firm may change its disclosure policy over time. For example, a newly listed firm with few analysts following it may start with untargeted selective-disclosure and then gradually switch to targeted selective disclosure when more analysts and investors acquire firm-specific expertise and can be identified by the firm.

geted selective disclosure encourages more expertise acquisition and leads to more informative prices than public disclosure and untargeted selective disclosure, as long as the information access cost is not too high.

To understand the intuition of our results, it is helpful to first understand how information access cost interacts with the expertise-acquisition incentive under the untargeted selective-disclosure regime—the hybrid regime. In this regime, if the information access cost is not too high, a nonnegligible portion of traders will be willing to pay for access but not for expertise. In this case, a marginal trader who is indifferent to becoming sophisticated under *untargeted selective disclosure* is also indifferent under *public disclosure*. This is because a marginal trader only compares the benefit from acquiring expertise to the benefit of information access alone. This marginal trader, however, if put under the targeted selective-disclosure regime, would enjoy a strictly larger benefit from acquiring expertise (and thus exclusive information access) than no expertise (and thus no access to information). Hence, if the information access cost is not too high, the incentive of expertise acquisition under untargeted selective disclosure (as well as public disclosure) is weaker than that under targeted selective disclosure.

Conversely, if the information access cost is sufficiently high, no trader pays for information access alone without becoming sophisticated in the untargeted selective-disclosure regime, essentially making the equilibria in the two selective disclosure regimes identical. With such a high information-access cost, a marginal trader, who was indifferent to becoming sophisticated with free information access under public disclosure, would not find it worthwhile to become sophisticated under the untargeted selective disclosure regime, where no traders will gain information access alone. Hence, in this case, the incentive for expertise acquisition under public disclosure is always stronger than that under both types of selective disclosure.

In terms of price informativeness, a trade-off exists between the amount of aggregate private information impounded into the price and broad access to information that directly improves price informativeness. We show that, when the information access cost is below a certain threshold, targeted selective disclosure induces a sufficiently large group of sophisticated investors, which dominates the negative effect of a smaller audience, leading to greater

price informativeness than that under public disclosure. An untargeted selective-disclosure regime, however, is always dominated by one of the other two regimes due to either a lower expertise-acquisition incentive or a lack of free information access.

Endogenous expertise acquisition also directly affects the firm's learning from the market price. This is because market price aggregates sophisticated traders' private information and provides incremental information about the fundamental value beyond the firm's own information. Hence targeted selective disclosure also promotes more learning from the market price when the information access cost is not too high. In addition, increasing the firm's information quality always reduces learning from the market price under public disclosure due to the crowding-out effect. However, under targeted selective disclosure, increasing the firm's information quality may encourage more expertise acquisition, and thus the firm can learn more from market prices.

One implication of our model is that the availability of low-cost communication channels may increase private disclosures if firms are free to choose their disclosure audience. For example, the launch of the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system undoubtedly lowered the information access cost for investors, which, according to our model, may explain the dramatic rise of selective disclosure practices during the late 1990s. Bushee et al. (2003) document that many firms conducted closed conference calls and private meetings before Reg FD, despite the significantly reduced information access cost, due to technological advances such as webcasting for real-time access. Recent technological developments also make low-cost information distribution channels (such as Facebook or Twitter) available for investors, which might contribute to the persistence of selective disclosures in the post-Reg FD era.⁷

Can sophisticated traders be identified by firms? In our view, this can be achieved through a long-term interaction between firms and investors. For example, sophisticated investors, such as institutional investors with large ownership or financial analysts who have followed firms for a long time, can easily be identified.⁸ Moreover, firms disclose information

⁷For example, Jung, Naughton, Tahoun, and Wang (2018) find that almost half S&P 1500 firms manage their Twitter accounts to enhance investor awareness of their public releases.

⁸Though financial analysts do not trade directly, their research reports provide information to clients who do. In this sense, our model captures trades by investors relying on financial analyses, without explicitly modeling the analysts' sale of their information.

when responding to questions raised by participants in investor conferences or private meetings, and the types of questions raised reveal whether investors deeply understand the firm (Park and Soltes, 2018). However, firms with lower analysts following or smaller institutional ownership may not be able to easily identify investors who have expertise about them. Our model suggests these firms should adopt public disclosure (i.e., open conference calls), consistent with the findings of Bushee et al. (2003), because public disclosure encourages expertise acquisition and leads to more informative prices than does untargeted selective disclosure.

Our model offers insights into concerns about ongoing private communications between firms and investors and about whether regulators should further tighten the enforcement by banning such communications.⁹ While regulators have strived to level the playing field in the market through Reg FD, the regulation was not designed to shut down private communications between firms and investors.¹⁰ The SEC acknowledges that sophisticated investors play an important role in “*gathering and analyzing information*” yet states that Reg FD does not affect their information-processing role since the information is still available.¹¹ Our results caution that, if sophisticated investors’ expertise is critical, a termination of private communications may lead to less-efficient market prices.¹² Relatedly, our model also provides implications with respect to the regulation of what types of information should be prohibited

⁹Allee, Bushee, Kleppe, and Pierce (2022) show that the difficulty of Reg FD enforcement may explain the recent increase in private communications and private-information-based trading.

¹⁰For example, Reg FD does not prohibit firms from disclosing a nonmaterial piece of information to analysts when “that piece helps the analyst complete a ‘mosaic’ of information that, taken together, is material” (<https://www.sec.gov/rules/final/33-7881.htm>). The question of what constitutes nonmaterial information is not well defined by the regulation. Our model does not exclude this kind of nonmaterial information.

¹¹See the SEC’s discussion in its proposal for Reg FD: <http://www.sec.gov/rules/proposed/34-42259.htm>. Many comment letters on the proposal for Reg FD raised concerns about its impact on sophisticated investors. For example, one pointed out that the regulated mandatory disclosure and informal direct communications between issuers and investors have been “two parallel information regimes that have worked well to make the U.S. securities markets the most efficient and best informed markets.” (See <https://www.sec.gov/rules/proposed/s73199/keller2.htm>). Other comment letters expressed concerns about the negative impact on analysts’ efforts in analyzing and gathering information of firms when they cannot freely ask in-depth questions through private communications (See <https://www.sec.gov/rules/proposed/s73199/sulcrom1.htm>).

¹²Immediately after the passage of a regulation, the number of investors who have acquired expertise may not change. Thus researchers may find a temporary positive effect on price informativeness right after the Reg FD passage, consistent with our prediction with *exogenous* expertise acquisition. But in the long run, the negative consequence may show up when investors endogenously adjust their expertise acquisition.

from selective disclosure.¹³ Information that does not require expertise to interpret should be disclosed publicly, while information that is hard to interpret could be disclosed privately. The exclusive information-access channel is more valuable when information requires more expertise to process.

The remainder of the paper proceeds as follows. Section 2 reviews the literature. Section 3 presents the model. Section 4 presents equilibria for the three disclosure regimes. Section 5 examines and compares endogenous information access and expertise acquisition decisions in different disclosure regimes. Section 6 compares price informativeness and the learning effect in different disclosure regimes. Section 7 discusses a few assumptions of our model, and Section 8 concludes. All proofs are in the appendix.

2. Literature review

Our paper extends the literature on the impact of voluntary disclosure on private information acquisition and allocations. This literature examines this question in either rational-expectation-model settings¹⁴ or strategic Kyle-model settings.¹⁵ Studies usually compare the public disclosure setting to the no-disclosure setting and examine the impact of public signals on private information markets. In contrast, we focus on the impact of a firm's disclosure-audience choice on the costly acquisition of private information and price informativeness. We also contribute to the recent literature on the impact of information processing costs (Blankespoor, deHaan, and Marinovic, 2020).

In a related study, Dutta (1996) examines the effect of private disclosure on price informativeness in a different framework. Dutta (1996) focuses on the private information market in which a monopolist analyst can sell information to other investors and shows that too

¹³Barth, Clinch, and Shibano (2003) study a firm's recognition versus disclosure choice in a model where both sophisticated and unsophisticated investors can understand recognized accounting items, while only sophisticated investors understand the note disclosure. They show that note disclosures may encourage the acquisition of accounting expertise and increase price informativeness. The difference between our story and theirs is that, in our setting, sophisticated investors can also use their expertise when information is public. Furthermore, the firm's information is held constant across different regimes in our setting, but the information provided through recognition is usually coarser than note disclosures.

¹⁴For example, Diamond, 1985; Bushman, 1991; Indjejikian, 1991; Kim and Verrecchia, 1991; Alles and Lundholm, 1993.

¹⁵For example, McNichols and Trueman, 1994; Bushman and Indjejikian, 1995.

much private disclosure can hurt price efficiency.¹⁶ A few other studies directly examine selective disclosure. Arya, Glover, Mittendorf, and Narayananamoorthy (2005) find that prohibiting selective disclosure heightens analysts’ herding behavior and leaves investors worse off. Cornand and Heinemann (2008) suggest it may be optimal to provide public information with maximum precision but not to all agents in the economy. Indjejikian, Lu, and Yang (2014) demonstrate that an informed insider trader may rationally leak noisy information to designated independent traders to maximize the insider’s expected trading profit. Michaeli (2017) shows that a manager may gather more precise information when that person can choose a subset of users to receive the information.

Our paper also relates to the literature on the role of investor sophistication in financial markets. Fishman and Hagerty (2003) examine the impact of mandatory disclosure rules when some buyers cannot understand the disclosure. Dye (1998) shows that firms are more likely to voluntarily disclose information to the market when investors are more sophisticated. Langberg and Sivaramakrishnan (2008) characterize how analysts’ interpretation of disclosed information affects a firm’s voluntary disclosure policy via their costly information acquisition role. Mondria, Vives, and Yang (2022) study sophisticated investors’ role in processing information from price and show that investors may over-acquire sophistication. We show that, when investors’ ability to interpret firm information is critical, targeting disclosure on these sophisticated investors may encourage more expertise acquisition and increase price informativeness.

3. Model

Consider a market with two securities: shares in a risky firm and a risk-free asset. The risky firm has liquidating cash flows v that follow a normal distribution with mean \bar{v} and variance h_v^{-1} —i.e., $v \sim N(\bar{v}, h_v^{-1})$. The risk-free asset’s return is normalized to zero. A

¹⁶In Dutta (1996), the firm does not choose the disclosure audience but directly influences the precision of the private signal received by analysts, which the paper labels “private disclosure.” In other words, Dutta (1996) investigates how the analyst’s private-signal precision, as chosen by the firm, affects the price efficiency. We directly model the firm’s choice of disclosing the same piece of information to different audiences. Moreover, we distinguish the firm’s information from the investors’ private information generated by endogenous expertise acquisition, while in Dutta (1996), the ability to generate private information is directly controlled by the firm.

continuum of risk-averse rational traders are indexed in the interval $[0, 1]$. The initial wealth of each trader i is nonrandom and normalized to zero. All traders have the same CARA utility function $U(W_i)$ with a common risk-aversion coefficient $\rho > 0$. That is, $U(W_i) = -\exp\{-\rho W_i\}$, where $W_i \equiv (v - P)x_i$ is the trader i 's terminal wealth from buying x_i units of the risky asset at price P . Noise traders trade for exogenous liquidity reasons, resulting in an aggregate order of u , $u \sim N(0, h_u^{-1})$, and u is independent of all other random variables.¹⁷

The firm has a piece of information about v , denoted by $y = v + \eta$, where $\eta \sim N(0, h_\eta^{-1})$ and is independent of v . Once the firm discloses y , a sophisticated investor can process it and obtains a private signal about η , $\xi_i = \eta + \varepsilon_i$, where $\varepsilon_i \sim N(0, h_\varepsilon^{-1})$ is independent and identically distributed for all sophisticated traders and is independent from all other random variables. This information structure follows prior studies (Kim and Verrecchia, 1991; Indjejikian, 1991, etc.), allowing for investors' heterogeneous interpretations of the disclosed information. Our assumption—i.e., that traders' private information acquisition occurs in conjunction with public information disclosure—is consistent with the assumption in analytical studies and supported by empirical evidence.¹⁸ Following the law of large numbers, the average signal of any positive mass of continuum sophisticated traders equals v almost surely—i.e., $\forall \Delta > 0$, $\int_0^\Delta \varepsilon_i di = 0$. Therefore the aggregate signal from all sophisticated traders is a perfect signal about underlying noise η and perfectly reveals the true liquidation value v when combined with the firm's disclosure y .

Before the firm discloses, each trader may incur some cost to gain access to the information if it is not public. We label this cost the *information access cost* and assume it to be a commonly known constant, $c > 0$. In addition to such costly information access, each trader can also incur another cost to acquire the expertise (or to become sophisticated). We call this second cost the *expertise acquisition cost* and assume it also a commonly known constant, $k > 0$.¹⁹ Note that a trader must gain access to the firm's disclosure to use his

¹⁷We assume that noise traders are exogenous in different disclosure regimes. The noise traders in our model play the same role as the random asset supply in the rational expectation model following Grossman and Stiglitz (1980).

¹⁸Empirical studies generally find that analysts play a large role in interpreting publicly available information, instead of discovering new information about individual firms (Bradshaw, Ertimur, and O'Brien, 2017; Livnat and Zhang, 2012). Barron, Harris, and Stanford (2005) find that analysts obtain private information during the earnings announcement period. Chen, Nagar, and Schoenfeld (2018) also show that a firm's public disclosure further increases informed traders' information advantage over uninformed traders.

¹⁹We assume both types of costs are constant and thus invariant to characteristics that may affect the

expertise to process the information, whereas a trader does not need to become sophisticated to enjoy the benefit of superior access.

We view information access and expertise acquisition as separate activities. Information access refers to simply obtaining information and accepting it as is without further processing. For example, investors make costly efforts to attend or arrange various offline meetings with managers, such as holding investment conferences, networking, or traveling to corporate cities for private meetings. Expertise acquisition, in contrast, refers to acquiring firm-specific knowledge and skills that enable investors to better process and analyze individual firms' information. Expertise acquisition requires a significant amount of time and effort in understanding a firm's financial reporting practices, its operating environment, and its sensitivity to macroeconomic or industry shocks.

After observing the information, the firm may disclose it to specific audiences, according to its pre-committed disclosure-audience policy: that is, *selective disclosure* to certain market participants or *public disclosure* to everyone in the market. We further distinguish two types of selective disclosure: (i) “*targeted selective disclosure*,” where the firm can identify the sophisticated traders and disclose exclusively to them, and (ii) “*untargeted selective disclosure*,” where the firm discloses information to anyone who pays for access. Under public disclosure, information is free and accessible to all investors.²⁰

The assumption that a firm can perfectly identify sophisticated traders is simplified but reasonable. For example, a firm can identify financial analysts who have followed it

underlying risk of fundamentals or quality of the firm's information. One could extend our model to assume the cost function as $c(h_v^{-1}, h_\eta^{-1})$ or $k(h_v^{-1}, h_\eta^{-1})$, which may make the model solution intractable in each individual disclosure regime. However, our results should remain qualitatively similar if one tries to compare across the three regimes.

²⁰Strictly speaking, no information is entirely “free,” even if made available, because everyone needs to spend some basic cost—e.g., time and effort—to read and digest publicly available information, such as annual 10-K reports. Our results do not change if we incorporate this basic cost as an exogenous cost for every trader in our model. However, in some cases, investors cannot access information unless they choose to incur some acquisition cost, despite the information being “public.” For example, before the implementation of the EDGAR electronic filing system, investors chose to pay nonnegligible subscription fees to companies that specialized in retrieving corporate filings, and the acquisition of filings would usually take a couple of days. In that situation, there is no “public” disclosure but only untargeted selective disclosure. When advances in information dissemination significantly reduced the access cost, firms then could choose to disseminate information through different channels. For example, conference calls with restricted access would be called targeted selective disclosure in our framework, whereas those open to all professionals/analysts who register but do not provide real-time free access belong to untargeted selective disclosure. If, instead, conference calls are made available in real time through webcasting or other technology, we would call that public disclosure.

for a long time and have spent costly effort to understand its financial reports to provide valuable reports to their clients. A firm can also identify institutional investors who hold large ownership and acquire and analyze its information. In addition, a firm can identify whether individual analysts or investors have obtained expertise about the firm through the depth of their questions at investor conferences or private meetings and then can decide whether to respond or disclose information to these analysts and investors.²¹

For convenience, we label traders who acquire both expertise and information access as *type-A* traders, traders who only acquire information access as *type-B* traders, and all other rational traders as *type-C* traders. Figure 1 shows the timeline of events. At date 0, the firm chooses its disclosure regime, $d = \{s_1, s_2, p\}$, where s_1 refers to targeted selective disclosure to type-A traders only (if the firm can identify them); s_2 refers to untargeted selective disclosure to both type-A and type-B traders; and p refers to public disclosure. At date 1, each trader decides whether to pay c to gain information access and whether to pay an additional k to acquire expertise to better process information. At date 2, the firm receives a signal y and discloses to the audience, according to its pre-committed disclosure regime. At date 3, traders submit orders, and the market clears. All aspects of the model are common knowledge.

An assumption in our model is that the firm commits to its disclosure-audience policy before receiving a signal y . In the model, the firm benefits from the ex post deviation to public disclosure once traders have already acquired expertise and their abilities to process information are given. However, this deviation is not sustainable in a multi-period game. If a firm does not follow its pre-committed policy, traders may invest their expertise in other firms in the next period, or institutional investors may sell their investment, breaking down the equilibrium and hurting the firm's price efficiency and liquidity in the long run. Thus the commitment assumption is reasonable if we consider our model as a subgame in a multi-period game in which any deviation is very costly.

²¹Park and Soltés (2018) examine the types of questions asked by participants during private meetings, and document that a significant percentage are in-depth questions. For example, a question about the firm's total revenue is straightforward and does not require the expertise to raise and process the answer, while a question about revenue growth in different geographic or product segments may reveal an analyst's knowledge of the multiple segments of a firm's operations.

Date 0	Date 1	Date 2	Date 3
Firm chooses disclosure regime, $d \in \{s_1, s_2, p\}$	Traders pay c to become type-B traders and pay additional k to become type-A traders.	Firm receives y and discloses according to its regime d . Type-A traders obtain private signals ξ_i .	All traders submit orders, and market clears.

Figure 1: Timeline

4. Equilibrium

In this section, we characterize the equilibrium price and trading strategies in different disclosure regimes, assuming an exogenous proportion of each type- t trader in the market. For simplicity, we assume the following among all traders: a fraction f are type-A traders, a fraction $m - f$ are type-B traders, and the remaining $1 - m$ fraction are type-C traders, where $1 \geq m \geq f \geq 0$.

Definition of equilibrium

We focus on the symmetric equilibrium where all traders of the same type follow the same trading strategy. Denote each trader i 's information set besides price as $\Phi_i^t(d)$ and the order submitted as $x_i^t(\Phi_i^t(d), P_d)$, where $t \in \{A, B, C\}$ and $d \in \{s_1, s_2, p\}$.

DEFINITION 1 (EQUILIBRIUM DEFINITION) *A symmetric rational expectation equilibrium is defined by a set of trading strategies $x_i^t(\Phi_i^t(d), P_d)$ for each type- t trader and a price function P_d such that:*

i) Each trader submits an order to maximize his or her own utility conditional on his or her information set and market price:

$$x_i^t(\Phi_i^t(d), P_d) \in \arg \max_x E[U_i(W_i) | \Phi_i^t(d), P_d], \quad t \in \{A, B, C\}, \quad (1)$$

where $W_i = (v - P_d)x_i$ represents the trading profit of each trader i with a position x_i .

ii) The market-clearing condition holds:

$$\int_0^f x_i^A di + \int_f^m x_i^B di + \int_m^1 x_i^C di + u = 0. \quad (2)$$

Each trader forms rational expectations about the fundamental value, conditional on both the information set $\Phi_i^t(d)$ and market price P_d . The optimal trading strategy takes into account the equilibrium relation between price and the aggregate information in the market as well as noise trading. The maximization of the CARA utility yields the following optimal order for each type- t trader:

$$x_i^t(\Phi_i^t(d), P_d) = \frac{E[v|\Phi_i^t(d), P_d] - P_d}{\rho \text{Var}[v|\Phi_i^t(d), P_d]}, \quad t \in \{A, B, C\}. \quad (3)$$

Table 1 summarizes each type- t trader's information set in each regime ($\Phi_i^t(d)$). In all three regimes, a type-A trader's information set includes the firm's information and that trader's own private signal ξ_i . A type-B trader observes the firm's information y in the untargeted selective disclosure and public disclosure regimes, and a type-C trader only receives the information y in the public disclosure regime.

Table 1: Traders' Information Sets

Information sets	Disclosure Regime		
	$d = s_1$	$d = s_2$	$d = p$
$\Phi_i^A(d)$	y, ξ_i	y, ξ_i	y, ξ_i
$\Phi_i^B(d)$	\emptyset	y	y
$\Phi_i^C(d)$	\emptyset	\emptyset	y
$d = s_1$ represents the targeted selective-disclosure regime, $d = s_2$ represents the untargeted selective-disclosure regime, and $d = p$ represents the public disclosure regime.			

Equilibrium characterization

We now characterize the equilibrium in each disclosure regime. In equilibrium, the trading orders take into account each trader's own information and that trader's rational expectations

based on the common knowledge of other traders' information sets and beliefs about trading strategies.

PROPOSITION 1 *In the disclosure regime d , a unique linear equilibrium in the competitive market exists such that*

$$x_i^A(\Phi_i^A(d)) = \alpha_d^A(y - P_d) + \beta_d^A(y - \xi_i - P_d) + \gamma_d^A(\bar{v} - P_d),$$

$$x_i^B(\Phi_i^B(d)) = \alpha_d^B(y - P_d) + \gamma_d^B(\bar{v} - P_d),$$

$$x_i^C(\Phi_i^C(d)) = \alpha_d^C(y - P_d) + \gamma_d^C(\bar{v} - P_d),$$

$$P_d = \bar{v} + \lambda_d z_d,$$

where $z_d = \alpha_d(y - \bar{v}) + \beta_d(v - \bar{v}) + u$, and $\lambda_d = (\alpha_d + \beta_d + \gamma_d)^{-1}$, with $\alpha_d = f\alpha_d^A + (m - f)\alpha_d^B + (1 - m)\alpha_d^C$, $\beta_d = f\beta_d^A$, $\gamma_d = f\gamma_d^A + (m - f)\gamma_d^B + (1 - m)\gamma_d^C$, for $d \in \{s_1, s_2, p\}$.

The parameters in each disclosure regime are given by:

- In the targeted selective-disclosure regime ($d = s_1$),

$$\alpha_{s_1}^A = h_\eta(\rho + f\beta_{s_1}h_u)^{-1}, \alpha_{s_1}^B = \alpha_{s_1}^C = 0; \beta_{s_1}^A = \rho^{-1}h_a;$$

$$\gamma_{s_1}^A = \rho^{-1}(h_v - \gamma_{s_1}\beta_{s_1}h_u), \text{ and } \gamma_{s_1}^B = \gamma_{s_1}^C = \rho^{-1}(h_v - \gamma_{s_1}\frac{\alpha_{s_1} + \beta_{s_1}}{h_u^{-1} + h_\eta^{-1}\alpha_{s_1}^2}).$$

- In the untargeted selective-disclosure regime ($d = s_2$),

$$\alpha_{s_2}^A = \alpha_{s_2}^B = h_\eta(\rho + m\beta_{s_2}h_u)^{-1}, \text{ and } \alpha_{s_2}^C = 0; \beta_{s_2}^A = \rho^{-1}h_a;$$

$$\gamma_{s_2}^A = \gamma_{s_2}^B = \rho^{-1}(h_v - \gamma_{s_2}\beta_{s_2}h_u), \text{ and } \gamma_{s_2}^C = \rho^{-1}(h_v - \gamma_{s_2}\frac{\alpha_{s_2} + \beta_{s_2}}{h_u^{-1} + h_\eta^{-1}\alpha_{s_2}^2}).$$

- In the public disclosure regime ($d = p$),

$$\alpha_p^A = \alpha_p^B = \alpha_p^C = h_\eta(\rho + \beta_p h_u)^{-1}; \beta_p^A = \rho^{-1}h_a;$$

$$\gamma_p^A = \gamma_p^B = \gamma_p^C = h_v(\rho + \beta_p h_u)^{-1}.$$

In equilibrium, each trader's order may contain one or more of the following three elements: private-information-based trading, $\beta_d^t(y - \xi_i - P_d)$, firm-information-based trading, $\alpha_d^t(y - P_d)$, and market-making-incentive-based trading, $\gamma_d^t(\bar{v} - P_d)$. The private-information-based trading occurs only in the type-A trader's trading. When a sophisticated type-A trader

observes the firm's information y and processes it to generate a private signal ξ_i , that person trades as if receiving two correlated signals about the fundamental value, y and $y - \xi_i$. The trading intensity with respect to the private signal $y - \xi_i$ is given by $\beta_d^A \equiv \rho^{-1} h_a$, which increases with the precision of private signal h_a and the risk tolerance level ρ^{-1} . That is, a trader trades more aggressively when the private signal is more precise and when the trader is less risk averse. This element of trading for each type-A trader is the same across all three regimes.

The firm-information-based trading is captured by $\alpha_d^t = \frac{h_\eta}{\rho + m_d \beta_d h_u}$, where m_d denotes the fraction of traders receiving the firm's information in regime d , with $m_{s_1} = f$, $m_{s_2} = m$, and $m_p = 1$. The firm-information-based trading intensity increases with the precision of firm information, because when updating his belief about the fundamental value, each trader puts more weight on the firm's information when it is more precise, $\frac{\partial \alpha_d^t}{\partial h_\eta} > 0$. At the same time, each trader also uses price to infer the aggregate private information from sophisticated traders and adjusts the weight on the firm's information accordingly. The trading intensity on the firm's information decreases when more traders receive the information, $\frac{\partial \alpha_d^t}{\partial m_d} < 0$, or when the aggregate private-information-based trading intensity increases, $\frac{\partial \alpha_d^t}{\partial \beta_d} < 0$. Last, the trading intensity on the firm's information increases the amount of noise trading, $\frac{\partial \alpha_d^t}{\partial h_u^{-1}} < 0$. This is because price reveals less private information as the amount of noise trading increases, and so traders increase the weight on the firm's information. Note that, in each regime, this element of trading is the same as long as the trader receives the firm's information.

The last element of trading is the market-making-incentive-based trading, as captured by γ_d^t . This trading reflects the traders' incentives to protect themselves from the informed trading by leaning against the market price. In general, for all traders, the trading intensity γ_d^t increases when noise trading (h_u^{-1}) is larger, the prior uncertainty about the fundamental value (h_v^{-1}) is smaller, and the trading intensity with respect to private information (β_d) is smaller. In the public disclosure regime ($d = p$), the market-making-incentive-based trading is the same for all three types of traders, $\gamma_p^A = \gamma_p^B = \gamma_p^C$. However, in the selective disclosure regimes, this trading intensity varies for different types of traders, because of the differential access to the firm's information. If a trader does not receive the firm's information, he or she faces adverse selection with respect to both the firm's information

and the private information acquired by sophisticated traders and hence trades differently from better-informed traders. Therefore, in the targeted selective-disclosure regime, the trading intensities of type-B and type-C traders differ from that of type-A sophisticated traders—i.e., $\gamma_{s_1}^A \neq \gamma_{s_1}^B = \gamma_{s_1}^C$. In the untargeted selective-disclosure regime, type-C traders remain uninformed and trade differently from both type-A and type-B traders—i.e., $\gamma_{s_1}^A = \gamma_{s_1}^B \neq \gamma_{s_1}^C$.

5. Endogenous information access and expertise acquisition

We next examine traders' decisions to acquire information access and expertise in different disclosure regimes. In our model, all traders are initially identical and unsophisticated. We assume that both information access and expertise knowledge are acquired before a firm observes and discloses its information.²² An assumption of this equilibrium is that (1) before traders incur costs to gain information access or expertise, they know the firm's disclosure policy and make acquisition decisions accordingly, and (2) the firm commits to its disclosure policy as anticipated by all traders in the market.

We first calculate the expected utility of each type- t trader in regime d as²³

$$E[U(W_{i,d}^t)] = E[E[U(W_{i,d}^t)|P_d]] = -\sqrt{\frac{\text{Var}[v|\Phi_i^t(d), P_d]}{\text{Var}[v|P_d]}} E[\exp\{-\frac{(E[v|P_d] - P_d)^2}{2\text{Var}[v|P_d]}\}], \quad (4)$$

where $W_{i,d}^t = x_i^t(v - P_d)$, for $t \in \{A, B, C\}$ and $d \in \{s_1, s_2, p\}$, x_i^t and P_d follow from Proposition 1. The expected utility function for each type of trader in (4) will be used to determine the equilibrium fraction of traders to acquire information access and expertise. $\text{Var}[v|\Phi_i^t(d), P_d]$ represents the information uncertainty of a type- t trader, conditional on his information set and market price. In regime $d \in \{s_1, s_2, p\}$, given the different information

²²This follows the literature on costly information acquisition (Grossman and Stiglitz, 1980; Verrecchia, 1982; Diamond, 1985).

²³See the Appendix for the detailed derivation of Equation (4).

sets, we have

$$\begin{aligned} \text{Var}[v|y, \xi_i, P_d]^{-1} &= h_v + h_\eta + h_a + \beta_d^2 h_u, \\ \text{Var}[v|y, P_d]^{-1} &= h_v + h_\eta + \beta_d^2 h_u, \quad \text{and} \\ \text{Var}[v|P_d]^{-1} &= h_v + \frac{(\alpha_d + \beta_d)^2}{h_u^{-1} + h_\eta^{-1} \alpha_d^2}. \end{aligned}$$

Endogenous information access

The decision to gain information access—i.e., becoming a type-B trader—is relevant only in the untargeted disclosure regime. In this regime, a firm discloses its information to whoever pays for information access. A trader needs to decide whether to pay the information access cost, without acquiring expertise, to become a type-B trader, or to stay uninformed as a type-C trader. Denote as $\mu_{s_2}^B$ the ratio of a type-B trader’s expected utility of gaining information access (after paying c) over that of a type-C trader. Given an f_{s_2} fraction of type-A traders and an m_{s_2} fraction of type-B traders already in the market, we have

$$\mu_{s_2}^B \equiv \frac{E[U(W_{i,s_2}^B - c)]}{E[U(W_{i,s_2}^C)]} = \exp(\rho c) \sqrt{\frac{h_v + \frac{(\alpha_{s_2} + \beta_{s_2})^2}{h_u^{-1} + h_\eta^{-1} \alpha_{s_2}^2}}{h_v + h_\eta + \beta_{s_2}^2 h_u}}, \quad (5)$$

where $\beta_{s_2} = f_{s_2} \rho^{-1} h_a$ and $\alpha_{s_2} = \frac{m_{s_2} h_\eta}{\rho + m_{s_2} \beta_{s_2} h_u}$. Because we define the utilities as negative, the inverse of this ratio, $1/\mu_{s_2}^B$, captures the relative advantage of acquiring information access over the benchmark type. The marginal trader, who is indifferent between acquiring information access and remaining uninformed, determines the equilibrium fraction of informed type-B traders in the untargeted disclosure regime. That is, we solve for the fraction $m_{s_2}^*$ that satisfies $\mu_{s_2}^B(m_{s_2}^*) = 1$, if an interior solution exists. Note that $\mu_{s_2}^B(m)$ increases in m . This is because, as more traders are already informed in the market (and thus price becomes more informative), a marginal trader’s information advantage of becoming informed is smaller—i.e., $1/\mu_{s_2}^B$ decreases. A key determinant of $m_{s_2}^*$ is the cost of information access: a higher cost reduces the relative benefit to become informed, lowering the incentive to acquire information access. Lemma 1 follows from the well-known result of Grossman and

Stiglitz (1980).

LEMMA 1 *In the untargeted selective-disclosure regime, for any given f_{s_2} , there exist two threshold values, \bar{c} and \underline{c} , that are implicitly defined by $\mu_{s_2}^B(\underline{c}, m_{s_2} = 1) = 1$ and $\mu_{s_2}^B(\bar{c}, m_{s_2} = f_{s_2}) = 1$ respectively, such that,*

- *when $c \leq \underline{c}$, all traders obtain information access, $m_{s_2}^* = 1$;*
- *when $c \geq \bar{c}$, no trader obtains information access alone without acquiring expertise, $m_{s_2}^* = f_{s_2}$;*
- *when $\underline{c} < c < \bar{c}$, an interior equilibrium fraction of traders with information access satisfies $\mu_{s_2}^B(m_{s_2}^*) = 1$, $f_{s_2} < m_{s_2}^* < 1$.*

Figure 2 plots the expected utility ratio for type-B traders $\mu_{s_2}^B(m)$ against the fraction of type-B traders m , varying the information access cost. When the cost is small, $c = 0.05$, $\mu_{s_2}^B(m)|_{m=1} < 1$, implying that a trader always finds that paying the cost to gain information access is better than staying uninformed, despite that every other trader has already gained information access. Thus, in this case, all traders will gain information access in equilibrium, $m_{s_2}^* = 1$. When the cost is large, $c = 0.5$, $\mu_{s_2}^B|_{m_{s_2}=f_{s_2}} > 1$, implying that a trader is always better off by remaining uninformed than becoming a type-B trader, even when no other trader has gained access yet. Therefore, in this case, no trader gains information access alone in equilibrium, $m_{s_2}^* = f_{s_2}$. When the cost is at the moderate level, $c = 0.2$, the fraction of type-B traders is an interior solution, $m_{s_2}^* \in (f_{s_2}, 1)$, that satisfies $\mu_{s_2}^B(m)|_{m=m_{s_2}^*} = 1$.

Note that the untargeted selective-disclosure regime may converge to one of the other two regimes, depending on the information access cost. If all traders choose to gain information access when the information access cost is sufficiently low, untargeted selective disclosure essentially becomes public disclosure; if, instead, no trader benefits from acquiring information access alone when the information access cost is too high, untargeted selective disclosure is the same as targeted selective disclosure. As will subsequently become clear, the information access cost plays an important role in comparing equilibrium expertise acquisitions in different disclosure regimes.

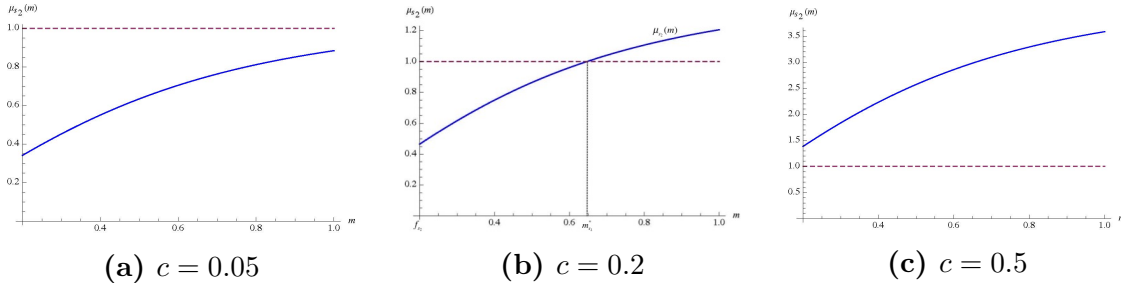


Figure 2: Costly information access.

The parameters are set as: $h_u = 2$, $h_a = 1$, $h_\eta = 3$, $h_v = 0.5$, and $\rho = 2$. We also exogenously set $f_{s_2} = 0.2$. We plot the function of $\mu_{s_2}^B(m)$ with respect to $m \in [f_{s_2}, 1]$ when the cost of information acquisition is at $c = 0.05$, $c = 0.2$, and $c = 0.5$ respectively. The equilibrium fraction is determined by the intersection point of $\mu_{s_2}^B(m)$ and $\mu_{s_2} = 1$.

Endogenous expertise acquisition

Although the expertise acquisition decision occurs in all three regimes, the incentives differ. The equilibrium fraction of sophisticated type-A traders is determined by a marginal trader who is indifferent between becoming sophisticated and remaining unsophisticated.

In the public disclosure regime, let μ_p^A denote the ratio of expected utility of a type-A trader (after paying k) over that of an unsophisticated trader (type-B and type-C traders are the same):

$$\mu_p^A = \frac{E[U(W_{i,p}^A - k)]}{E[U(W_{i,p}^B)]} = \exp(\rho k) \sqrt{\frac{h_v + h_\eta + \beta_p^2 h_u}{h_v + h_a + h_\eta + \beta_p^2 h_u}}, \quad (6)$$

where $\beta_p = f_p \rho^{-1} h_a$.

LEMMA 2 *In the public disclosure regime, an interior equilibrium fraction of type-A traders, $0 < f_p^* < 1$ (that satisfies $\mu_p^A(f_p^*) = 1$), always exists when $\underline{k}_p < k < \bar{k}_p$, where \underline{k}_p and \bar{k}_p satisfy $\mu_p^A(f = 1, \underline{k}_p) = 1$ and $\mu_p^A(f = 0, \bar{k}_p) = 1$, respectively.*

Following Lemma 2, extreme cases can occur, in which all-or-none traders become sophisticated. To prevent such uninteresting extreme cases in our setting, we restrict our analysis to the case where an interior equilibrium always exists in the public disclosure regime; i.e., $\underline{k}_p < k < \bar{k}_p$ holds. That is, some, but not all, traders in the market always find it worthwhile to incur the cost to become sophisticated to process the information, provided information is free. Therefore we emphasize the role of expertise acquisition by sophisticated traders

in the market, and, more importantly, this allows us to focus on the interesting interaction between information access cost and expertise acquisition in different disclosure regimes.

In both targeted and untargeted selective-disclosure regimes, an investor who decides to become sophisticated needs to pay for information access in addition to expertise acquisition. Thus the cost of information access has a nontrivial impact on the incentive to acquire expertise. This impact is manifested in a trader's decision to become sophisticated under untargeted selective disclosure.

Under untargeted selective disclosure, a trader decides whether to become sophisticated by comparing a type-A trader's payoff with that of a type-B trader. Denote as $\mu_{s_2}^A$ the ratio of the expected utility of a type-A trader (after paying $c + k$) over that of a type-B trader (after paying c),

$$\mu_{s_2}^A \equiv \frac{E[U(W_{i,s_2}^A - k - c)]}{E[U(W_{i,s_2}^B - c)]} = \exp(\rho k) \sqrt{\frac{h_v + h_\eta + \beta_{s_2}^2 h_u}{h_v + h_a + h_\eta + \beta_{s_2}^2 h_u}}, \quad (7)$$

where $\beta_{s_2} = f_{s_2} \rho^{-1} h_a$.

For any k , the expertise acquisition decision under untargeted selective disclosure follows one of the two cases below.

- *Case 1:* $c < \bar{c}^*(k)$. In this case, some traders acquire information access without expertise; i.e., $f_p^* < m_{s_2}^* \leq 1$. As a result, the incentives to acquire expertise in both the untargeted selective-disclosure regime, $\mu_{s_2}^A$ in (7), and in the public disclosure regime, μ_p^A in (6), are equal. Therefore $f_{s_2}^* = f_p^*$ in Case 1.
- *Case 2:* $c \geq \bar{c}^*(k)$. In this case, no traders acquire information access alone without expertise. Thus the incentive to acquire expertise is combined with the incentive of information access, making it equal to the targeted selective-disclosure regime, i.e., $f_{s_2}^* = f_{s_1}^*$, and $f_{s_1}^*$ is determined by the implicit function $\mu_{s_1}^A(f_{s_1}^*) = 1$.

The cutoff value, $\bar{c}^*(k)$, is implicitly defined by $\mu_{s_2}^B(\bar{c}^*(k), m_{s_2}^* = f_p^*) = 1$, where $0 < f_p^*(k) < 1$ is the fraction of traders who acquire expertise if information is free (i.e., public disclosure).

In sum, a trader's decision to become sophisticated in the untargeted selective-disclosure regime either resembles that in the public disclosure regime or in the targeted disclosure

regime, depending on the information access cost. In other words, public disclosure can be viewed as an extreme case in which information is free for all traders in the market, while targeted selective disclosure is the other extreme case in which information access is too costly to be acquired without expertise.

The incentive to acquire expertise in the untargeted selective-disclosure regime is an important benchmark to compare the expertise acquisition incentives in the other two regimes, as shown in Proposition 2.

PROPOSITION 2 *With the endogenous expertise acquisition, there exists a threshold $\bar{c}^*(k)$, as defined implicitly by $\mu_{s_2}^B(m = f_p^*, \bar{c}^*(k)) = 1$, such that*

- (Case 1) when $c < \bar{c}^*(k)$, the equilibrium fraction of type-A traders in the untargeted selective-disclosure regime is the same as that in the public disclosure regime, and both are smaller than the fraction of type-A traders in the targeted selective-disclosure regime; i.e., $f_{s_1}^* > f_{s_2}^* = f_p^*$;
- (Case 2) when $c \geq \bar{c}^*(k)$, the equilibrium fraction of type-A traders in the targeted selective-disclosure regime is the same as that in the untargeted selective-disclosure regime, and both are smaller than the fraction of type-A traders in the public disclosure regime; i.e., $f_{s_1}^* = f_{s_2}^* \leq f_p^*$,

where f_p^* and $f_{s_1}^*$ are implicit solutions to $\mu_p^A(f_p^*) = 1$ and $\mu_{s_1}^A(f_{s_1}^*) = 1$, respectively.

To understand the intuition in Proposition 2, denote as $\mu_{s_1}^A(f)$ the ratio of expected utility of a marginal type-A trader (after paying $k + c$) over an uninformed trader in the targeted selective-disclosure regime, given that an f fraction of type-A traders already exists in the market:

$$\mu_{s_1}^A(f) \equiv \frac{E[U(W_{i,s_1}^A - k - c)]}{E[U(W_{i,s_1}^{B,C})]} = \exp(\rho(k + c)) \sqrt{\frac{h_v + \frac{(\alpha_{s_1} + \beta_{s_1})^2}{h_u^{-1} + h_\eta^{-1} \alpha_{s_1}^2}}{h_v + h_a + h_\eta + \beta_{s_1}^2 h_u}}, \quad (8)$$

where $\beta_{s_1} = f\rho^{-1}h_a$ and $\alpha_{s_1} = \frac{fh_\eta}{\rho + f\beta_{s_1}h_u}$.

For any given f , we can rewrite $\mu_{s_1}^A(f)$ as

$$\mu_{s_1}^A(f) = \mu_{s_2}^B(f, m_{s_2} = f) \cdot \mu_{s_2}^A(f). \quad (9)$$

Let $f = f_p^*$, the equilibrium fraction of type-A traders in the public disclosure regime. By examining whether $\mu_{s_1}^A(f_p^*)$ is greater or less than 1, we can then determine whether the equilibrium fraction of type-A traders in the targeted selective-disclosure regime, $f_{s_1}^*$, exceeds or falls below that in the public disclosure regime, f_p^* . Recall that, in Case 1, when the information access cost is relatively small ($c < \bar{c}^*(k)$), the equilibrium fraction of type-B traders is nonzero (i.e., $m_{s_2}^* > f_p^*$), we have $\mu_{s_2}^A(f_p^*) = 1$ and $\mu_{s_2}^B(f_p^*, m_{s_2} = f_p^*) < \mu_{s_2}^B(f_p^*, m_{s_2}^*) = 1$; in Case 2, when the cost of information access is large ($c \geq \bar{c}^*(k)$), the equilibrium fraction of type-B traders is zero, we have $\mu_{s_2}^A(f_p^*) = 1$ and $\mu_{s_2}^B(f_p^*, m_{s_2} = f_p^*) \geq 1$. Taking together these two cases, we have

$$\mu_{s_1}^A(f_p^*) = \begin{cases} < 1 \Rightarrow f_{s_1}^* > f_p^*, & \text{when } c < \bar{c}^*(k), \\ \geq 1 \Rightarrow f_{s_1}^* \leq f_p^*, & \text{when } c \geq \bar{c}^*(k). \end{cases} \quad (10)$$

Intuitively, when a marginal trader is indifferent to acquiring expertise in the public disclosure regime, such a trader is also indifferent regarding expertise acquisition in the untargeted selective-disclosure regime, as long as the information access cost is not too large. However, this indifferent trader only enjoys the relative information advantage over type-B traders who also receive the information under untargeted selective disclosure while paying both information access and expertise acquisition costs. If the same trader were given exclusive access to information under targeted selective disclosure (while still paying the same costs), he or she would be strictly better off than under untargeted selective disclosure and would always choose to acquire expertise to become a type-A trader. Thus, in equilibrium, more traders acquire expertise in the targeted selective-disclosure regime than in the other two regimes.

In contrast, when the information access cost is large, a marginal trader who is indifferent to acquiring expertise under public disclosure finds it unprofitable to pay for the additional information access cost under untargeted selective disclosure, because doing so reduces the marginal benefit of expertise acquisition. As a result, this marginal trader will not acquire expertise under untargeted selective disclosure. His or her decision to acquire the expertise is essentially identical to that under targeted selective disclosure, in which the information access and expertise acquisition decisions are always bundled together. Thus, in equilibrium,

more traders acquire expertise in the public disclosure regime than in the other two.

Comparative statics

We further provide comparative static analyses about the threshold \bar{c}^* in Proposition 2. We are interested in several parameters that affect this threshold: the expertise acquisition cost k , the precision of the firm's information (h_η), the precision of sophisticated traders' private signals (h_a), the uncertainty in the firm's fundamental value h_v^{-1} , and the amount of noise trading (h_u^{-1}). We need to consider these parameters' indirect effects on expertise acquisition to determine their total effects.

COROLLARY 2 *The threshold $\bar{c}^*(k)$ ²⁴*

- *increases with the cost of expertise acquisition, $\frac{\partial \bar{c}^*}{\partial k} > 0$;*
- *increases with the precision of the firm's information, $\frac{\partial \bar{c}^*}{\partial h_\eta} > 0$;*
- *increases with the precision of the firm's fundamental value, $\frac{\partial \bar{c}^*}{\partial h_v} > 0$;*
- *decreases with the precision of a type-A trader's private signal, $\frac{\partial \bar{c}^*}{\partial h_a} < 0$;*
- *does not depend on noise trading, $\frac{\partial \bar{c}^*}{\partial h_u} = 0$.*

Recall that \bar{c}^* is the threshold for the existence of nonzero type-B traders who are willing to acquire information access without expertise acquisition in the untargeted selective-disclosure regime, as implicitly defined by $\mu_{s_2}^B(\bar{c}^*, m_{s_2}^* = f_p^*) = 1$. First, the cost of expertise acquisition affects the threshold \bar{c}^* through its effect on endogenous expertise acquisition (f_p^*) under public disclosure. In the presence of more sophisticated traders, a marginal type-B trader's incentive (or relative information advantage) to acquire information access alone decreases, implying that the threshold \bar{c}^* decreases with f_p^* , all else equal. Since fewer traders (i.e., smaller f_p^*) become sophisticated type-A traders when the expertise acquisition cost increases, the threshold \bar{c}^* increases with k . Intuitively, the benefit of exclusive information

²⁴These parameters also have similar effects on the lower bound $\underline{c}^*(k)$. We do not include them because the lower bound $\underline{c}^*(k)$ plays a limited role in our model: it is irrelevant to both expertise acquisition and price informativeness comparisons in different regimes.

access through targeted selective disclosure becomes more important if more time and effort are required to process the firm’s information to obtain valuable private signals.

All other parameters, (h_η, h_a, h_v, h_u) , have both a direct effect on $\mu_{s_2}^B$ and an indirect effect on f_p^* , which together determine the net effect on \bar{c}^* , as shown in Corollary 2. Specifically, when the firm’s information is more precise ($h_\eta \uparrow$), the relative benefit of acquiring information access alone increases under untargeted selective disclosure, while, at the same time, the incentive to acquire expertise under public disclosure is smaller—both effects lead to a higher threshold \bar{c}^* . When the fundamental value is less volatile ($h_v \uparrow$), the benefit of acquiring information access alone under untargeted selective disclosure and that of acquiring expertise under public disclosure are both reduced, but the latter effect dominates the former, leading to a higher \bar{c}^* . When the sophisticated traders’ private signal is more precise ($h_a \uparrow$), the relative information advantage of acquiring information access alone is smaller, which always dominates its indirect effect on the expertise acquisition incentive and leads to a lower \bar{c}^* . Finally, the amount of noise trading has no effect on the threshold, as more noise trading increases the benefit to acquire expertise (and thus decreases the relative benefit of selective disclosure) but, at the same time, also increases the benefit of gaining exclusive access to information. These two effects exactly offset each other in equilibrium, and the threshold remains unchanged when the amount of noise trading varies.

6. Price informativeness and learning from the market

Price informativeness

In a rational expectation model, price aggregates investors’ average expectation about the fundamental value. Studies show that more informative price (or more efficient price) improves investment efficiency and resource allocation of the capital market.²⁵ In the literature

²⁵For example, Fishman and Hagerty (1989) demonstrate how more efficient price can lead to more efficient investment. Holmstrom and Tirole (1993) and Baiman and Verrecchia (1995) find that optimal managerial compensation depends on market price, as price impounds information about the manager’s effort; improving price efficiency then improves contracting efficiency. Dye and Sridhar (2002) also show that information can flow from capital markets to firms and affect firms’ real decisions. Durnev et al. (2004) find a positive association between price informativeness and investment efficiency. Gao and Liang (2013) examine the market feedback effect, which can simultaneously improve both price informativeness and investment efficiency, as

(Vives, 2008; Goldstein and Yang, 2017), price informativeness is defined as the precision of the posterior about the fundamental value v , conditional on price. Given the equilibrium price function in Proposition 1, we derive price informativeness in disclosure regime d as

$$\tau_d \equiv \text{Var}[v|P_d]^{-1} = h_v + \frac{(\alpha_d + \beta_d)^2}{h_u^{-1} + h_\eta^{-1}\alpha_d^2}, \quad d \in \{s_1, s_2, p\}, \quad (11)$$

where α_d and β_d are as in Proposition 1. Price informativeness depends on the aggregate firm-information-based trading intensity α_d and the aggregate private-information-based trading intensity β_d , as both reflect how much information is incorporated into the price.

As a benchmark, we first compare price informativeness in different regimes without endogenous information access or expertise acquisition decisions. That is, we assume that some traders are endowed with expertise to better process the firm information, and thus the fraction of sophisticated type-A traders (f_d) remains the same in the three regimes. The fraction of type-B traders is determined by the firm's disclosure regime. In the targeted selective-disclosure regime, the fraction of type-B traders is zero, $m_{s_1} = f_{s_1}$; in the untargeted selective-disclosure regime, the fraction of type-B traders is exogenously given but always smaller than 1, $0 < f_{s_2} \leq m_{s_2} \leq 1$; and in the public disclosure regime, all traders receive information, $m_p = 1$.

Given the same fraction of sophisticated traders, $f_{s_1} = f_{s_2} = f_p$, the aggregate private-information-based trading intensity is the same in all three disclosure regimes; i.e., $\beta_{s_1} = \beta_{s_2} = \beta_p$. Next the aggregate firm-information-based trading intensity increases with the fraction of traders receiving the firm's information; i.e., $\alpha_{s_1} < \alpha_{s_2} < \alpha_p$ for the same β_d in different regimes. Therefore we have the following Lemma 3.

LEMMA 3 *With exogenous information access and expertise acquisitions, price informativeness increases with the broadness of the disclosure audience; i.e., $\tau_{s_1} < \tau_{s_2} < \tau_p$.*

With endogenous expertise acquisition, the price informativeness in the disclosure regime d , $\tau_d(f_d^*)$, depends on the equilibrium fraction of sophisticated traders f_d^* in each regime. Proposition 2 shows that the equilibrium fraction of sophisticated traders under untargeted price aggregates information that firms may not possess.

selective disclosure is always weakly smaller than that under public disclosure or under targeted selective disclosure, $f_{s_2}^* \leq \min\{f_p^*, f_{s_1}^*\}$.

Untargeted selective disclosure

It is convenient to first compare the price informativeness in the untargeted selective-disclosure regime with the other two regimes first and then compare the targeted selective-disclosure regime with the public disclosure regime.

PROPOSITION 3 *When expertise acquisition and information access are both endogenous, the price informativeness in the untargeted selective-disclosure regime is always smaller than that in the other two regimes; i.e., $\tau_p(f_p^*) \geq \tau_{s_2}(f_{s_2}^*, m_{s_2}^*)$ and $\tau_{s_1}(f_{s_1}^*) \geq \tau_{s_2}(f_{s_2}^*, m_{s_2}^*)$.*

The proof follows from the following discussion. Not surprisingly, the price informativeness under public disclosure is always greater than that under untargeted selective disclosure, $\tau_p(f_p^*) \geq \tau_{s_2}(f_{s_2}^*, m_{s_2}^*)$, since the information is available to all traders under public disclosure, whereas, under untargeted selective disclosure, only a fraction of traders acquire information access; i.e., $m_{s_2}^* \leq 1$.

But comparing price informativeness in the targeted and untargeted selective-disclosure regimes is not so straightforward. Although the fraction of sophisticated traders under untargeted selective disclosure never exceeds that fraction under targeted selective disclosure, more traders gain information access (without expertise) under untargeted selective disclosure—i.e., $m_{s_2}^* \geq f_{s_2}^*$. The price informativeness comparison depends on the relative magnitude of these two countervailing effects. To compare these two regimes, we again consider two different cases.

(i). When the information access cost is sufficiently high ($c \geq \bar{c}^*$), no trader gains information access alone under untargeted selective disclosure, and the incentive to acquire expertise is identical to that under targeted selective disclosure; i.e., $m_{s_2}^* = f_{s_2}^* = f_{s_1}^*$. Then the price informativeness is the same in the two regimes.

(ii). When the information access cost is not too high ($c < \bar{c}^*$) and therefore $f_{s_2}^* < m_{s_2}^* \leq 1$, the relative utility of a type-B bidder satisfies $\mu_{s_2}^B(f_{s_2}^*, m_{s_2}^*) \leq 1$ in the untargeted selective-disclosure regime. In addition, the expertise acquisition yields an interior solution

because of nonzero type-B traders; i.e., $\mu_{s_2}^A(f_{s_2}^*) = 1$. Therefore,

$$\mu_{s_2}^A(f_{s_2}^*) \cdot \mu_{s_2}^B(f_{s_2}^*, m_{s_2}^*) = \frac{\text{Var}[v|y, \xi_i, P_{s_2}]}{\text{Var}[v|P_{s_2}]} \leq 1. \quad (12)$$

In the targeted selective-disclosure regime, we always have

$$\mu_{s_1}^A(f_{s_1}^*) = \frac{\text{Var}[v|y, \xi_i, P_{s_1}]}{\text{Var}[v|P_{s_1}]} = 1. \quad (13)$$

Since $f_{s_1}^* \geq f_{s_2}^*$, it must hold that $\text{Var}[v|y, \xi_i, P_{s_2}] \geq \text{Var}[v|y, \xi_i, P_{s_1}]$. We can easily infer from (12) and (13) that $\text{Var}[v|P_{s_2}] \geq \text{Var}[v|P_{s_1}]$.

The intuition for this result is as follows. Under untargeted selective disclosure, each sophisticated trader decides to acquire expertise through a two-step process, as shown in (12): first the trader decides whether to gain access by comparing the relative information advantage over a completely uninformed trader, and then the trader decides to further acquire expertise by comparing the relative information advantage over a less informed type-B trader. As a result, in equilibrium, a type-A trader's relative information advantage over a type-C trader under untargeted selective disclosure is essentially the same as (when $m_{s_2}^* < 1$) or lower than (when $m_{s_2}^* = 1$) that under targeted selective disclosure. In addition, the exclusive information access encourages more expertise acquisition and thus lowers the information uncertainty for a type-A trader under targeted selective disclosure than under untargeted selective disclosure. Therefore an individual type-C trader's information uncertainty (implied in price) is also lower in equilibrium under targeted selective disclosure than under untargeted selective disclosure; i.e., $\text{Var}[v|P_{s_1}] \leq \text{Var}[v|P_{s_2}]$.

Overall, combining both cases, the price informativeness in the untargeted selective-disclosure regime is always weakly smaller than that in the targeted selective-disclosure regime; that is, broader access to information under untargeted selective disclosure is not large enough to compensate for the lower level of expertise acquisition.

Proposition 3 implies that, when a firm can identify sophisticated traders and thus disclose information exclusively to them as the targeted audience, it is then never optimal for the firm to selectively disclose information to an untargeted group of investors. The untargeted selective-disclosure regime, as a hybrid regime, is either dominated by the pub-

lic disclosure regime due to the limited information access to investors or by the targeted selective-disclosure regime due to the lower expertise-acquisition incentive.

Targeted selective disclosure versus public disclosure

We now compare the price informativeness in the targeted selective-disclosure and public disclosure regimes. As previously discussed, public disclosure provides much broader access to information than untargeted selective disclosure, but targeted selective disclosure may encourage more expertise acquisition than untargeted selective disclosure. Therefore a trade-off exists between (1) the amount of private information impounded through a larger fraction of sophisticated traders in the targeted selective-disclosure regime and (2) the free information access available to all investors in the public disclosure regime. Since the information access cost directly affects the incentive to acquire expertise in the targeted selective-disclosure regime, we again identify the cost of information access as the impetus for the trade-offs of the overall comparison of price informativeness in these two regimes.

PROPOSITION 4 *With endogenous information access and expertise acquisition, there exists a threshold $\hat{c} \in [\underline{c}^*, \bar{c}^*]$ for the information access cost, such that the price informativeness in the targeted selective-disclosure regime exceeds that in the public disclosure regime if and only if $c < \hat{c}$.*

To see the intuition for Proposition 4, note that the price informativeness always decreases with the information access cost in the targeted selective-disclosure regime, $\frac{\partial \tau_{s_1}^*}{\partial c} < 0$, because higher information access cost reduces the equilibrium fraction of sophisticated traders, $\frac{\partial f_{s_1}^*}{\partial c} < 0$. Consider now two extreme cases.

(a) When the information access cost is low, $c < \underline{c}^*$, untargeted selective disclosure is equivalent to public disclosure, because all traders choose to acquire information access ($m_{s_2}^* \rightarrow 1$). Therefore we have $\tau_{s_2}^* = \tau_p^*$. Furthermore, since $\tau_{s_1}^* \geq \tau_{s_2}^*$ from Proposition 3, we obtain that the price informativeness under targeted selective disclosure is always greater than that under public disclosure, $\tau_{s_1}^* \geq \tau_p^*$.

(b) When the cost of information access is high, $c \geq \bar{c}^*$, untargeted selective disclosure converges to targeted selective disclosure because no trader acquires information access alone. Therefore we have $\tau_{s_1}^* = \tau_{s_2}^*$. Since $\tau_{s_2}^* \leq \tau_p^*$ from Proposition 3, the price informativeness

under targeted disclosure is always smaller than that under public disclosure, $\tau_{s_1}^* \leq \tau_p^*$.

When the cost is in-between, $c \in [\underline{c}^*, \bar{c}^*]$, by continuity and monotonicity, there always exists a unique value $\hat{c} \in [\underline{c}, \bar{c}]$ such that the price informativeness in the targeted disclosure regime is greater than that in the public disclosure regime, if and only if the information access cost is below this cutoff value.

Learning from the market

In our model, the firm discloses information to the market and, at the same time, learns from the market price about its own future payoff from the price, because price aggregates private information from sophisticated traders in the market. To measure the degree of learning from the market, we define the learning effect, L_d , as the incremental information contained in price relative to what the firm already knows,

$$L_d \equiv Var[v|y, P_d]^{-1} - Var[v|y]^{-1} = \beta_d^2 h_u, \quad d \in \{s_1, s_2, p\}. \quad (14)$$

This definition of the learning effect follows Goldstein and Yang (2017). A firm learns more from the market as type-A traders' private-information-based trading (i.e., β_d) increases. In addition, with more noise trading, the price reveals less about the aggregate private information of sophisticated traders, reducing the firm's learning. Given that each type-A trader's private-information-based trading intensity, i.e., β_d^A , is the same across all regimes, the overall learning effect in each regime then depends on the equilibrium fraction of traders who become sophisticated, f_d^* . Following Proposition 2, we arrive at an immediate implication that the learning effect in the targeted selective-disclosure regime is largest for a relatively small information access cost, whereas the learning effect in the public disclosure regime is largest for a relatively large information access cost.

We now turn to examine an interesting question related to the learning effect: How does the firm's information quality affect the firm's learning from the market or, equivalently, the equilibrium fraction of sophisticated traders in different regimes? In our model, increasing the quality of public information has a well-known crowding-out effect in the public disclosure

regime.²⁶ That is, when the firm’s information is more precise, the marginal information advantage of becoming a sophisticated over an unsophisticated trader becomes smaller, as captured by a larger μ_p^A ; that is, $\frac{\partial \mu_p^A}{\partial h_\eta} > 0$. Thus the equilibrium fraction of sophisticated traders always decreases with the firm’s information quality under public disclosure.

In the targeted selective-disclosure regime, however, increasing the firm’s information precision does not always reduce the expertise acquisition. This is because acquiring expertise not only allows traders to generate valuable “private” signals with their expertise knowledge but also grants them exclusive access to the “common” signal disclosed by the firm. Thus increasing the precision of the firm’s information has a nontrivial effect on the incentive of expertise acquisition (μ_A^{s1}). To examine the effect of h_η on μ_A^{s1} , we rewrite μ_A^{s1} into two parts, so that the benefits of information access and expertise can be separated.

$$\mu_{s_1}^A = \exp\{\rho(k + c)\} \sqrt{I_k^A \cdot I_c^A}, \quad (15)$$

where $I_k^A \equiv \frac{\text{Var}[v|y, P_{s_1}]^{-1}}{\text{Var}[v|y, \xi_i, P_{s_1}]^{-1}} = \frac{h_v + h_\eta + \beta_{s_1}^2 h_u}{h_v + h_a + h_\eta + \beta_{s_1}^2 h_u}$, and $I_c^A \equiv \frac{\text{Var}[v|P_{s_1}]^{-1}}{\text{Var}[v|y, P_{s_1}]^{-1}} = \frac{h_v + \frac{(\alpha_{s_1} + \beta_{s_1})^2}{h_u + h_\eta}}{h_v + h_\eta + \beta_{s_1}^2 h_u}$.

I_k^A represents a type-A trader’s incentive to acquire expertise to better process information, and I_c^A represents the incentive to simply gain information access without processing it. Note that increasing information precision always increases I_k^A ; i.e., $\frac{\partial I_k^A}{\partial h_\eta} > 0$. So a crowding-out effect still exists on the incentive to acquire expertise to generate the valuable private signal, assuming the trader already obtains the information.

Increasing information quality, however, has a different effect on the incentive to gain information access through I_c^A . Taking the first-order derivative of I_c^A with respect to the

²⁶The literature documents a *crowding-out* effect on private information production by public disclosure (Diamond, 1985; Kim and Verrecchia 1994; Gao and Liang 2013; Colombo, Femminis, and Pavan 2014; Goldstein and Yang, 2017). As pointed out by Goldstein and Yang (2017), when both public and private signals provide information on the same fundamental variable v , these two signals can substitute each other.

information precision h_η , we have

$$\frac{\partial I_c^A}{\partial h_\eta} \propto \underbrace{(Var[v|y, P_{s_1}]^{-1} - Var[v|P_{s_1}]^{-1}) \frac{\partial Var[v|P_{s_1}]^{-1}}{\partial h_\eta}}_{\text{crowding-out effect} > 0} + \underbrace{Var[v|P_{s_1}]^{-1} \left(\frac{\partial Var[v|P_{s_1}]^{-1}}{\partial h_\eta} - \frac{\partial Var[v|y, P_{s_1}]^{-1}}{\partial h_\eta} \right)}_{\text{exclusive-access benefit effect} < 0}. \quad (16)$$

Note two separate effects here: a crowding-out effect and an exclusive-access benefit effect in (16). In the crowding-out effect, when the firm information is more precise, the price becomes more informative, which directly reduces the traders' incentive to gain information access ($\frac{\partial Var[v|y, P_{s_1}]^{-1}}{\partial h_\eta} > 0$). However, at the same time, there is an exclusive-access benefit effect, because the price only partially reveals the private information of traders, and the impact of increasing information quality on price informativeness is smaller for traders who do not receive information ($\frac{\partial Var[v|P_{s_1}]^{-1}}{\partial h_\eta} < \frac{\partial Var[v|y, P_{s_1}]^{-1}}{\partial h_\eta}$), resulting in a greater incentive to gain information access. Combining these two effects, the exclusive access benefit is more valuable and dominates the crowding-out effect when the firm fundamental is relatively less uncertain (h_v is large).

Combining the effects on I_k^A and I_c^A , we find that the overall incentive to acquire expertise under targeted selective disclosure is nonmonotonic. When the positive effect from the exclusive access to information dominates, increasing the firm's information quality may encourage more expertise acquisition in the targeted selective-disclosure regime.

COROLLARY 3 *When the firm's information precision increases,²⁷*

- *in the public disclosure regime, the equilibrium fraction of sophisticated traders always decreases; i.e., $\frac{\partial f_p^*}{\partial h_\eta} < 0$.*
- *in the targeted selective-disclosure regime, the equilibrium fraction of sophisticated*

²⁷The effect of information precision on the expertise acquisition in the untargeted selective-disclosure regime is the same as in the public (targeted selective) disclosure regime when the information access cost is low (high).

traders increases (i.e., $\frac{\partial f_{s_1}^*}{\partial h_\eta} > 0$) if and only if

$$h_v > \frac{\beta_{s_1}^2 h_u (h_a + h_\eta + \beta_{s_1}^2 h_u)^2}{h_a (h_a + \beta_{s_1}^2 h_u)}. \quad (17)$$

Intuitively, in the targeted selective-disclosure regime, the learning effect can increase when the firm's information quality increases, because the exclusive information-access benefit may encourage traders to acquire more expertise to gain access to information. The condition for the stronger learning effect in (17) is more likely to hold when the firm's information quality h_η is relatively low, compared to the private information impounded into the price. Therefore targeted selective disclosure enables the firm to learn more from the market than public disclosure and makes it more likely to disclose higher quality information to learn more from the market.

7. Discussion

General information structure. In our main model, each type-A trader observes a private signal with an idiosyncratic i.i.d. noise ε_i . This assumption implies that each sophisticated trader interprets the noise in the firm's information differently but the aggregate private information is perfect. As a result, each sophisticated trader adjusts his or her trade according to the information revealed from the market price—i.e., each type-A trader also learns from the market price. However, our results are not driven by sophisticated traders' learning from the market price. To see this, we consider an alternative setting where all sophisticated investors observe the same private signal, $\xi_i = \eta + \varepsilon$, with common noise $\varepsilon \sim N(0, h_\varepsilon^{-1})$. This setting differs from the main model, because sophisticated traders receive identical private signals and do not learn from the price; their information efficiency is insensitive to expertise acquisition by other traders. Thus public disclosure more likely results in a greater price informativeness than the targeted selective disclosure, compared to the main model. However, we still find that, when the information access cost is sufficiently small, targeted selective disclosure encourages more expertise acquisition than public disclosure and leads to greater price informativeness. Our online appendix provides the formal

analytical analysis of this alternative setting.²⁸

Note that our model encompasses many other specific assumptions about traders' information structure or alternative market structures in a rational expectations model. For example, our results also hold if we instead assume a finite number of traders become sophisticated, as in Hellwig (1980), or if we assume other private signal structures. A necessary condition, as shown in the main analysis, all comes down to a sufficiently low information access cost, so that targeted selective disclosure encourages more expertise acquisition to compensate for the loss of broader information access. Our results remain as long as price does not perfectly reveal the traders' private information

Learning from the market. In our model, a firm learns about its own fundamental value from the market price, because sophisticated investors' private signals add incremental value to the firm's information. This assumption applies when a firm lacks the ability or resources to fully understand or estimate the noise due to industry or macroeconomic factors that analysts may have more expertise to analyze. However, our results also extend to settings without such learning effects. For example, if the role of sophisticated traders is confined to better interpreting information a firm already knows, this firm then only cares about price informativeness, as it does not learn anything from the market price per se. A stylized model with this feature assumes that the firm observes two signals, $v + \varepsilon$ and η , separately but can only communicate through an aggregate signal, $y = v + \varepsilon + \eta$. Sophisticated investors, however, can separate these two sources of information after observing the aggregate signal. In this setup, investors still gain an advantage in trading if they acquire expertise, which leads to similar implications as in our current model. The analysis about the learning effect will not be applicable in this setting. But our main results remain that targeted selective disclosure may encourage more expertise acquisition and lead to greater price informativeness than public disclosure when information access cost is relatively small.

²⁸We may also consider a generalized model that allows each trader's interpretation of the firm's information to contain both a common term and an idiosyncratic term. For example, we may assume that each sophisticated trader, after observing the firm's information $y = v + \eta$, obtains a private signal $\xi_i = \eta + \varepsilon + \varepsilon_i$, where $\varepsilon \sim N(0, h_\varepsilon^{-1})$ is common noise, and $\varepsilon_i \sim N(0, h_a^{-1})$ is i.i.d. idiosyncratic noise among all traders. Because of the common noise term, the aggregate private signal does not perfectly reveal η , thus reducing the amount of learning from the price by sophisticated traders. When $h_\varepsilon \rightarrow \infty$, we are back to the main model that features only the idiosyncratic noise; when $h_a \rightarrow \infty$, we are in another extreme setting that features only the common noise. Our results are robust in this general setting as well.

Identification of sophisticated traders. In our model, (targeted) selective disclosure may be preferred over public disclosure only when a firm can identify and target sophisticated investors in disclosure. However, not all sophisticated investors may be perfectly identified by the firm. To incorporate this imperfect identification, a simple modification to our model assumes that a fraction of f traders have acquired expertise but only receive information with probability $p \in [0, 1]$. To solve this model, we then define $f' = p \cdot f$ as the *effective* fraction of traders that might use their expertise. The incentive to acquire expertise in the imperfectly targeted selective-disclosure regime can be represented by the relative information disadvantage for type-A traders over the other traders, which is given by $\mu_{s_1}^{A'} = p \cdot \exp(\rho(k + c)) \sqrt{I_{s_1}^A(f')}$, where $I_{s_1}^A \equiv \frac{\text{Var}[v|P_{s_1}]^{-1}}{\text{Var}[v|y, \xi_i, P_{s_1}]^{-1}}$. The incentives to acquire expertise in the untargeted selective and public disclosure regimes, however, remain the same as before, because traders can use their expertise as long as the firm makes disclosures. Not surprisingly, if sophisticated traders cannot be perfectly identified, the relative benefit of acquiring expertise becomes smaller, and public disclosure is more likely preferred.

Small and young firms with lower analysts following or smaller institutional ownership may find it hard to identify potential investors who have acquired expertise in analyzing the firm's information. For these firms, our model suggests that public disclosure encourages more expertise acquisition and leads to more informative prices than untargeted selective disclosure. This is consistent with previous findings that, before Reg FD, firms that provided open conference calls had more dispersed shareholders, lower institutional ownership, and fewer analysts following them than firms that provided closed conference calls (Bushee et al., 2003).

8. Conclusion

We study the impact of a firm's disclosure-audience policy by incorporating the important role of sophisticated investors as information processors in the market. In our model, sophisticated traders process the firm's information and generate valuable private signals about the noise in the firm's information. We characterize the effect of a firm's disclosure regime on the traders' incentive to acquire the expertise as well as price informativeness as

a result of endogenous expertise acquisition. We find that, when the information access cost is small, the targeted selective-disclosure regime gives traders greater incentive to acquire expertise than the public disclosure regime and, in equilibrium, more traders become sophisticated. With a smaller information access cost, more private-information-based trading from sophisticated traders leads to greater price informativeness in the selective disclosure regime than in the public disclosure regime. By contrast, when the information access cost is large, disclosure to a broader audience in the public disclosure regime results in more informative prices.

One critical assumption of our model is that the firm does not change the quality of information disclosed to different parties. This assumption is consistent with the SEC's objective of inducing firms to disclose the same information to the public, to analysts, and to other parties. However, mandating companies to disclose the same information to all parties may change the quality of information companies choose to disclose. Michaeli (2017) finds that the manager may gather more precise information when he or she can choose a subset of users to receive the information without considering endogenous expertise acquisition among investors. Future research might further examine the choice of information quality when firms can choose their disclosure audience.

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Appendix: Proof

PROOF OF *Proposition 1*

In all regimes, we first conjecture the linear demand function of each type of traders, and use the market clearing condition to derive the price function. We then obtain the parameters of the conjectured demand functions from the optimal trade for each type of sophisticated traders given their information sets in different regimes, as in (3). The equilibrium with the linear demand function is unique in this setting.

We conjecture the following linear demand functions for each type of traders:²⁹

$$\begin{aligned} x_i^A(\Phi_i^A(d), P_d) &= \alpha_d^A(y - P_d) + \beta_d^A(y - \xi_i - P_d) + \gamma_d^A(\bar{v} - P_d), \\ x_i^B(\Phi_i^B(d), P_d) &= \alpha_d^B(y - P_d) + \gamma_d^B(\bar{v} - P_d). \\ x_i^C(\Phi_i^C(d), P_d) &= \alpha_d^C(y - P_d) + \gamma_d^C(\bar{v} - P_d). \end{aligned} \tag{18}$$

In the above demand functions, the demand by each type of traders is linear in the price P_d , the firm's information (y) if available, and the trader's private information ($y - \xi_i$) if acquired.

Given that $\xi_i = \eta + \varepsilon_i$ and $\int_0^f \varepsilon_i di = 0$, we have $\int_0^f (y - \xi_i) di = fv$. Define $\alpha_d = f\alpha_d^A + (m - f)\alpha_d^B + (1 - m)\alpha_d^C$, $\beta_d = f\beta_d^A$, $\gamma_d = f\gamma_d^A + (m - f)\gamma_d^B + (1 - m)\gamma_d^C$. Substituting the above demand functions into the market-clearing condition in (2), we have

$$\alpha_d(y - P_d) + \beta_d(v - P_d) + \gamma_d(\bar{v} - P_d) + u = 0. \tag{19}$$

We then obtain the price P_d as below

$$P_d = \bar{v} + \lambda_d(\alpha_d(y - \bar{v}) + \beta_d(v - \bar{v}) + u), \quad \text{where } \lambda_d = (\alpha_d + \beta_d + \gamma_d)^{-1}. \tag{20}$$

Now we derive the equilibrium in each regime based on different information sets available to traders.

²⁹We obtain the same results if we start with a more general form of linear conjecture—i.e., $x_i^t = \alpha y + \beta \xi_i + \gamma P + \delta \bar{v}$. This particular form of conjecture follows Vives (2008) and facilitates our analysis.

1) **Targeted selective disclosure** ($d = s_1$)

In the targeted selective-disclosure regime, no information is disclosed to type-B and type-C traders, and they can only trade based on the price. Following (3), the optimal trading order that maximizes type-B and type-C traders' expected utility conditional on price is given by:

$$x_i^t(P_{s_1}) = \frac{E[v|P_{s_1}] - P_{s_1}}{\rho \text{Var}[v|P_{s_1}]}, \quad t \in \{B, C\}. \quad (21)$$

Given the price function in (20), it follows that

$$E[v|P_{s_1}] = \bar{v} + \frac{\lambda_{s_1}^{-1}(\alpha_{s_1} + \beta_{s_1})}{h_v(h_u^{-1} + h_\eta^{-1}\alpha_{s_1}^2) + (\alpha_{s_1} + \beta_{s_1})^2}(P_{s_1} - \bar{v}), \text{ and} \quad (22)$$

$$\text{Var}[v|P_{s_1}] = [h_v + \frac{(\alpha_{s_1} + \beta_{s_1})^2}{h_u^{-1} + h_\eta^{-1}\alpha_{s_1}^2}]^{-1}. \quad (23)$$

Substituting (22) and (23) into (21) and rearranging terms, we obtain the parameters for the linear demand functions for type-B and type-C traders in (18): $\alpha_{s_1}^B = \alpha_{s_1}^C = 0$, and $\gamma_{s_1}^B = \gamma_{s_1}^C = \rho^{-1}(h_v - \gamma_{s_1} \frac{\alpha_{s_1} + \beta_{s_1}}{h_u^{-1} + h_\eta^{-1}\alpha_{s_1}^2})$.

For type-A traders, they observe both y and ξ_i , and the optimal trading order that maximizes type-A sophisticated traders' expected utility conditional on their information set is given by:

$$x_i^A(y, \xi_i, P_{s_1}) = \frac{E[v|y, \xi_i, P_{s_1}] - P_{s_1}}{\rho \text{Var}[v|y, \xi_i, P_{s_1}]}. \quad (24)$$

Given the price function in (20), we obtain

$$E[v|y, \xi_i, P_{s_1}] = \bar{v} + \frac{(h_\eta - h_u\alpha_{s_1}\beta_{s_1})(y - \bar{v}) + h_a(y - \xi_i - \bar{v}) + \lambda_{s_1}^{-1}\beta_{s_1}h_u(P_{s_1} - \bar{v})}{h_a + h_v + h_\eta + \beta_{s_1}^2 h_u}, \quad (25)$$

$$\text{Var}[v|y, \xi_i, P_{s_1}] = [h_a + h_v + h_\eta + \beta_{s_1}^2 h_u]^{-1}. \quad (26)$$

substituting (25) and (26) into (24), and rearranging terms, we obtain the parameters for the linear demand function for type-A traders in (18), $\alpha_{s_1}^A = h_\eta(\rho + f\beta_{s_1}h_u)^{-1}$, $\beta_{s_1}^A = \rho^{-1}h_a$,

and $\gamma_{s_1}^A = \rho^{-1}(h_v - \gamma_{s_1}\beta_{s_1}h_u)$.

We then solve for γ_{s_1} by substituting $\gamma_{s_1}^A$, $\gamma_{s_1}^B$ and $\gamma_{s_1}^C$ into the equation $\gamma_{s_1} = f\gamma_{s_1}^A + (m - f)\gamma_{s_1}^B + (1 - m)\gamma_{s_1}^C$, and obtain that $\gamma_{s_1} = h_v[\rho + f\beta_{s_1}h_u + (1 - f)\frac{\alpha_{s_1} + \beta_{s_1}}{h_u^{-1} + h_\eta^{-1}\alpha_{s_1}^2}]^{-1}$.

2) Untargeted selective disclosure ($d = s_2$)

In this regime, the information set for type-A traders and thereby the trading strategy are the same as in $d = s_1$. Therefore, we obtain the following parameters for type-A traders,

$$\alpha_{s_2}^A = h_\eta(\rho + m\beta_{s_2}h_u)^{-1}, \beta_{s_2}^A = \rho^{-1}h_u, \text{ and } \gamma_{s_2}^A = \rho^{-1}(h_v - \gamma_{s_2}\beta_{s_2}h_u).$$

For type-B traders, the information set is now different. Each type-B trader receives the information disclosed by the firm. The optimal trading order that maximizes the type-B sophisticated traders' expected utility conditional on the available information set is given by:

$$x_i^B(y, P_{s_2}) = \frac{E[v|y, P_{s_2}] - P_{s_2}}{\rho \text{Var}[v|y, P_{s_2}]}. \quad (27)$$

Given the price function in (20), we can derive

$$E[v|y, P_{s_2}] = \bar{v} + \frac{(h_\eta - h_u\alpha_{s_2}\beta_{s_2})(y - \bar{v}) + \lambda_{s_2}^{-1}\beta_{s_2}h_u(P_{s_2} - \bar{v})}{h_v + h_\eta + \beta_{s_2}^2 h_u}, \quad (28)$$

$$\text{and } \text{Var}[v|y, P_{s_2}] = [h_v + h_\eta + \beta_{s_2}^2 h_u]^{-1}. \quad (29)$$

Substituting (28) and (29) into (30) and rearranging terms, we obtain the parameters for the linear demand function for type-B traders in (18), $\alpha_{s_2}^B = h_\eta(\rho + m\beta_{s_2}h_u)^{-1}$ and $\gamma_{s_2}^B = \rho^{-1}(h_v - \gamma_{s_2}\beta_{s_2}h_u)$.

Type-C traders do not receive any information except the price in the untargeted selective-disclosure regime, which is the same as in the targeted selective-disclosure regime. Thus their trading strategy is the same form as in (21) and (22), and we obtain that $\alpha_{s_2}^C = 0$, and $\gamma_{s_2}^C = \rho^{-1}(h_v - \gamma_{s_2}\frac{\alpha_{s_2} + \beta_{s_2}}{h_u^{-1} + h_\eta^{-1}\alpha_{s_2}^2})$.

We then solve for γ_{s_2} by substituting $\gamma_{s_2}^A$, $\gamma_{s_2}^B$ and $\gamma_{s_2}^C$ into the equation $\gamma_{s_2} = f\gamma_{s_2}^A + (m - f)\gamma_{s_2}^B + (1 - m)\gamma_{s_2}^C$, and obtain that $\gamma_{s_2} = h_v[\rho + m\beta_{s_2}h_u + (1 - m)\frac{\alpha_{s_2} + \beta_{s_2}}{h_u^{-1} + h_\eta^{-1}\alpha_{s_2}^2}]^{-1}$.

3) Public disclosure ($d = p$)

In the public disclosure regime, the information set for type-A traders is still the same as in the other regimes. Therefore, we have the following parameters for type-A traders,

$\alpha_p^A = h_\eta(\rho + f\beta_p h_u)^{-1}$, $\beta_p^A = \rho^{-1}h_a$, and $\gamma_p^A = \rho^{-1}(h_v - \gamma_p\beta_p h_u)$.

For type-B and type-C traders, their information sets include both the firm's information and price, and thus their trading strategies are the same as a type-B trader's strategy in the untargeted selective-disclosure regime,

$$x_i^t(y, P_p) = \frac{E[v|y, P_p] - P_p}{\rho \text{Var}[v|y, P_p]}, \quad t \in \{B, C\}. \quad (30)$$

Therefore, we have $\alpha_p^B = \alpha_p^C = h_\eta(\rho + \beta_p h_u)^{-1}$ and $\gamma_p^B = \gamma_p^C = \rho^{-1}(h_v - \gamma_p\beta_p h_u)$.

Again we solve for γ_p by substituting γ_p^A , γ_p^B and γ_p^C into the equation $\gamma_p = f\gamma_p^A + (m - f)\gamma_p^B + (1 - m)\gamma_p^C$, and obtain that $\gamma_p = h_v(\rho + \beta_p h_u)^{-1}$. Substituting γ_p back to γ_p^A , γ_p^B and γ_p^C , we get $\gamma_p^A = \gamma_p^B = \gamma_p^C = h_v(\rho + \beta_p h_u)^{-1}$. ■

PROOF OF Lemma 3

The price informativeness function is given by $\tau = h_v + \frac{(\alpha + \beta)^2}{h_u^{-1} + h_\eta^{-1}\alpha^2}$. Let $\beta = \rho^{-1}fh_a$, and $\alpha = \frac{fh_\eta}{\rho + f\beta h_u}$, and then taking the first-order derivative with respect to f , we obtain that

$$\frac{\partial \tau}{\partial f} = \frac{2(\alpha + \beta)[h_a(h_u^{-1} + \alpha h_\eta^{-1}) + \frac{h_\eta \rho^3}{h_u(f\beta h_u + \rho)^3}]}{\rho(h_u^{-1} + \alpha h_\eta^{-1})^2} > 0.$$

When the fraction of sophisticated traders is exogenously given as f , $\beta_{s_1} = \beta_{s_2} = \beta_p = \rho^{-1}fh_a$; and $\alpha_{s_1} = \frac{fh_\eta}{\rho + f\beta_{s_1}h_u}$, $\alpha_{s_2} = \frac{m_{s_2}h_\eta}{\rho + m_{s_2}\beta_{s_2}h_u}$, $\alpha_p = \frac{h_\eta}{\rho + \beta_{s_2}h_u}$.

Given that $f \leq m_{s_2} \leq 1$, it is easy to see that $\tau_{s_1} \leq \tau_{s_2} \leq \tau_p$. ■

PROOF OF Derivation of Eqs. (4) and (8)

i) We first derive the expected utility of each individual trader conditional on the price in Eq. (4).

For each type- t trader, the trading profit from submitting an order x_i^t as in (3) is given by

$$W_{i,d}^t = x_i^t(\Phi_i^t(d), P_d)(v - P_d) = \frac{E[v|\Phi_i^t(d), P_d] - P_d}{\rho \text{Var}[v|\Phi_i^t(d), P_d]}(v - P_d). \quad (31)$$

Substituting (31) into the utility function, we can obtain each trader's expected utility

conditional on his information set and the price,

$$\begin{aligned} E[U(W_{i,d}^t | \Phi_i^t(d), P_d)] &= -\exp\{-\rho E[W_{i,d}^t | \Phi_i^t(d), P_d] + \frac{\rho^2}{2} \text{Var}[W_{i,d}^t | \Phi_i^t(d), P_d]\} \\ &= -\exp\left\{-\left(\frac{E[v | \Phi_i^t(d), P_d] - P_d}{\sqrt{2\text{Var}[v | \Phi_i^t(d), P_d]}}\right)^2\right\}. \end{aligned} \quad (32)$$

Denote $\Lambda_{i,d}^t = \frac{E[v | \Phi_i^t(d), P_d] - P_d}{\sqrt{2\text{Var}[v | \Phi_i^t(d), P_d]}}$. It is easy to see that $\Lambda_{i,d}^t | P_d$ follows a normal distribution with mean $E[\Lambda_{i,d}^t | P_d]$ and variance $\text{Var}[\Lambda_{i,d}^t | P_d]$.

For any random variable $x \sim N(\bar{x}, \sigma_x^2)$, we have a technical result that $E[e^{-x^2}] = \frac{1}{\sqrt{1+2\sigma_x^2}} \exp\left\{-\frac{\bar{x}^2}{1+2\sigma_x^2}\right\}$.

Therefore we obtain that

$$E[U(W_{i,d}^t | P_d)] = E[-\exp\{-(\Lambda_{i,d}^t)^2\} | P_d] = -\frac{1}{\sqrt{1+2\text{Var}[\Lambda_{i,d}^t | P_d]}} \exp\left\{-\frac{(E[\Lambda_{i,d}^t | P_d])^2}{1+2\text{Var}[\Lambda_{i,d}^t | P_d]}\right\}. \quad (33)$$

We then calculate $E[\Lambda_{i,d}^t | P_d]$ and $\text{Var}[\Lambda_{i,d}^t | P_d]$ as below,

$$E[\Lambda_{i,d}^t | P_d] = \frac{1}{\sqrt{2\text{Var}[v | \Phi_i^t(d), P_d]}} (E[v | P_d] - P_d), \quad (34)$$

$$\begin{aligned} \text{Var}[\Lambda_{i,d}^t | P_d] &= \frac{1}{2\text{Var}[v | \Phi_i^t(d), P_d]} \text{Var}[(E[v | \Phi_i^t(d), P_d] - P_d) | P_d] \\ &= \frac{1}{2\text{Var}[v | \Phi_i^t(d), P_d]} (\text{Var}[v | P_d] - \text{Var}[v | \Phi_i^t(d), P_d]) \quad (\text{Law of total variance}) \\ &= \frac{\text{Var}[v | P_d]}{2\text{Var}[v | \Phi_i^t(d), P_d]} - \frac{1}{2}. \end{aligned} \quad (35)$$

Substituting (34) and (35) into the utility function (33), we obtain (4).

ii) Now we outline the derivation of Eq. (8) here, which also applies to Eqs. (5) and (6) in other regimes. Given the conditional expected utility in (4), we obtain

$$E[E[U(W_{i,s_1}^A - k - c) | P_{s_1}]] = \exp\{\rho(k + c)\} \sqrt{\frac{\text{Var}[v | \Phi_i^A, P_{s_1}]}{\text{Var}[v | P_{s_1}]}} E\left[\exp\left\{-\frac{(E[v | P_{s_1}] - P_{s_1})^2}{2\text{Var}[v | P_{s_1}]}\right\}\right],$$

$$\text{and } E[E[U(W_{i,s_1}^B) | P_{s_1}]] = E\left[\exp\left\{-\frac{(E[v | P_{s_1}] - P_{s_1})^2}{2\text{Var}[v | P_{s_1}]}\right\}\right].$$

Therefore,

$$\frac{E[U(W_{i,s_1}^A - k - c)]}{E[U(W_{i,s_1}^B)]} = \frac{E[E[U(W_{i,s_1}^A - k - c)|P_{s_1}]]}{E[E[U(W_{i,s_1}^B)|P_{s_1}]]} = \exp\{\rho(k + c)\} \sqrt{\frac{\text{Var}[v|y, \xi_i, P_{s_1}]}{\text{Var}[v|P_{s_1}]}}.$$

Thus, substituting $\text{Var}[v|y, \xi_i, P_{s_1}]^{-1} = h_v + h_a + h_\eta + \beta_{s_1}^2 h_u$ and $\text{Var}[v|y, \xi_i, P_{s_1}]^{-1} = h_v + \frac{(\alpha_{s_1} + \beta_{s_1})^2}{h_u^{-1} + h_\eta^{-1} \alpha_{s_1}^2}$ into the above term, we obtain the equation (8). ■

PROOF OF *Corollary 1*

From (5), $\mu_{s_2}^B = \exp\{\rho c\} \sqrt{\frac{h_v + \frac{(\alpha_{s_2} + \beta_{s_2})^2}{h_u^{-1} + h_\eta^{-1} \alpha_{s_2}^2}}{h_v + h_\eta + \beta_{s_2}^2 h_u}}$, with $\beta_{s_2} = \rho^{-1} f_{s_2} h_a$ and $\alpha_{s_2} = m_{s_2} h_\eta (\rho + \beta_{s_2} h_u)^{-1}$.

We solve $\mu_{s_2}^B(\underline{c}, m_{s_2} = 1) = 1$ and $\mu_{s_2}^B(\bar{c})|_{m_{s_2}=f_{s_2}} = 1$, and obtain \underline{c} and \bar{c} as below,

$$\underline{c} = \rho^{-1} \ln \sqrt{\frac{h_v + h_\eta + \beta_{s_2}^2 h_u}{h_v + \frac{(\bar{\alpha}_{s_2} + \beta_{s_2})^2}{h_u^{-1} + h_\eta^{-1} \bar{\alpha}_{s_2}^2}}}, \text{ where } \bar{\alpha}_{s_2} = \frac{h_\eta}{\rho + f_{s_2} \beta_{s_2} h_u};$$

$$\bar{c} = \rho^{-1} \ln \sqrt{\frac{h_v + h_\eta + \beta_{s_2}^2 h_u}{h_v + \frac{(\underline{\alpha}_{s_2} + \beta_{s_2})^2}{h_u^{-1} + h_\eta^{-1} \underline{\alpha}_{s_2}^2}}}, \text{ where } \underline{\alpha}_{s_2} = \frac{f_{s_2} h_\eta}{\rho + f_{s_2} \beta_{s_2} h_u}.$$

When $\mu_{s_2}^B(c)|_{m_{s_2}=1} < 1$ (i.e. when $c < \underline{c}$), the equilibrium fraction is $m_{s_2}^* = 1$. When $\mu_{s_2}^B(c)|_{m_{s_2}=f_{s_2}} > 1$ (i.e. when $c > \bar{c}$), the equilibrium fraction is $m_{s_2}^* = f_{s_2}$. Otherwise, there always exists an interior solution $f_{s_2} \leq m_{s_2}^* \leq 1$ such that $\mu_{s_2}^B(m_{s_2}^*) = 1$ always holds. ■

PROOF OF *Corollary 2*

The threshold \bar{c} is defined by $\mu_{s_2}^B(m = f_p^*, \bar{c}) = 1$. From (5) and (7), we have

$$\mu_{s_2}^B(m = f_p^*, \bar{c}) \equiv \exp\{\rho \bar{c}\} \sqrt{I_{s_2}^c(f_p^*)} = 1. \quad (36)$$

$$\mu_p^A(f_p^*) \equiv \exp\{\rho k\} \sqrt{I_p^k(f_p^*)} = 1. \quad (37)$$

where $I_{s_2}^c(f_p^*) = \frac{h_v + \frac{(\alpha_{s_2} + \beta_{s_2}(f_p^*))^2}{h_u^{-1} + h_\eta^{-1} \alpha_{s_2}(f_p^*)^2}}{h_v + h_\eta + \beta_{s_2}(f_p^*)^2 h_u}$, and $I_p^k(f_p^*) = \frac{h_v + h_\eta + \beta_{s_2}(f_p^*)^2 h_u}{h_v + h_a + h_\eta + \beta_{s_2}(f_p^*)^2 h_u}$, with $\beta_{s_2}(f_p^*) = \rho^{-1} f_p^* h_a$, $\alpha_{s_2}(f_p^*) = f_p^* h_\eta (\rho + f_p^* \beta_{s_2}(f_p^*) h_u)^{-1}$.

Since Eq. (36) always holds, the effects of changes in parameters (h_η, h_a, h_v, h_u) on the threshold \bar{c} are in the opposite direction to their effects on $I_{s_2}^c$ —i.e., $\frac{d\bar{c}}{d(\cdot)} \propto -\frac{dI_{s_2}^c}{d(\cdot)}$.

Taking the total derivative of $I_{s_2}^c$ with respect to these parameters, we have

$$\frac{dI_{s_2}^c}{d(\cdot)} = \frac{\partial I_{s_2}^c}{\partial(\cdot)} + \frac{\partial I_{s_2}^c}{\partial f_p^*} \frac{\partial f_p^*}{\partial(\cdot)}. \quad (38)$$

To solve $\frac{dI_{s_2}^c}{d(\cdot)}$, we also need to take into account the endogenous effect of changes in these variables on the equilibrium fraction $\frac{\partial f_p^*}{\partial(\cdot)}$, which is given by

$$\frac{dI_p^k}{d(\cdot)} = \frac{\partial I_p^k}{\partial(\cdot)} + \frac{\partial I_p^k}{\partial f_p^*} \frac{\partial f_p^*}{\partial(\cdot)} = 0 \Rightarrow \frac{\partial f_p^*}{\partial(\cdot)} = -\frac{\partial I_p^k}{\partial(\cdot)} / \frac{\partial I_p^k}{\partial f_p^*}. \quad (39)$$

We then calculate separately the partial derivatives with respect to each variable in (38) and obtain

$$\begin{aligned} \frac{\partial f_p^*}{\partial h_\eta} &= -\frac{\rho^2}{2f_p^* h_a^2 h_u}, \\ \frac{\partial f_p^*}{\partial h_a} &= -\frac{(f_p^* h_a)^2 h_u - \rho^2 (h_\eta + h_v)}{2f_p^* h_a^3 h_u}, \\ \frac{\partial f_p^*}{\partial h_u} &= -\frac{f_p^*}{2h_u}, \\ \frac{\partial f_p^*}{\partial h_v} &= -\frac{\rho^2}{2f_p^* h_a^2 h_u}. \end{aligned}$$

Substituting these partial effects into $\frac{dI_{s_2}^c}{d(\cdot)}$, we obtain that (i.e., $\beta_{s_2}^2(f_p^*)$ is simplified to)

$$\begin{aligned} \frac{dI_{s_2}^c}{dh_\eta} &= -\frac{h_a^2 (\beta^2 h_u + h_a + h_\eta)}{(\beta^2 h_u + h_\eta + h_v)((\beta^2 h_u + h_a)^2 + \beta^2 h_\eta h_u)^2} < 0, \\ \frac{dI_{s_2}^c}{dh_a} &= \frac{h_a h_\eta ((\beta^2 h_u + h_a + h_\eta + h_v)^2 - h_v (h_v + h_\eta))}{(\beta^2 h_u + h_\eta + h_v)((\beta^2 h_u + h_a)^2 + \beta^2 h_\eta h_u)^2} > 0, \\ \frac{dI_{s_2}^c}{dh_v} &= -\frac{h_a^2 h_\eta (2\beta^2 h_u + 2h_a + h_\eta)}{(\beta^2 h_u + h_\eta + h_v)((\beta^2 h_u + h_a)^2 + \beta^2 h_\eta h_u)^2} < 0, \\ \frac{dI_{s_2}^c}{dh_u} &= 0, \end{aligned}$$

Because $\frac{d\bar{c}}{d(\cdot)} \propto -\frac{dI_{s_2}^c}{d(\cdot)}$, $\frac{d\bar{c}}{dh_\eta} > 0$, $\frac{d\bar{c}}{dh_a} < 0$, $\frac{d\bar{c}}{dh_v} > 0$ and $\frac{d\bar{c}}{dh_u} = 0$. ■

PROOF OF *Corollary 3*

1) Public disclosure regime.

Taking the total derivative of μ_p^A in (6) with respect to h_η , we obtain that

$$\frac{\partial \mu_p^A}{\partial h_\eta} + \frac{\partial \mu_p^A}{\partial f_p^*} \frac{\partial f_p^*}{\partial h_\eta} = 0 \Rightarrow \frac{\partial f_p^*}{\partial h_\eta} = -\frac{\partial \mu_p^A}{\partial h_\eta} / \frac{\partial \mu_p^A}{\partial f_p^*}. \quad (40)$$

Furthermore, we can show that

$$\begin{aligned} \frac{\partial \mu_p^A}{\partial f_p^*} &= \frac{2\beta_p^2 h_u h_a}{f(\beta_p^2 h_u + h_v + h_\eta + h_a)^2} > 0, \\ \frac{\partial \mu_p^A}{\partial h_\eta} &= \frac{h_a}{(\beta_p^2 h_u + h_v + h_\eta + h_a)^2} > 0. \end{aligned}$$

Therefore $\frac{\partial f_p^*}{\partial h_\eta} < 0$.

2) Targeted selective-disclosure regime.

Similarly, taking the total derivative of $\mu_{s_1}^A$ with respect to h_η , we obtain

$$\frac{\partial \mu_{s_1}^A}{\partial h_\eta} + \frac{\partial \mu_{s_1}^A}{\partial f_{s_1}^*} \frac{\partial f_{s_1}^*}{\partial h_\eta} = 0 \Rightarrow \frac{\partial f_{s_1}^*}{\partial h_\eta} = -\frac{\partial \mu_{s_1}^A}{\partial h_\eta} / \frac{\partial \mu_{s_1}^A}{\partial f_{s_1}^*}. \quad (41)$$

Furthermore, we can derive

$$\frac{\partial \mu_{s_1}^A}{\partial h_\eta} = \frac{h_a(\beta_{s_1}^2 h_u + h_a)[\beta_{s_1}^2 h_u(\beta_{s_1}^2 h_u + h_a + h_\eta)^2 - h_v h_a(\beta_{s_1}^2 h_u + h_a)]}{(\beta_{s_1}^2 h_u + h_a + h_\eta + h_v)^2((\beta_{s_1}^2 h_u + h_a)^2 + \beta_{s_1}^2 h_\eta h_u)^2},$$

Therefore, $\frac{\partial \mu_{s_1}^A}{\partial h_\eta} < 0$ if and only if $h_v > \frac{\beta_{s_1}^2 h_u(\beta_{s_1}^2 h_u + h_a + h_\eta)^2}{\beta_{s_1}^2 h_u h_a + h_a^2}$. Given that $\frac{\partial \mu_{s_1}^A}{\partial f_{s_1}^*} > 0$, we have $\frac{\partial f_{s_1}^*}{\partial h_\eta} > 0$ if and only if $h_v > \frac{\beta_{s_1}^2 h_u(\beta_{s_1}^2 h_u + h_a + h_\eta)^2}{\beta_{s_1}^2 h_u h_a + h_a^2}$. ■

Online Appendix: Equilibrium with common private signals

In this Appendix, we analyze an alternative setting where the sophisticated traders observe an identical signal after processing the firm's information, i.e., each type-A trader generates a signal $\xi = \eta + \varepsilon$, $\varepsilon \sim N(0, h_\varepsilon)$, after observing the firm's information y . All the other assumptions remain the same as in the main model. For each type-A trader, price is only noisy information about the fundamental compared to one's own private information set. The conditional expectation given the type-A trader's information set in the disclosure regime d is given by $E[v|y, y - \xi, P_d] = \bar{v} + \frac{h_\eta}{h_v + h_\varepsilon + h_\eta}(y - \bar{v}) + \frac{h_\varepsilon}{h_v + h_\varepsilon + h_\eta}(y - \xi - \bar{v})$, and the conditional variance is $Var[v|y, y - \xi, P_d] = \frac{1}{h_v + h_\varepsilon + h_\eta}$. Thus, the type-A trader submits an order

$$x_i^A = \frac{E[v|y, y - \xi, P_d] - p}{Var[v|y, y - \xi, P_d]} = h_\eta(y - P_d) + h_\varepsilon(y - \xi - P_d) + h_v(\bar{v} - P_d).$$

We then solve for type-B and type-C traders' strategies in different regimes, and obtain the equilibrium as below.

Equilibrium The equilibrium follows the same structure as in Definition 1. In the disclosure regime d , a unique linear equilibrium in the competitive market exists such that

$$x_i^A(\Phi_i^A(d)) = \alpha_d^A(y - P_d) + \beta_d^A(y - \xi_i^A - P_d) - \gamma_d^A(P_d - \bar{v}),$$

$$x_i^B(\Phi_i^B(d)) = \alpha_d^B(y - P_d) - \gamma_d^B(P_d - \bar{v}),$$

$$x_i^C(\Phi_i^C(d)) = \alpha_d^C(y - P_d) - \gamma_d^C(P_d - \bar{v}),$$

and $P_d = \bar{v} + \lambda_d z_d$,

where $z_d = \alpha_d(y - \bar{v}) + \beta_d(v - \bar{v}) + u$, and $\lambda_d = (\alpha_d + \beta_d + \gamma_d)^{-1}$, with $\alpha_d = f\alpha_d^A + (m - f)\alpha_d^B + (1 - m)\alpha_d^C$, $\beta_d = f\beta_d^A$, $\gamma_d = f\gamma_d^A + (m - f)\gamma_d^B + (1 - m)\gamma_d^C$, for $d \in \{s_1, s_2, p\}$.

The parameters in each disclosure regime are given by:

- Under targeted selective disclosure (to type-A traders only) ($d = s_1$),

$$\alpha_{s_1}^A = \rho^{-1}h_\eta, \alpha_{s_1}^B = \alpha_{s_1}^C = 0; \beta_{s_1}^A = \rho^{-1}h_\varepsilon; \gamma_{s_1}^A = \rho^{-1}h_v, \text{ and } \gamma_{s_1}^B = \gamma_{s_1}^C = \frac{h_v}{\rho + (\alpha_{s_1} + \beta_{s_1})h_u}.$$

- Under untargeted selective disclosure (to type-A and B traders only) ($d = s_2$),

$$\alpha_{s_2}^A = \rho^{-1}h_\eta, \alpha_{s_2}^B = \frac{h_\eta}{\rho + m\beta_{s_2}h_u}, \text{ and } \alpha_{s_2}^C = 0; \beta_{s_2}^A = \rho^{-1}h_\varepsilon;$$

$$\gamma_{s_2}^A = \rho^{-1}h_v, \gamma_{s_2}^B = \rho^{-1}\left(h_v - \frac{\beta_{s_2}\gamma_{s_2}}{h_u^{-1} + h_\varepsilon^{-1}\beta_{s_2}^2}\right), \text{ and } \gamma_{s_2}^C = \rho^{-1}\left(h_v - \frac{\gamma_{s_2}(\alpha_d + \beta_{s_2})}{h_u^{-1} + h_\varepsilon^{-1}\beta_{s_2}^2 + h_\eta^{-1}\alpha_{s_2}^2}\right),$$

$$\text{where } \gamma_{s_2} = h_v\left[\rho + (m - f)\frac{\beta_{s_2}}{h_u^{-1} + h_\varepsilon^{-1}\beta_{s_2}^2} + (1 - m)\frac{\alpha_{s_2} + \beta_{s_2}}{h_u^{-1} + h_\varepsilon^{-1}\beta_{s_2}^2 + h_\eta^{-1}\alpha_{s_2}^2}\right]^{-1}.$$

- Under public disclosure ($d = p$),

$$\alpha_p^A = \rho^{-1}h_\eta, \alpha_p^B = \alpha_p^C = h_\eta(\rho + \beta_p h_u)^{-1}; \beta_p^A = \rho^{-1}h_\varepsilon;$$

$$\gamma_p^A = \rho^{-1}h_v, \gamma_p^B = \gamma_p^C = h_v(\rho + \beta_p h_u)^{-1}.$$

Given the above equilibrium, the conditional variances based on the available information sets for each type-t individual trader are

$$\text{Var}[v|y, \xi, P_d]^{-1} = h_v + h_\eta + h_\varepsilon,$$

$$\text{Var}[v|y, P_d]^{-1} = h_v + h_\eta + \frac{\beta_d^2}{h_u^{-1} + h_\varepsilon^{-1}\beta_d^2},$$

$$\text{Var}[v|P_d]^{-1} = h_v + \frac{(\alpha_d + \beta_d)^2}{h_u^{-1} + h_\varepsilon^{-1}\beta_d^2 + h_\eta^{-1}\alpha_d^2}.$$

A trader's incentive to gain information access in the untargeted selective-disclosure regime, $\mu_{s_2}^B$, still increases in m and decreases in c . Therefore, it is easy to show the same result that in equilibrium, all traders gain information access, $m_{s_2}^* = 1$, when the information access cost is sufficiently small; or no traders gains information access without expertise, $m_{s_2}^* = f_{s_2}^*$, when the information access is sufficiently large.

Similar analysis follows for the expertise acquisition incentive. The result in Proposition 2 holds following the same analysis by comparing the untargeted selective-disclosure regime with the other two regimes. That is, when the information access cost is sufficiently small (large), there are more sophisticated traders in the targeted selective-disclosure regime (public disclosure regime) than in the other two regimes.

We now compare the price informativeness in different disclosure regimes. When the information access cost is very large, $c > \bar{c}$, we have

$$\mu_{s_1}^A(f_{s_1}^*) = \exp\{\rho(k+c)\} \sqrt{\frac{\text{Var}[v|y, \xi, P_{s_1}(f_{s_1}^*)]}{\text{Var}[v|P_{s_1}(f_{s_1}^*)]}} = 1,$$

$$\mu_{s_2}^A(f_p^*) \cdot \mu_{s_2}^B(f_p^*, m_p^* = f_p^*) = \exp\{\rho(k+c)\} \sqrt{\frac{\text{Var}[v|y, \xi, P_{s_2}(f_p^*)]}{\text{Var}[v|P_{s_2}(f_p^*)]}} > 1.$$

Since $\text{Var}[v|y, \xi, P_{s_1}]^{-1} = \text{Var}[v|y, \xi, P_{s_2}]^{-1} = h_v + h_\varepsilon + h_\eta$, we have $\text{Var}[v|P_{s_1}(f_{s_1}^*)]^{-1} < \text{Var}[v|P_{s_2}(f_p^*)]^{-1}$. That is, assuming the fraction of typer-A traders in the untargeted selective-disclosure regime is the same as that in the public disclosure regime, the price informativeness under untargeted selective disclosure is greater than that under targeted selective disclosure. Furthermore, we have $\text{Var}[v|P_{s_2}(f_p^*)]^{-1} < \text{Var}[v|P_p(f_p^*)]^{-1}$, because fewer traders receive information under untargeted selective disclosure (i.e., $m_{s_2}^* < 1$) when the information access cost is large. Therefore, price informativeness under public disclosure is always greater, i.e., $\text{Var}[v|P_p]^{-1} > \text{Var}[v|P_{s_2}]^{-1} = \text{Var}[v|P_{s_1}]^{-1}$.

When the information access cost is very small $c < \underline{c}$, all traders gain information access in the untargeted selective-disclosure regime. Therefore we have

$$\mu_{s_1}^A(f_{s_1}^*) = \exp\{\rho(k+c)\} \sqrt{\frac{\text{Var}[v|y, \xi, P_{s_1}]}{\text{Var}[v|P_{s_1}]}} = 1,$$

$$\mu_{s_2}^A(f_{s_2}^*) \cdot \mu_{s_2}^B(f_{s_2}^*, m_{s_2}^* = 1) = \exp\{\rho(k+c)\} \sqrt{\frac{\text{Var}[v|y, \xi, P_{s_2}]}{\text{Var}[v|P_{s_2}]}} < 1.$$

Because $\text{Var}[v|y, \xi, P_{s_1}]^{-1} = \text{Var}[v|y, \xi, P_{s_2}]^{-1}$, we have $\text{Var}[v|P_{s_1}]^{-1} > \text{Var}[v|P_{s_2}]^{-1}$, i.e., the price informativeness is greater in the targeted selective-disclosure regime than in the untargeted selective-disclosure regime. Furthermore, in this case, $m_{s_2}^* = 1$ and $f_{s_2}^* = f_p^*$, i.e., the untargeted selective-disclosure regime is identical to the public disclosure regime. As a result, $\text{Var}[v|P_{s_1}]^{-1} > \text{Var}[v|P_{s_2}]^{-1} = \text{Var}[v|P_p]^{-1}$.

When the information access cost is in the middle range, $\bar{c} \geq c \geq \underline{c}$, we have

$$\mu_{s_1}^A(f_{s_1}^*) = \exp\{\rho(k+c)\} \sqrt{\frac{\text{Var}[v|y, \xi, P_{s_1}]}{\text{Var}[v|P_{s_1}]}} = 1,$$

$$\mu_{s_2}^A(f_{s_2}^*) \cdot \mu_{s_2}^B(f_{s_2}^*, m_{s_2}^*) = \exp\{\rho(k+c)\} \sqrt{\frac{\text{Var}[v|y, \xi, P_{s_2}]}{\text{Var}[v|P_{s_2}]}} = 1.$$

Immediately, since $\text{Var}[v|y, \xi, P_{s_1}]^{-1} = \text{Var}[v|y, \xi, P_{s_2}]^{-1}$, we obtain that $\text{Var}[v|P_{s_1}]^{-1} = \text{Var}[v|P_{s_2}]^{-1}$, i.e., the price informativeness is the same in the two selective disclosure regimes. Furthermore, because $m_{s_2}^* < 1$ and $f_{s_2}^* = f_p^*$, the price is more informative under public disclosure than under untargeted selective disclosure, i.e., $\text{Var}[v|P_p]^{-1} > \text{Var}[v|P_{s_2}]^{-1}$. Therefore, $\text{Var}[v|P_p]^{-1} > \text{Var}[v|P_{s_1}]^{-1}$. Intuitively, though the targeted selective-disclosure regime may encourage the expertise acquisition, the broad dissemination of information to more traders under the public disclosure regime actually compensates for that and results in an overall greater price informativeness.

This is in contrast to the main model, where the price informativeness in the targeted selective-disclosure regime is still possibly greater than in the public disclosure regime when $c \in (\underline{c}, \bar{c})$. This is because each sophisticated trader now receives an identical private signal and does not learn from the price, thus their information uncertainty is insensitive to the expertise acquisition activities from other traders in both regimes. Thus public disclosure is more likely to result in greater price informativeness than targeted selective disclosure, compare to the main model.

However, as shown above, when the information access cost is sufficiently small ($c < \underline{c}$), we still find that the benefit of exclusive access to information through targeted selective disclosure encourages much more expertise acquisition than public disclosure, leading to greater price informativeness, as in the main model.