Strategic complexity in disclosure*

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Abstract

Extensive evidence suggests that managers strategically choose the complexity of their descriptive disclosures. However, their motives in doing so appear mixed, as complex disclosures are highly informative in some cases and uninformative, or obfuscated, in others. We develop a model in which a manager discloses to investors of heterogeneous sophistication and can adjust the complexity of the disclosure to either provide more precise information or to obfuscate. In equilibrium, managers with both highly positive and negative news choose to issue complex disclosures. The average market reaction to simple disclosures may exceed that to complex disclosures, which is at odds with the conventional wisdom that negative news is more often complexified. Moreover, even when relatively uninformative, complex disclosures generate significant volatility. Finally, we offer preliminary empirical evidence consistent with a non-monotonic relationship between disclosure complexity and firm news. Our results help to reconcile conflicting findings in the empirical literature and offer a number of novel predictions.

Keywords: Financial reporting complexity, disclosure, complexity, obfuscation, disclosure informativeness, sophisticated investors, MD&A.

JEL classification: C72, D82, D83, G14, M41.

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“For more than forty years, I’ve studied the documents that public companies file. Too often, I’ve been unable to decipher just what is being said or, worse yet, had to conclude that nothing was being said. [...] Maybe we simply don’t have the technical knowledge to grasp what the writer wishes to convey. Or perhaps the writer doesn’t understand what he or she is talking about. In some cases, moreover, I suspect that a less-than scrupulous issuer doesn’t want us to understand a subject it feels legally obligated to touch upon.”

—Warren Buffett, 1998.¹

1 Introduction

Corporate disclosures often include descriptive information regarding firm performance. For example, in the MD&A, press releases, and conference calls, firms may explain losses and discuss long-term strategy, products in development, or changes in contractual terms. Managers generally have considerable latitude in how this information is conveyed to the capital market, influencing not just its breadth and precision, but also its complexity, i.e., how accessible the information is to investors. Managerial discretion over the complexity of narrative disclosures—which accounts for roughly 80% of the content of annual reports—has recently been of significant interest in the empirical literature, but the results are conflicting. In particular, in some cases, managers add complexity to disclosures in order to convey more detailed and precise information, while in others, they do so to reduce investors’ ability to understand their content.²

In this paper, we develop an equilibrium theory of the strategic choice of complexity in disclosure. Our model aims to shed light on the following questions: what are the economic forces that determine whether a manager discloses her information in a complex or simple manner? What are the expected market reactions to simple and complex disclosure? How does disclosure complexity depend upon the sophistication of a firm’s investor base and how does it vary across industries? In addressing these questions, we seek to account for both the empirically-documented roles of complexity in conveying precise information and

¹The excerpt is from the preface of Securities and Exchange Commission (1998).
²See, e.g., Loughran and McDonald (2014), Lang and Stice-Lawrence (2015), Guay et al. (2016), Bushee et al. (2018), Chychyla et al. (2019), Cohen et al. (2020), for evidence of complexity in disclosure that represents information provision. On the other hand, see, e.g., Li (2008), Ertugrul et al. (2017), Lo et al. (2017), Kim et al. (2018), deHaan et al. (2020), for evidence that disclosure complexity may represent strategic obfuscation. Moreover, in a large-scale survey of public company executives, Graham et al. (2005) document that “some CFOs admit that they do not mind ‘fuzziness’ in bad news disclosures” (p. 65). Relatedly, Solomon (2012), Cohen et al. (2013), and Dzielsinski et al. (2016) find that managers “spin” or obscure bad-news releases.
in obfuscating negative news.

In our setting, a firm manager is obligated to disclose a piece of news to the market, but she can adjust both the informativeness of this disclosure and whether it is “simple” or “complex.” The market consists of sophisticated and unsophisticated investors. Both classes of investors understand simple information, but only sophisticated investors understand complex information. The manager is subject to a natural constraint: in order to raise the disclosure’s informativeness, she must increase its complexity. This captures the need to provide technical details or to use complex language in order to convey additional information. The manager can also raise the disclosure’s complexity without increasing its informativeness. This reflects her ability to add irrelevant details or “pseudo-signals” to the disclosure or to use unnecessarily technical language. In sum, the manager can choose among three types of disclosure: (i) simple disclosure, (ii) “complex informative” disclosure, which is complex and more informative than simple disclosure, and (iii) “obfuscated” disclosure, which is complex and relatively uninformative.

Importantly, all investors in our model observe whether the firm’s disclosure is simple or complex. This captures the notion that investors may readily observe the length of and diction used in a disclosure, even if they do not fully understand its implications for firm value. Thus, in equilibrium, the manager’s choice of disclosure complexity serves as a signal of the manager’s information to investors. For instance, investors might infer that a manager using complex language possesses positive news and is seeking to communicate this news precisely. Alternatively, they might infer the manager possesses negative news and is seeking to obfuscate this news. As is common in disclosure models, in order to prevent a trivial “unravelling” equilibrium, we assume that with some probability, the manager is constrained in her disclosure choice. This captures the possibility that some managers are non-strategic, unconcerned with their short-term prices, or that regulation in conjunction with their (unobservable) transactions requires them to disclose in a particular way (e.g., Lang and Stice-Lawrence (2015), Guay et al. (2016)).

As a concrete example of a scenario captured by these assumptions, consider a manager who has qualitative information regarding the potential success of a new technology in development and is compelled to discuss the technology due to market pressure or litigation concerns. The manager can attempt to convey her information to the market in a simple way by providing high-level projections without accompanying detail to support the assertions. By omitting potentially complicated information concerning the specifics of the technology, investors are left with a limited understanding of the project’s impact on future performance. Alternatively, the manager can provide a more technical and complete description of the technology’s promise. While this enables industry experts to fully assess
the manager’s news, it renders the disclosure uninterpretable to other investors. Finally, the manager can instead provide excessive technical detail that is largely erroneous to the situation at hand. While more adept investors can parse through such detail and recognize its insignificance, unsophisticated investors would be unable, or find it too costly, to do so.

As illustrated by this example, complex informative disclosure has two offsetting effects relative to simple disclosure: sophisticated investors find such disclosure more informative, but unsophisticated investors find it entirely uninformative. We focus on the case in which the manager can convey more information to the average investor by issuing a complex informative than a simple disclosure. This occurs when either the firm’s investor base is relatively sophisticated or attempting to simplify the disclosure entails significant information loss. Our main result is that any equilibrium takes the form of a strategic complexity equilibrium, whereby the manager chooses complex informative disclosure when she observes sufficiently positive news, simple disclosure when she observes intermediate news, and obfuscated disclosure when she observes sufficiently negative news. Thus, the relation between complexity in disclosure and firm performance is non-monotonic and exhibits a “U-shape.”

The manager’s disclosure choice in such an equilibrium reflects a trade-off between the informativeness of her disclosure to the average investor and investors’ inferences from her disclosure choice. When the manager has extremely positive or negative news, her decision is transparent: in this case, she primarily aims to maximize or minimize the market’s reaction to this news, respectively. Thus, she chooses the most and least informative disclosures, i.e., complex informative and obfuscated disclosure, respectively. The reason that the manager chooses simple disclosure when she has intermediate news is more subtle. In fact, we show that there can exist two types of strategic complexity equilibria that are distinguished by the range of signals that prompt the manager to choose simple disclosure and her incentives for doing so.

In the first type of equilibrium, which always exists, the manager provides a simple disclosure when she has moderately negative news. Intuitively, upon observing such news, the manager aims to temper the reaction to her disclosure. This inclines her towards selecting either simple or obfuscated disclosure. While obfuscating would lead to a smaller response to the disclosure, in equilibrium, investors know that the manager obfuscates whenever she has very negative news. Moreover, sophisticated investors would recognize that the disclosure was obfuscated and thus discount the firm. Therefore, the manager instead prefers to issue a simple disclosure. Surprisingly, this implies that the average price reaction to simple news is negative, while the average response to complex news is positive. This equilibrium feature is at odds with the conventional wisdom that “bad” news is more often complexified.

A second type of equilibrium also exists when simple and complex informative disclosure
provide a similar amount of information to the average investor. In this equilibrium, the manager provides a simple disclosure when she has, on average, moderately positive news. In this case, unsophisticated investors draw a negative inference upon observing a complex disclosure, causing the firm’s price to decline on average following complex news. Because simple and complex informative disclosure provide roughly the same amount of information, when the manager observes intermediate news, she is primarily concerned with avoiding this negative inference. This leads the manager to select simple disclosure.

We next perform numerical analyses that reveal that both types of strategic complexity equilibria exhibit common, unanticipated features. First, when a firm’s investor base is less sophisticated or the information loss from conveying its information in a simple manner is small, the firm is more likely to issue complex disclosure. Intuitively, in any equilibrium, the manager is on the margin between simple and obfuscated disclosure when she possesses moderately negative news. Thus, when simple information becomes relatively more informative, the manager is more inclined to obfuscate to reduce the reaction to her news.

Next, even when complex disclosure typically reflects obfuscation and thus is not very informative, it generates more price volatility than simple disclosure. The reason is that, in equilibrium, the manager issues complex disclosure when she has either highly positive or negative news, which merits a large price reaction. Finally, despite offering little information, obfuscated disclosure can generate more disagreement among investors than complex informative disclosure. This results from the fact that only sophisticated investors recognize that such disclosure has been obfuscated, which causes their beliefs regarding firm value to drop relative to unsophisticated investors.

The non-monotonic relation between news and complexity that our model predicts is starkly at odds with the existing empirical literature, which typically focuses on linear specifications (e.g., Li (2008)). We conclude by conducting an exploratory empirical analysis of the functional relationship between managers’ private information and the complexity of the 10-K. We proxy for complexity using multiple textual measures drawn from prior literature. Moreover, given the manager’s private information is partially impounded into prices via sophisticated investors’ demand, we proxy for this information using announcement-date returns. Consistent with our model’s predictions, we find a robust “U-shaped” relationship that grows stronger among firms with high institutional ownership. These findings suggest that future research on disclosure complexity may benefit from incorporating non-linear specifications or separately considering the cases in which firms possess highly positive and negative news.

While framed in terms of financial disclosures, our model and findings apply more broadly to any form of strategic, technical communication. For example, researchers often present
results to multiple audiences, only a fraction of whom understand the methods applied. In this case, researchers with unfavorable results may be inclined to present their methods in an obscure manner. At the same time, researchers with favorable results might likewise present in a seemingly obscure manner because doing so enables them to better communicate to the domain experts in the audience. Our results indicate that both patterns of behavior can arise in equilibrium – even when unsophisticated audiences rationally anticipate that researchers with unfavorable results may attempt to mislead them.

1.1 Related literature

Our study relates to the stream of literature that considers disclosure and complexity. Carlin (2009) examines strategic price complexity in a model where multiple firms independently choose the difficulty for consumers to understand their price of a homogeneous financial product. The composition of expert consumers (analogous to sophisticated investors in the current setting) is a decreasing function of the aggregate difficulty in understanding prices within the industry. Firms follow a mixed strategy in equilibrium over prices and difficulty, which generates price dispersion for the identical product. Among other differences, our study varies as we allow complexity to increase informativeness of the disclosure for sophisticated investors, and we allow the firm to have private information when making the complexity decision.

Similar to Carlin (2009), obfuscation in prices has also been investigated by Carlin and Manso (2011), Ellison and Wolitzky (2012), and Gu and Wenzel (2014). These studies generally consider firm incentives to obfuscate prices within a consumer search framework. Our setting adds to this literature as we consider firm incentives when complexity may be information-increasing, in light of the potential for mimicry through obfuscation. A few papers consider the connection between the precision of information and disclosure choices. Langberg and Sivaramakrishnan (2008) consider a manager’s voluntary disclosure decision in the presence of an analyst who can potentially learn and reveal the precision of the disclosed information. The equilibrium is one where the manager has a greater tolerance for imprecision when disclosing good news relative to bad news. Hughes and Pae (2004) and Lee (2019) investigate voluntary disclosure of the precision of a public signal when there is uncertainty as to the manager’s endowment of such information, and Penno (1996) analyzes precision choice of subsequent mandatory disclosure following the release of a public signal. Titman and Trueman (1986) consider a model of IPOs where going-public firms can provide more precise information at a cost by using a high-quality auditor. Our model varies from these studies as we examine the trade-off between informativeness and accessibility of
disclosure in a setting with heterogeneous investors.

Myatt and Wallace (2012), Chen et al. (2017), Avdis and Banerjee (2019), and Liang and Zhang (2019) consider models in which certain disclosures are exogenously “clearer” or “more objective” than others, in that agents’ posterior means given such disclosures are more highly correlated. In these studies, the signals investors derive from the disclosure are of identical quality independent of the clarity of the disclosure. The notion of simplicity versus complexity we consider is related but distinct: simpler signals in our setting lead investors to receive signals of more homogenous quality. This not only implies that their posterior means are more highly correlated, but also that their expected posterior variances are more similar.

As unsophisticated investors in our setting have uncertainty regarding the quality of complex disclosures, our model relates to studies that examine disclosure with uncertainty over precision, such as Subramanyam (1996), Kirschenheiter and Melumad (2002), and Beyer (2009). Our paper also relates to studies that entail signaling in disclosure, such as Teoh and Hwang (1991), Beyer and Dye (2012), and Aghamolla et al. (2021). In our setting, complexity is a decision by the manager after she has observed private information, and thus the choice of complexity itself conveys information. Chen et al. (2020) examine the interaction of manipulation and disclosure accessibility; investors can exert costly effort to uncover manipulation if supplementary disclosure is made accessible. They show a separating equilibrium where only bad firms manipulate and make their disclosures inaccessible, but this equilibrium is sensitive to the degree of information asymmetry. Our model differs as we allow complexity to increase informativeness for one group of investors and we do not consider manipulation.

Our paper is also related to the literature that incorporates heterogeneous investors in disclosure. Dye (1998) extends the Dye (1985) framework to allow some investors to observe if the manager has received information. Another class of models examine disclosure incentives when some investors may be better informed than others, such as Bertomeu et al. (2011), Kumar et al. (2016), Einhorn (2018), Petrov (2020), and Banerjee et al. (2020). The current setting incorporates a similar feature, as sophisticated investors are better able to interpret complex information, thus being more informed for certain disclosure choices. In contrast to these models, however, we allow discretion over the quality of disclosure, which permits the manager to affect the degree of heterogeneity among investors.

Finally, our empirical methodology builds upon other recent work that documents non-monotonic relationships between characteristics of firms’ disclosures and features of their information environments. For instance, Fang et al. (2017) documents an inverse-U shaped relation between errors and bias in accounting, and Samuels et al. (2021) finds a non-monotonic
relation between public scrutiny and misreporting. Moreover, Kim et al. (2021) documents a non-monotonic relation between disclosure frictions and the prevalence voluntary disclosure, and Bertomeu et al. (2020) documents a non-monotonic relation between voluntary disclosure and investor attention.

2 Model

We consider a firm whose manager receives a private signal regarding the firm’s value $\tilde{y}$, which she must disclose to the market. The manager faces a market composed of a continuum of investors. Investors are heterogeneous in the sense that a fraction $\chi \in [0, 1]$ are sophisticated, while the remaining portion $1 - \chi$ are unsophisticated. We elaborate on the importance of this distinction shortly. For simplicity, but without loss of generality, we assume that the expected value of the firm given the manager’s signal $\tilde{y} = y$ is simply equal to $y$, and refer to $y$ as the firm’s value. We denote the density function of $\tilde{y}$ as $f(\cdot)$, its distribution function as $F(\cdot)$, and its mean by $\mu \equiv \mathbb{E}(\tilde{y})$. We further assume $\tilde{y}$ has full support on $(-\infty, \infty)$.

We seek to capture the phenomenon that managers often have latitude to present their information in a complex or simple manner; however, to communicate information precisely, managers must increase its complexity. For example, technology firms may possess obscure details on their product development. Moreover, managers can observe and disclose performance metrics whose value is ambiguous to those not familiar with their industry. Managers may also discuss the legal details of their contracts with large customers or their derivative hedging practices. At the same time, we wish to capture the potential for managers to artificially add complexity to their disclosures without conveying additional details in order to obfuscate their information. To capture these possibilities parsimoniously and to allow for tractable analysis, we introduce the following three disclosure choices:

- **Simple disclosure.** The manager can choose to disclose the information through a simple or uncomplicated disclosure. In this case, sophisticated and unsophisticated investors both observe a signal $\Delta_S$, which takes the following form. With probability $\rho_S \in (0, 1)$, the signal $\Delta_S$ reveals the manager’s private information $y$ and otherwise provides no information. This feature captures the notion that, due to its simplicity, information is lost to the capital market. For example, a disclosure with insufficient details prevents investors from making an informative judgment on the future impact of the signal. We assume that all investors are aware of the type of disclosure; that is, the fact that the disclosure is “simple” is common knowledge.

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3 We may expect a low $\rho_S$, for instance, in technical or high-growth industries where information is naturally complex, rendering simple disclosure to be ineffective for conveying the nuance and potential of
• **Informative complex disclosure.** The manager can alternatively choose to provide sufficient detail such that that the implications of the disclosed information can be adequately understood. However, the additional complexity in disclosure prevents unsophisticated investors from understanding the information. Formally, when the manager chooses informative complex disclosure, sophisticated investors observe a signal $\Delta_C$ that reveals the manager’s private information with probability one. On the other hand, unsophisticated investors do not observe $\Delta_C$. Hence, the information is fully revealed to a fraction $\chi$ of investors who are sufficiently sophisticated to parse the disclosure. In contrast to simple disclosure, all investors only observe that the information communicated is “complex,” and are unable to distinguish it with the other kind of complex disclosure discussed next.

• **Obfuscated disclosure.** The manager can instead choose to complexify the information release without making it more informative. In this case, the disclosure is obfuscated with additional erroneous details and explanations with the purpose of clouding information. Sophisticated investors observe a signal $\Delta_O$, which reveals the manager’s private information with probability $\rho_O \in [0, 1)$, and otherwise provides no information. Unsophisticated investors are again unable to interpret the disclosure due to the complexity. Moreover, as above, all investors understand that the disclosure is “complex,” but cannot disentangle between informative and obfuscated complexity. As we see later, the lack of distinction between the two kinds of complex disclosure becomes salient only for unsophisticated investors.\(^4\) A natural special case is $\rho_O = 0$, in which case obfuscation is equivalent to uninformative “babbling.”

This parsimonious structure allows us to capture the essence of variation in the amount and quality of information communicated with complex versus simple disclosure. The advantage of this informational structure is that it avoids distributional features that make the analysis intractable, and moreover, allows us to cleanly demonstrate the economic insights that arise from the model. A simplification embedded in this setting is that information can be lost to the capital market (e.g., Gao and Liang (2013), Guttman and Marinovic (2018)).\(^5\) While disclosures are generally not completely uninformative, we interpret this as a metaphor for noise or information loss in disclosure. For example, an unnecessarily complex disclosure on the firm’s future performance. In contrast, less technical and more stable industries can more easily convey information simply without significant information loss, implying a higher $\rho_S$.

\(^4\)As sophisticated investors can always understand complex disclosure, an uninformative signal implies that the manager must have obfuscated the disclosure.

\(^5\)This information structure also resembles models of probabilistic investor learning such as Goldstein et al. (2020) and Banerjee and Breon-Drish (2021).
and garbled disclosure can hinder the market’s ability to fully understand the information conveyed.

As obfuscated disclosures are meant to be the least informative type of disclosure, we incorporate the following assumption throughout the analysis:

**Assumption 1.** $\rho_S, \rho_O, \text{and } \chi$ are such that the following holds:

\[
\rho_S > \chi \cdot \rho_O.
\]

This condition states that simple disclosure is more informative than obfuscated disclosure to the average investor. Note a fraction $\chi$ of investors can understand obfuscated disclosure and this disclosure is informative with probability $\rho_O$. Thus, the likelihood that a given investor’s beliefs reflect the information in an obfuscated disclosure—which we refer to as the average investor’s “marginal reaction” to the disclosure—is $\chi \cdot \rho_O$. Likewise, since all investors can understand simple disclosure but it is only successfully communicated with probability $\rho_S$, the average investor’s marginal reaction to such a disclosure is $\rho_S$. A natural, sufficient condition for this assumption to hold is that obfuscated disclosure is no more informative than simple disclosure, i.e., $\rho_S \geq \rho_O$.

In our main analysis, we further impose the following parameter restriction.

**Assumption 2.** $\rho_S$ and $\chi$ are such that the following holds:

\[
\chi > \rho_S.
\]

This condition states that the manager is able to communicate more information to the average investor by choosing complex informative disclosure than by choosing simple disclosure. As mentioned above, the average investor’s marginal reaction to simple news is $\rho_S$. Since complex informative disclosure is always informative but understood only by a fraction $\chi$ of investors, the average investor’s marginal reaction to complex informative disclosure is $\chi$. We focus our analysis on this case given our interest in the potential for complexity to enable managers to communicate more information to the market. In Section 5, we return to consider the alternative case in which $\rho_S > \chi$, consistent with a setting in which a firm’s investor base is unsophisticated.

We additionally assume that with probability $\beta \in (0, 1)$, the manager does not have discretion over the disclosure choice.\(^6\) This captures the possibility that some managers are non-strategic, unconcerned with their short-term price, or that regulation in conjunction with their (unobservable) transactions requires them to disclose in a particular way. To

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\(^6\)A similar assumption is used in the disclosure models of Acharya et al. (2011) and Beyer and Dye (2012).
reiterate, the market observes the disclosure choice (simple or complex); however, it cannot
distinguish whether or not the manager has discretion. Conditional on the manager having
no discretion, a fraction $\omega_1 \in (0, 1)$, $\omega_2 \in (0, 1)$, and $1 - \omega_1 - \omega_2 \in [0, 1)$ of disclosures are
simple, uninformative complex, and informative complex, respectively.\(^7\)

The manager aims to maximize the firm’s price $P$, which assume reflects a weighted
average of investors’ beliefs:

$$P = \mathbb{E}(y|\Omega) = \chi \mathbb{E}_I(y|\Omega_I) + (1 - \chi) \mathbb{E}_U(y|\Omega_U),$$

where $\mathbb{E}_I(y|\Omega_I)$ and $\mathbb{E}_U(y|\Omega_U)$ denote the sophisticated and unsophisticated investors’ condi-
tional expectations given their information sets, respectively. While this assumption clearly
abstracts from many of the details of price formation, we simply seek to capture the notion
that the manager is concerned with the beliefs of both sophisticated and unsophisticated
investors. Note the model can also capture the case in which the manager is differentially
concerned with the beliefs of sophisticated and unsophisticated investors. For instance, so-
phisticated investors may be more willing to speculate on their beliefs. In this case, $\chi$ may be
interpreted more generally as the fraction of sophisticated investors in the market weighted
by the importance the manager places on their beliefs relative to those of unsophisticated
investors.

The sequence of the model is summarized as follows:

**Stage 1:** The manager privately observes $y$ and whether or not she has discretion.

**Stage 2:** If the manager has discretion, she chooses whether to disclose and the type of
disclosure: simple, obfuscated complex, or informative complex.

**Stage 3:** If the manager chooses to disclose, investors observe whether disclosure is simple
or complex. All investors observe the signal $\Delta_S$ under simple disclosure, while only sophis-
ticated investors observe the signal $\Delta_C$ or $\Delta_O$ under informative complex or obfuscated
complex disclosure, respectively.

**Stage 4:** Investors form beliefs, the firm is priced, and the manager’s payoff is realized.

### 3 Equilibrium

In this section, we derive the model’s equilibria. For ease of exposition, we introduce the
notation $x \in \{S, O, C\}$ to denote the manager’s choice of complexity and informativeness

\(^7\)As a consequence, off-equilibrium-path beliefs do not arise in our setting, which allows for a cleaner
characterization of the results.
in disclosure, where $S$, $O$, and $C$ represent simple, obfuscated complex, and informative complex disclosure, respectively. Recall that the manager’s goal is to maximize price, which reduces to maximizing the (weighted) average investor belief regarding its value. Given the assumption that $\chi > \rho S > \chi O$, the average investor reacts most strongly to complex informative and most weakly to obfuscated disclosure. This suggests that the manager will choose $x = O$ upon observing sufficiently negative news and will choose $x = C$ upon observing sufficiently positive news. This motivates us to consider the following class of equilibria.

**Definition 1.** Let a strategic complexity equilibrium refer to an equilibrium in which, for two thresholds $T_L < T_H$, a manager with discretion chooses obfuscated disclosure, $x = O$, when she observes $\tilde{y} < T_L$, chooses simple disclosure, $x = S$, when she observes $\tilde{y} \in [T_L, T_H]$, and chooses complex informative disclosure, $x = C$, when she observes $\tilde{y} > T_H$.

In a strategic complexity equilibrium, two thresholds determine the manager’s disclosure choice. The manager chooses obfuscated disclosure upon observing sufficiently bad news, informative complex disclosure upon observing sufficiently good news, and simple disclosure otherwise. Our first key result is that any equilibrium must be a strategic complexity equilibrium, regardless of the distribution of firm value.

**Theorem 1.** Any equilibrium of the model is a strategic complexity equilibrium.

The formal argument underlying Theorem 1 follows a series of steps. First, we show that in any equilibrium, the manager always chooses $x = O$ ($x = C$) when she observes sufficiently negative (positive) news. This follows from the intuition above: $x = O$ minimizes and $x = C$ maximizes the reaction to the manager’s news. Next, we rule out equilibria in which the manager selects the same form of disclosure on disjoint intervals of her signal. Finally, we rule out equilibria in which the manager always chooses either obfuscated or informative complex disclosure but never chooses simple disclosure.

This final result, which implies that the manager always chooses simple disclosure when she observes news on some range of intermediate values, is perhaps the most surprising and subtle, and thus warrants additional discussion. To see why it holds, suppose by contradiction that there is an equilibrium in which the manager always chooses either $x = O$ or $x = C$. Then, in this equilibrium, the manager selects between two potential disclosure choices, one that leads to a stronger response to her news than the other. Therefore, the equilibrium resembles that from a classical Dye (1985) disclosure model. Standard arguments can thus be applied to show that the equilibrium must be characterized by a threshold $\tau < \mu$ such that the manager chooses $x = C$ upon observing $\tilde{y} \geq \tau$ and $x = O$ upon observing $\tilde{y} < \tau$ (e.g., Jung and Kwon (1988)).
Figure 1: This figure depicts the firm’s expected price as a function of its value in a strategic-complexity equilibrium. The dashed lines represent the equilibrium thresholds $T_L, T_H$. The parameters held constant in the plot are: $\beta = 0.5; \omega_1 = 0.3; \omega_2 = 0.4; \rho_S = 0.3; \chi = 0.5; \rho_O = 0.3; \mu = 0$.

Now, suppose the manager observes $y \in (\tau, \mu)$ and thus chooses $x = C$ in this equilibrium. Unsophisticated investors would then value the firm at its the prior expected value, $\mu$, given that the manager always chooses a complex disclosure when she has discretion. In contrast, sophisticated investors value the firm at its expected value given the manager’s signal, $y$. This implies the manager can profitability deviate to $x = S$. If she does so, all investors assess the firm’s expected value to be $\mu$ in the event that the disclosure is uninformative, as any simple disclosure is believed to result from a manager with no discretion. Moreover, this would reduce the average investor’s reaction to the negative information given that $\chi > \rho_S$. Figure 1 illustrates a strategic complexity equilibrium, demonstrating that in such an equilibrium, the marginal reaction to the firm’s information is increasing, i.e., price is a convex function of firm value.

An implication of Theorem 1 is that any equilibrium in the model is consistent with both of the aforementioned empirical patterns that firms with negative news obfuscate (e.g., Li (2008), Lo et al. (2017)), and that complex disclosure can be informative (Lang and Stice-Lawrence (2015), Loughran and McDonald (2014), Bushee et al. (2018)). However, there remains some tension as to whether a strategic complexity equilibrium in fact always exists, and if so, what signals lead a manager to choose informative complexity. Notably, a manager with positive news faces a trade-off when choosing between $x = C$ and $x = S$ that must be

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6Formally, the payoff to the manager who observes $\tilde{y} = \tau$ from selecting $x = C$ is $\pi_C(\tau) \equiv \chi \tilde{y} + (1 - \chi)\mu$, while the payoff from $x = S$ is $\pi_S(\tau) \equiv \rho_S \tilde{y} + (1 - \rho_S)\mu$. Observe that $\pi_C(\tau) < \pi_S(\tau)$ since $\chi > \rho_S$ and $\tau < \mu$. 

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balanced in equilibrium. If the manager chooses \( x = C \) over \( x = S \), sophisticated investors will react more strongly to her news, but unsophisticated investors will not understand the disclosure and face uncertainty over whether the manager is obfuscating negative news. Moreover, from a technical point of view, a strategic complexity equilibrium requires the manager to be indifferent between disclosure choices at two thresholds, such that the usual arguments used to demonstrate existence of threshold equilibria in disclosure models do not apply.

In the next section, we will establish that strategic complexity equilibria, in fact, exist, and characterize their properties. To do so, we first derive the investors’ beliefs and the manager’s incentives in such an equilibrium.

**Investors’ Conditional Beliefs**

We begin by characterizing investors’ beliefs when the manager discloses simple information. In this case, both sophisticated and unsophisticated investors hold the same beliefs, which are determined by the disclosed signal \( \tilde{\Delta}_S \):

\[
\mathbb{E}_U(\tilde{y}|\tilde{x} = S) = \mathbb{E}_I(\tilde{y}|\tilde{x} = S) = \mathbb{E}(\tilde{y} | \tilde{\Delta}_S) = \begin{cases} 
\tilde{y} & \text{if } \tilde{\Delta}_S = \tilde{y}, \\
\beta \omega_1 \mu + (1 - \beta) (1 - F(T_H) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, T_H]) & \text{if } \tilde{\Delta}_S = \emptyset.
\end{cases}
\]

As in standard voluntary disclosure models, investors make a rational inference given uninformative disclosure. Specifically, investors realize that such disclosure either arises from a manager without discretion, in which no inference can be made, or a manager with discretion, in which case it can be inferred that the firm’s value belongs to the interval on which she chooses simple disclosure, i.e., \( \tilde{y} \in [T_L, T_H] \).

Next, if the manager issues an obfuscated disclosure, \( x = O \), investors’ beliefs depend upon whether they are sophisticated. Unsophisticated investors form their beliefs purely based upon the inference they make in equilibrium. As these investors cannot distinguish whether the disclosure is informative complex or obfuscated, they can only infer that \( \tilde{y} \notin [T_L, T_H], \) if the manager has discretion; this leads to:

\[
\mathbb{E}_U(\tilde{y}|\tilde{x} = O) = \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(T_H) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, T_H])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(T_H) + F(T_L))}.
\]

In contrast, sophisticated investors observe the disclosure signal \( \tilde{\Delta}_O \). When this signal is informative, they learn \( \tilde{y} \); otherwise, they are able to infer that, if the manager has discretion,
\( \tilde{y} < T_L \). Thus, we have:

\[
\mathbb{E}_I (\tilde{y} | \tilde{x} = O) = \mathbb{E} (\tilde{y} | \tilde{\Delta}_O) = \begin{cases} 
\tilde{y} & \text{if } \tilde{\Delta}_O = \tilde{y}, \\
\beta \omega_1 \mu + (1 - \beta) \frac{F(T_H) - F(T_L)}{\beta \omega_1 + (1 - \beta) F(T_L)} & \text{if } \tilde{\Delta}_O = \emptyset.
\end{cases}
\]

Finally, if the manager discloses informative complex information, unsophisticated investors again believe that \( \mathbb{E}_U (\tilde{y} | \tilde{x} = C) = \mathbb{E}_U (\tilde{y} | \tilde{x} = O) \), as given in expression (1). In contrast, sophisticated investors always learn the firm’s value:

\[
\mathbb{E}_I (\tilde{y} | \tilde{x} = C) = \mathbb{E} (\tilde{y} | \tilde{\Delta}_C) = \tilde{y}.
\]

With these results at hand, we move to deriving the manager’s expected payoffs as a function of her disclosure choice.

**Disclosure Choice and Manager Payoffs**

Let \( \pi_x (\tilde{y}; T_L, T_H) \) denote the manager’s expected payoff in a strategic complexity equilibrium characterized by the thresholds \( T_L \) and \( T_H \), given that the manager observes \( \tilde{y} \) and selects \( x \in \{ S, O, C \} \). Standard arguments imply that a strategic complexity equilibrium exists if and only if, upon observing \( \tilde{y} = T_L \), the manager is indifferent between simple and obfuscated disclosure and upon observing \( \tilde{y} = T_H \), the manager is indifferent between simple and informative complex disclosure. This leads to the following equilibrium conditions:

\[
Q_1 (T_L, T_H) \equiv \pi_S (T_H; T_L, T_H) - \pi_C (T_H; T_L, T_H) = 0; \\
Q_2 (T_L, T_H) \equiv \pi_S (T_L; T_L, T_H) - \pi_O (T_L; T_L, T_H) = 0.
\]

Now, note that, if the manager chooses simple disclosure, her payoff is a weighted average of investors’ beliefs conditional on the disclosure signal revealing her signal versus being uninformative:

\[
\pi_S (\tilde{y}; T_L, T_H) \equiv \rho_S \tilde{y} + (1 - \rho_S) \frac{\beta \omega_1 \mu + (1 - \beta) (F(T_H) - F(T_L)) \mathbb{E} (\tilde{y} | \tilde{y} \in [T_L, T_H])}{\beta \omega_1 + (1 - \beta) (F(T_H) - F(T_L))}.
\]

Similarly, if the manager chooses informative complex disclosure, her payoff is a weighted average of the beliefs of sophisticated and unsophisticated investors:

\[
\pi_C (\tilde{y}; T_L, T_H) \equiv \chi \tilde{y} + (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(T_H) + F(T_L)) \mathbb{E} (\tilde{y} | \tilde{y} \notin [T_L, T_H])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(T_H) + F(T_L))}.
\]
Finally, if the manager chooses obfuscated disclosure, her payoffs are a weighted average of sophisticated and unsophisticated investors’ beliefs, as well as the sophisticated investors’ beliefs as a function of whether the disclosure is informative:

$$\pi_O(\tilde{y}; T_L, T_H) \equiv \chi \left( \rho_O \tilde{y} + (1 - \rho_O) \frac{\beta \omega_2 \mu + (1 - \beta) F(T_L) \mathbb{E}(\tilde{y} | \tilde{y} < T_L)}{\beta \omega_2 + (1 - \beta) F(T_L)} \right)$$

$$+ (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(T_H) + F(T_L)) \mathbb{E}(\tilde{y} | \tilde{y} \notin [T_L, T_H])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(T_H) + F(T_L))}.$$ 

**Equilibrium**

We next demonstrate the existence of strategic complexity equilibria and characterize their core features.\(^9\)

**Proposition 1.** In any strategic complexity equilibrium, \(T_L < \mu\). Moreover,

1. There always exists a strategic complexity equilibrium in which \(T_H < \mu\) and the expected price response to simple information is negative.
2. For \(\rho_s\) sufficiently close to \(\chi\), there exists a strategic complexity equilibrium in which \(T_H > \mu\) and the expected price response to simple information is positive.

The first part of the proposition states that \(T_L < \mu\) in all equilibria, that is, the manager never obfuscates upon observing positive news. This is intuitive: by obfuscating, not only would the manager reduce the reaction to their information, but she would pool with lower performing firms. The remainder of the proposition states that there are two forms of strategic complexity equilibria. In the first type of equilibrium, which always exists, \(T_L < T_H < \mu\). Interestingly, the fact that \(T_H < \mu\) in such an equilibrium implies that, on average, the market updates downward upon observing simple disclosure, and updates upward upon observing complex disclosure. Stated differently, the average price response to simple disclosure is negative, which may be surprising given the common narrative that firms with bad news choose to obfuscate. The second part of the proposition effectively states that, as the relative reactions to simple and informative complex information converge \((\rho_s \to \chi)\), there also exists an equilibrium in which \(T_L < \mu < T_H\). In this case, the price response to simple information is, on average, positive (specifically, \(\mathbb{E}(\tilde{y} | \tilde{y} \in [T_L, T_H]) > \mu\)).

\(^9\)Technically, this result is a non-trivial extension of the classic arguments used to prove existence of disclosure equilibria. The classic argument involves showing that by varying the disclosure threshold, by continuity, one ultimately finds a point at which the manager on the threshold is indifferent between disclosing and not disclosing. In our setting, this argument does not apply in its standard form because (i) there are two disclosure thresholds, \(T_L, T_H\), and (ii) varying, e.g., the threshold \(T_H\) simultaneously affects the inference made from simple and complex informative disclosure.
Figure 2: This figure depicts the two potential types of equilibria characterized in Proposition 1.

**Equilibrium 1: Negative Reaction to Simple News**

Equilibrium 1: Negative Reaction to Simple News

<table>
<thead>
<tr>
<th>Obfuscated Disclosure</th>
<th>Simple Disclosure</th>
<th>Complex Informative Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x = O$</td>
<td>$x = S$</td>
<td>$x = C$</td>
</tr>
</tbody>
</table>

The existence of an equilibrium in which the price reaction to simple news is negative (i.e., $T_H < \mu$) can be understood as follows. In such an equilibrium, the manager chooses $x = S$ when she observes moderately negative news to partially temper the reaction to this news. She prefers $x = S$ over $x = O$, as obfuscating would cause unsophisticated investors to recognize that the manager observes highly negative news, and discount the firm accordingly. It may initially be surprising that, in this equilibrium, the manager chooses complex informative disclosure when she observes mildly negative news (i.e., when $y \in [T_H, \mu]$). The manager does so in order to avoid the negative inference investors draw from simple disclosure.

The reason why there may also exist a second type of equilibrium in which the reaction to simple news is positive (i.e., $T_H > \mu$) is as follows. When $\rho_S$ is close to $\chi$, the average investor reacts almost as strongly to complex informative disclosure as they do to simple disclosure. Thus, when the manager observes positive news, she is only marginally swayed towards complex informative disclosure based upon the increase in the average investor’s reaction that it creates. Nevertheless, if the manager’s news is extremely positive, she still prefers complex informative disclosure to maximize the reaction to this news, independent of the inference made from the manager’s disclosure choice. However, the manager is inclined towards simple disclosure when she observes mildly positive news. The reason is that, in such an equilibrium, investors draw a positive inference upon observing simple disclosure as they know the manager chooses $x = S$ when she observes, on average, positive news. Figure 2 depicts the two types of equilibria discussed in the proposition.
4 Properties of Strategic Complexity Equilibria

In this section, we first assess how a firm’s equilibrium disclosure complexity varies with the parameters of the model, including investor sophistication, the ability with which information can be simplified, and the likelihood the firm does not have discretion. We then assess how disclosure complexity relates to the dispersion in the beliefs of sophisticated and unsophisticated investors, and the relationship between disclosure complexity and price volatility. Our goal with these analyses is to develop intuition for the features of a strategic complexity equilibrium and generate empirical predictions.

4.1 Relative Likelihood of Obfuscation, Simplicity, and Informative Complexity

To assess the drivers of a firm’s equilibrium disclosure choice, we next conduct numerical comparative statics on the equilibrium thresholds $T_H$ and $T_L$ under the assumption that $\tilde{y} \sim N(0,1)$.\(^{10}\) We assess both the equilibria in which $T_H < \mu$ and in which $T_H > \mu$. Moreover, we focus on the parameters $\rho_S$, $\chi$, and $\beta$. Figure 3 illustrates the results.

While the exact relationships between the parameters $\rho_S$, $\chi$, and $\beta$ and firms’ disclosure choices depend upon the type of equilibrium under consideration, several key findings are robust to both types of equilibria. First, the upper panel in the figure shows that an increase in the likelihood the manager is constrained $\beta$ increases the likelihood that she chooses $x = O$ (but has an ambiguous impact on the likelihood she chooses $x = C$). Intuitively, as $\beta$ rises, the penalty sophisticated investors place on an obfuscating firm declines, which pushes the manager, when she is on the margin between $x = S$ and $x = O$, towards $x = O$. Furthermore, in the equilibrium in which $T_H < \mu$ ($T_H > \mu$), the manager has negative (positive) news when she is on the margin between $x = S$ and $x = C$. Thus, an increase in $\beta$ causes investors’ inferences from simple disclosure to rise (fall), which implies that the manager is more (less) inclined to choose $S$ over $C$. Thus, our model predicts that an increase in disclosure regulation that constrains firms to specific forms of disclosure increases obfuscation but has an ambiguous impact on informative complexity.

The middle and lower panels in Figure 3 illustrate two initially counter-intuitive results. Notably, an increase in manager’s ability to communicate via simple disclosure, $\rho_S$, decreases the likelihood she chooses simple disclosure in equilibrium. Similarly, an increase in investor sophistication, $\chi$, decreases the likelihood that the manager chooses complex disclosure.

\(^{10}\)Undocumented analyses suggest that the numerical results provided here extend beyond the parameters considered.
**Figure 3:** This figure depicts how the disclosure thresholds change as a function of $\rho_S$, $\chi$, and $\beta$ in both types of equilibria. The parameters held constant in the plots are $\beta = 0.5$; $\omega_1 = 0.3$; $\omega_2 = 0.4$; $\chi = 0.5$; $\rho_O = 0.3$; $\mu = 0$. In the left-hand plots, $\rho_S = 0.3$, while in the right-hand plots, $\rho_S = 0.45$; this ensures the equilibrium in which $T_H > \mu$ exists.
whether informative or not, in equilibrium. While these relationships hold in any equilibrium, the intuition differs across the equilibria in which \( T_H > \mu \) and \( T_H < \mu \).

Consider first the equilibrium in which the average response to \( x = S \) is negative, i.e., \( T_H < \mu \). In such an equilibrium, the positive relationship between \( \rho_S \) and complexity stems from the fact that the manager chooses \( x = S \) when she possesses negative news and so dislikes an increase in the response to her news. The negative relationship between investor sophistication and obfuscated disclosures arises because sophisticated investors see through obfuscation and penalize it heavily. Finally, the negative relationship between investor sophistication and complex informative disclosure arises because the manager is on the margin between \( S \) and \( C \) when she possesses negative news. Thus, thus manager dislikes the fact that, as sophistication rises, so too does the response to complex informative disclosure.

Next, consider an equilibrium in which the response to simple disclosure is positive, i.e., \( T_H > \mu \).\(^{11}\) In this case, a rise in \( \rho_S \) has two offsetting effects on the probability that the firm chooses \( x = S \). In particular, since the manager is on the margin between \( x = S \) and \( x = C \) when she possesses positive news, the increase in the reaction to this news caused by a rise in \( \rho_S \) pushes her towards \( x = S \). On the other hand, since the manager is on the margin between \( x = S \) and \( x = O \) when she possesses negative news, a rise in \( \rho_S \) pushes her towards \( x = O \). The latter effect dominates because \( |T_H| > |T_L| \); given a symmetric distribution such as the normal, this implies that the manager is more likely to be on the margin between \( x = O \) and \( x = S \) than between \( x = S \) and \( x = C \). A similar argument explains why an increase in investor sophistication (\( \chi \)) has the opposing effect, shifting the firm away from complex towards simple disclosure.

### 4.2 Disclosure Complexity and Belief Dispersion

We next analyze the difference in the average beliefs of sophisticated vs. unsophisticated investors, which we refer to as “belief dispersion.” Belief dispersion is important as it ostensibly determines the ability of sophisticated investors to earn trading profits at the cost of unsophisticated investors. It is further relevant to understanding the relationship between disclosure complexity and the trading behavior of sophisticated and unsophisticated investors. Conceivably, when the beliefs of investors depart, trading volume, and in particular, the absolute positions by sophisticated and unsophisticated investors, will increase.

Clearly, in our model, belief dispersion is minimized when the firm chooses simple disclosure; investors possess identical information in this case. Thus, loosely speaking, our

\(^{11}\)Note the parameter ranges analyzed in the right panels of the figure are limited, as an equilibrium with \( T_H > \mu \) only exists for a limited range of the parameter space.
model yields the intuitive prediction that volume will be minimized when firms issue easily digestible disclosure, ceteris paribus.\(^\text{12}\) Whether belief dispersion is greater when the firm issues complex informative vs. obfuscated disclosure is more subtle. Holding fixed the firm’s value, it is clearly the case that belief dispersion is the greatest when the manager chooses \(x = C\), as sophisticated investors receive a highly precise signal while unsophisticated investors do not receive a signal. However, given that complexity is an equilibrium choice, this need not imply that belief dispersion is the greatest when observing complex informative disclosure.

To see this more clearly, Figure 4 displays, across both types of equilibria in the model, (a) the average beliefs, \(\mathbb{E} [\mathbb{E}_U (\tilde{y}) | \tilde{y} = y]\) and \(\mathbb{E} [\mathbb{E}_I (\tilde{y}) | \tilde{y} = y]\), of sophisticated and unsophisticated investors in the economy as a function of \(y\), and (b) belief dispersion, defined as the absolute difference in these average beliefs, \(|\mathbb{E} [\mathbb{E}_U (\tilde{y}) - \mathbb{E}_I (\tilde{y}) | \tilde{y} = y]|\). Given that unsophisticated investors are less able to extract information from the firm’s disclosure, their beliefs depart significantly from those of sophisticated investors when the firm has very significant news (i.e., more surprising, in either direction). This is particularly pronounced when \(y\) is large and positive, as the manager chooses \(x = C\) in this case. For moderate levels of news that lead the firm to choose \(O\) or \(C\), the relationship between the firm’s value and belief dispersion is subtle and can be non-monotonic because of the signal that the firm’s disclosure choice provides to unsophisticated investors. In the equilibrium with \(T_H < \mu\), when \(\tilde{y}\) is only marginally greater than \(T_H\), unsophisticated investors are overly optimistic. In contrast, when \(\tilde{y}\) is significantly larger than \(T_H\), they are overly pessimistic. Thus, the difference in beliefs between the two classes of investors crosses zero at \(\tilde{y} = \mathbb{E}_U (\tilde{y}|C)\), such that belief dispersion given \(C\) is “V”-shaped. This non-monotonicity implies that obfuscated or complex informative disclosure may, on average, generate greater belief dispersion, depending upon the model’s parameters.

### 4.3 Disclosure Complexity and Price Volatility

In this section, we assess the relationship between the disclosure complexity and the volatility in prices that the disclosure creates. We define price volatility given a disclosure choice \(x \in \{S, O, C\}\) as \(\text{Var} [P | x]^{\frac{1}{2}}\). Two economic forces drive the relationship between disclosure complexity and price volatility. First, the disclosure’s complexity determines the magnitude of the average investor’s reaction to the news, which directly affects the amount of

\(^{12}\)This result contrasts with Avdis and Banerjee (2019), who find, in a setting where disclosure is exogenous, that clearer information leads to more trading volume in a setting of imperfectly competitive markets and ex-ante homogenous traders. Our model differs from theirs in that we abstract from competition among traders and model heterogeneous traders.
**Figure 4:** This figure depicts the average beliefs of sophisticated and unsophisticated investors and belief dispersion as a function of the firm’s value in equilibrium. The dashed lines represent the equilibrium thresholds $T_L, T_H$. The parameters held constant in the plot are: $\beta = 0.5; \omega_1 = 0.5; \omega_2 = 0.4; \rho_S = 0.4; \chi = 0.5; \rho_O = 0.3; \mu = 0$.

Equilibrium with Negative Reaction to Simple Info ($T_H < \mu$)

Equilibrium with Positive Reaction to Simple Info ($T_H > \mu$)

variation in prices it creates. Based on this force alone, whether simple or complex disclosure generates more volatility is unclear. While complex informative disclosure is more informative, obfuscated disclosure is less informative than simple disclosure. Whether, on average, complex disclosure is more informative thus depends upon the relative likelihood that the manager selects $x = O$ versus $x = C$.\(^{13}\) Second, in equilibrium, independent of the information contained in the disclosure itself, the manager chooses complex disclosure when she observes extremely positive or negative news. This tends to increase the volatility that complex disclosure creates.

In Figure 5, we illustrate the relationship between disclosure complexity and volatility in

\(^{13}\)Note that when the distribution of the manager’s news is symmetric and the likelihood the manager has no discretion and must choose $x = O$ and $x = C$ are the same, we can show that, in an equilibrium in which $T_H < \mu$, complex disclosure tends to be more informative than simple disclosure, and vice versa when $T_H < \mu$. This follows directly from the fact that when $T_L < T_H < \mu$, $F(T_L) < 1 - F(T_H)$. That is, among complex firms, a greater fraction select complex informative disclosure than obfuscated disclosure.
**Figure 5:** This figure depicts the volatility of the firm’s price conditional on complex and simple news under the two varieties of equilibria. Across all plots, we hold constant the parameters $\beta = 0.75; \omega_1 = 0.5; \omega_2 = 0.4; \mu = 0$. The left-hand plots consider the case in which complex news is relatively informative; here, we set $\rho_O = 0.3$ and $\chi = 0.7$. The left-hand plots consider the case in which complex news is relatively uninformative; here, we set $\rho_O = 0$ and $\chi = 0.5$. The figure demonstrates an additional unanticipated feature of the model. In particular, price volatility given a simple disclosure can fall as simple disclosure becomes more informative. Intuitively, as simple disclosure becomes more informative, in equilibrium, the manager chooses simple disclosure when their information is more moderate, attenuating price volatility.
5 Extension: Unsophisticated Investor Base ($\rho_S > \chi$)

Thus far, we have focused on the case in which complex informative disclosure is more informative to the average investor than simple disclosure, i.e., $\rho_S < \chi$. This is consistent with a firm whose investor base is reasonably sophisticated relative to the information loss caused by a simple disclosure. However, in certain cases, the majority of investors may be unable to process complex information, or information may be simplified with minimal information loss, i.e., we might expect that $\rho_S > \chi$. This may lead the average investor to learn more from simple than from complex informative disclosure. We conclude our analysis by studying the nature of the equilibrium that arises in this case.

In contrast to our previous analysis, when $\rho_S > \chi$, investors react most strongly to simple disclosure. Therefore, in any equilibrium, the manager chooses $x = S$ upon observing sufficiently positive news and $x = O$ upon observing sufficiently negative news. It is less clear whether, in equilibrium, the manager will ever find it optimal to choose $x = C$. The next proposition formalizes the nature of equilibria that arise, showing that the likelihood the manager is constrained to choosing obfuscated disclosure, $\beta \omega_2$, is pivotal in determining whether she ever chooses $x = C$.

**Proposition 2.** Suppose $\rho_S > \chi$. Then, in any equilibrium, there exists a $T_L < T_H < \mu$ such that the manager chooses $x = O$ when she observes $y < T_L$ and $x = S$ when she observes $y > T_H$. Moreover, there exists a $Z \in (0, 1)$ such that the following statements hold.

(i) Suppose $\beta \omega_2 \leq Z$. Then, there exists an equilibrium in which, for some $T_L < T_H < \mu$, the manager chooses $x = O$ when she observes $y < T_L$, $x = C$ when she observes $y \in (T_L, T_H)$, and $x = S$ when she observes $y > T_H$.

(ii) Suppose $\beta \omega_2 \geq Z$. Then, there exists an equilibrium in which, for some $T < \mu$, the manager chooses $x = O$ when she observes $y < T$, chooses $x = S$ when she observes $y > T$, and never chooses $x = C$.

The proposition demonstrates that in any equilibrium, the manager chooses $x = S$ when she observes either positive news ($\tilde{y} > \mu$) or mildly negative news, and chooses $x = O$ when she observes sufficiently negative news. As a result, the price reaction to simple disclosure is always positive. Moreover, assuming the distribution of firm value is not heavily skewed, simple disclosure is the manager’s most common choice. When $\beta \omega_2 > Z$, the manager never chooses $x = C$, while when $\beta \omega_2 < Z$, there exists an intermediate range of signals that lead her to choose $x = C$ in equilibrium.

Intuitively, $\beta \omega_2$ determines the nature of the equilibrium because it determines the discount imposed on obfuscated disclosure by unsophisticated investors. When $\beta \omega_2$ is large,
the discount placed on obfuscation is minor, as it is likely to have arisen from a firm without
discretion. Thus, when the manager observes negative news, she prefers to diminish the
response to this news by choosing $x = O$. In contrast, when $\beta \omega_2$ is small, the discount to
obfuscation is severe. Thus, the manager prefers to choose $x = C$ over $x = O$ upon observing
moderately negative news despite the fact that the average investor reacts more strongly to
this news.

6 Empirical Implications

A number of studies in the empirical literature have recently explored linguistic complexity
in financial reporting and disclosure, such as Li (2008), You and Zhang (2009), Loughran
and McDonald (2014), Filzen and Peterson (2015), Guay et al. (2016), Bonsall et al. (2017),
Lo et al. (2017), Chychyla et al. (2019), Bushee et al. (2018), and Cohen et al. (2020), among
others. In this section, we discuss empirical predictions that emerge from our model. Our
aim is to provide potentially new avenues for future research; as such, many of the predictions
discussed below have yet to be investigated in the empirical literature. However, we make
connections with the literature when possible.

In our primary analyses, we find that, among firms that can convey additional information
to the market via complex disclosure, both firms with positive and negative news issue
complex disclosures, while firms with intermediate news issue simple disclosures. This implies
that disclosure complexity is \textit{non-monotone} in firm news. Firms are likely to be able to
provide more information by raising complexity when their investor base is sophisticated or
their economics are such that simplifying disclosure reduces its information content.

\textbf{Prediction 1.} \textit{The relation between complexity and news is U-shaped among firms or in-
dustries that have a high degree of sophisticated investors, or in industries where simplifying
disclosure leads to considerable information loss.}

The empirical literature has used a number of different proxies for reporting complexity.
These include, for example, disclosure length or the number of words in the disclosure (e.g.,
You and Zhang (2009), Guay et al. (2016), deHaan et al. (2020)), or the Fog index, which
considers the number of words per sentence and the number of syllables per word (e.g., Li
(2008), Miller (2010), Lehavy et al. (2011), Lo et al. (2017)). Using these measures, several
studies have documented a negative linear relationship between performance and complexity.
While these findings are consistent with our result that poorly performing firms obfuscate,
we expect a \textit{nonlinear} U-shaped relation between performance and complexity of disclosures.
under the common measures for complexity. Bushee et al. (2018) attempts to disentangle
the informative and obfuscated components of complexity, and finds evidence of both.

The results also provide implications concerning variation in the market reaction to disclosures within industries that exhibit this U-shaped pattern. Proposition 1 implies that, when a firm’s investor base is sophisticated or simple information entails significant information loss, the average market beliefs are updated downward following simple disclosure. This leads to an average negative (positive) market reaction to simple (complex) disclosure. However, when simple disclosure is sufficiently informative relative to the level of investor sophistication, there exist two equilibria with opposing reactions to simple news. Thus, our model makes no clear prediction in this case.

**Prediction 2.** Among firms or industries with a high level of investor sophistication or in more complex industries where simple disclosure is less informative, we expect an average negative market reaction following simple disclosures, and an average positive reaction following complex disclosures. In contrast, among industries in which simple disclosure is informative relative to the level of investor sophistication, the reaction to simple and complex disclosure may be either positive or negative.

The results imply that the average market reaction to simple and complex disclosures can vary depending on industry characteristics. While market reaction to complexity level has not been empirically analyzed directly (to our knowledge), a few papers provide indirect evidence. For example, Li (2008) shows that bad firms complexify, which would indicate an average negative market to complex disclosure, consistent with the latter implication in Prediction 2. Conversely, Lo et al. (2017) find that meet-or-beat firms often have complex disclosures, which suggests a positive reaction, in line with the first part of Prediction 2. Prediction 2 suggests that the market reaction to complexity in disclosure varies by industry characteristics, and may therefore help to reconcile these somewhat conflicting findings.

Our model further offers predictions on the relative frequency with which firms issue simple and complex disclosures. Section 4.1 shows that a firm is less likely to issue simple disclosure when such disclosure is more informative, such as in less complex industries. Likewise, the frequency of complex (simple) disclosures is decreasing (increasing) in the level of investor sophistication. Hence, the results provide implications regarding variation in the extent of complexity or simplicity in disclosure among firms within industries based on industry characteristics, as well as variation across industries which exhibit a nonlinear relation.

**Prediction 3.** The mass of firms issuing simple relative to complex disclosure is decreasing as simple disclosures become more informative, and increasing in the level of investor
Finally, our results have implications for belief dispersion among investors and return volatility upon the release of a disclosure. As discussed in Section 4, belief dispersion is always greater for complex disclosure due to some investors not being able to process the disclosure. Likewise, price volatility is higher for complex disclosure as the news tends to be more extreme.

**Prediction 4.** Belief dispersion and price volatility are greater for firms that issue complex (informative or obfuscated) disclosures than firms that issue simple disclosures.

Some evidence for the above prediction has been documented in the empirical literature. Miller (2010) finds that investor belief dispersion is greater among firms that issue complex disclosures. Relatedly, Lawrence (2013) documents that unsophisticated investors have a lower information disadvantage among firms that issue simple disclosures. Both findings are consistent with (i) in Prediction 4.

To reiterate, our main results rely on the firm’s ability to convey additional information to the market via complex disclosure, which is captured by Assumption 2 in the model. If this does not hold, as shown in Section 5, the relation between complexity and news is instead monotonic and negative. Thus, our results suggest cross-industry variation in the relation between news and complexity.

In particular, we expect a monotonic relation in industries which have a low proportion of sophisticated investors, or in industries where information can be conveyed in a simple manner (Proposition 2). These can include, for example, less technical or more established industries which can more easily convey information simply without significant information loss, or which do not often experience innovations (e.g., oil, toilet paper). In contrast, industries with rapidly evolving product markets, growth, or high-tech industries may naturally be more complicated, and hence simple disclosure is less effective in conveying complex information in such industries. Hence, we expect variation in the relation between performance and disclosure complexity based on industry characteristics.

### 6.1 Empirical Analysis

While the main focus of this study is the development of theoretical underpinnings of strategic complexity in disclosure, we provide a preliminary examination of our central prediction regarding the U-shaped relation between performance and complexity. We note that this analysis is exploratory in nature and is intended to provide a stepping stone for future empirical investigation of our predictions.
To examine the non-monotone relation, we consider the following research design at the firm-quarter level:

\[ Complexity_{i,t} = \alpha + \beta_1 Performance_{i,t} + \beta_2 Performance_{i,t}^2 + \gamma' Controls_{i,t-1} + \mu_k + \eta_t + \varepsilon_{i,t}. \]  

Specification (2) is similar to the extant empirical literature which considers a linear relation between complexity and performance (e.g., Li (2008)). The main difference is that we include \( Performance_{i,t}^2 \), which is the square of \( Performance_{i,t} \). For our dependent variable, disclosure complexity, we employ a number of measures that are widely used in the empirical literature. These include the fog index, the average number of words per paragraph, the number of complex words, the rix index, and the smog index. All measures are with respect to the complexity of firm \( i \)'s 10-Q report for quarter \( t \).

The main independent variables are \( Performance_{i,t} \) and its squared term. Performance in our model is primarily intended to capture future or expected performance of the firm based on management’s current beliefs. We therefore must measure firm performance in the period following the information release. Moreover, due to heterogeneity in investor ability to process complex information (e.g., Cohen et al. (2020)), the firm’s stock price may not immediately reflect future expected performance following the disclosure. Consequently, our primary measure of performance is the three-day abnormal return around the earnings announcement date. Because the manager’s private information is partially impounded into the firm’s stock price through sophisticated investors’ demand, the announcement date return serves as a proxy for this private information. However, we additionally use the quarterly cumulative abnormal return as an additional measure of expected performance.

Our model predicts that, in a strategic complexity equilibrium, high-performing firms choose informative complex disclosure, intermediate-performing firms choose simple disclosure, and low-performing firms choose obfuscated complex disclosure. As such, our results imply that the primary coefficient of interest, \( \beta_2 \), should be positive, indicating a non-monotone, U-shaped relation between performance and disclosure complexity. Controls include leverage, size, market-to-book, and return volatility, all measured at the previous quarter, \( t - 1 \). We include industry fixed effects, captured by the parameter \( \mu_k \) for firm \( i \) in industry \( k \), as the nature of certain industries may impact the complexity of disclosure. We also include time (quarter-year) fixed effects, denoted by \( \eta_t \).

Our model additionally implies that the non-monotone, U-shaped relation is more salient when the concentration of sophisticated investors is high. We therefore examine the following
related specification:

\[ \text{Complexity}_{i,t} = \alpha + \beta_1 \text{Performance}_{i,t} + \beta_2 \text{Performance}^2_{i,t} \]
\[ + \beta_3 \text{Inst Own}_{i,t} + \beta_4 \text{Performance}_{i,t} \times \text{Inst Own}_{i,t} \]
\[ + \beta_5 \text{Performance}^2_{i,t} \times \text{Inst Own}_{i,t} \]
\[ + \gamma' \text{Controls}_{i,t-1} + \mu_k + \eta_t + \varepsilon_{i,t}. \]

The variable \( \text{Inst Own}_{i,t} \) denotes the proportion of shares outstanding for firm \( i \) in quarter \( t \) that are owned by institutional investors. The main coefficient of interest in regression (3) is \( \beta_5 \). Our model predicts that the strategic complexity incentives should be more pronounced when institutional ownership concentration is higher, and thus coefficient \( \beta_5 \) should be positive.

Our data for complexity measures come from the WRDS SEC Analytics Suite database, and thus the measures requiring computation or textual analysis are done by the data vendor. Our firm performance measures come from CRSP and we gathered firm-level characteristics data from Compustat. Our institutional ownership data come from the WRDS Thomson Reuters Institutional (13f) Holdings database. The sample period is from 1994Q1 to 2019Q3, as 2019Q3 is the last period for which the complexity data is available. This results in a sample of 203,748 firm-quarter observations. We winsorize all continuous variables at the bottom and the top 1 percentiles. We drop all observations in which institutional ownership percentage is reported as greater than 1.

Table 1 reports the results for specification (3). We see that \( \beta_1 \), the coefficient on quarterly abnormal returns is negative and significant, which is in line with previous findings that complexity is decreasing in performance. However, the coefficient on the square of this term, \( \beta_2 \), is positive and significant across all measures, which comports with our prediction of a non-monotone, U-shaped relation between complexity and performance. This non-monotonicity is also graphically presented in Figure 6. The results for specification (4) are reported in Table 4. We see that the effects are centered on firms that have higher levels of institutional ownership, as the coefficient \( \beta_5 \) is positive and significant.

Tables 3 and 4 examine specifications (2) and (3) but use quarterly cumulative abnormal returns around earnings announcement. The results support the predictions of a non-monotone relation between performance and complexity, and that this relation holds primarily for firms with a high concentration of sophisticated shareholders.
7 Conclusion

Firm managers have considerable latitude in the level of complexity of their disclosures. The empirical literature has found mixed results concerning the informativeness of complex disclosures, which appear to be not only a means to obfuscate (e.g., Li (2008)), but also necessary to convey more precise information (e.g., Bushee et al. (2018)). In this paper, we develop a parsimonious model to help reconcile these conflicting findings and provide theoretical underpinnings for the notion of complexity in disclosure. Our results show that any equilibrium must take the form of a strategic complexity equilibrium, where both high-performing and low-performing firms complexity information, while intermediate-performing firms issue simple disclosures. This non-monotone, U-shaped pattern shares features with the data, as evidenced by our empirical investigation. Additionally, our results provide conditions under which we expect the market reaction to simple disclosure to be negative, in contrast to the conventional wisdom that bad news is more often complexified.

Our results also provide implications for public policy concerning financial statement disclosure. In particular, the main tension of our model arises due to the presence of investors who are unable to parse complex information. In practice, this can correspond to retail investors who are not adept in synthesizing complicated financial statements. In turn, a firm that wishes to convey deeper information must trade-off the cost of sacrificing information to unsophisticated investors through a more complex report. One remedy for this dichotomy is to mandate that firms must provide a “simplified report,” along with the 10-K or 10-Q, that synthesizes the main points of the textual narrative in the main report. This would allow retail investors to understand key points by management even if they are unable to digest the full report. Our model implies that this would increase informativeness of the overall disclosure and also can make mimicry more difficult for low-performing firms.
References


BANERJEE, S., I. MARINOVIC, AND K. SMITH (2020): “Disclosing to informed traders,” Available at SSRN.


226–253.


GUTTMAN, I., I. KREMER, AND A. SKRZYPACZ (2014): “Not only what but also when: A


Figure 6: Disclosure complexity and performance. We separate the three-day abnormal return around the earnings announcement date for each firm-quarter of our sample from 1994Q1 to 2019Q3 into ten bins. We then calculate the average complexity for each bin using the respective measure. The data sources are discussed in Section 6.1.
Table 1: Disclosure complexity and performance — three-day abnormal returns

This table provides results examining the non-monotone relation between disclosure complexity and performance. The dependent variable is a measure of disclosure complexity, as specified, for firm $i$ in quarter $t$. $CAR \text{ Announce}_{i,t}$ is the three-day abnormal return around the earnings announcement for firm $i$ in quarter $t$. $CAR \text{ Announce}^2_{i,t}$ is the square of $CAR \text{ Announce}_{i,t}$. Control variables include size, leverage, market-to-book ratio, and return volatility, all lagged to the previous quarter; variable definitions are included in Appendix B. The regressions are run from 1994Q1 to 2019Q3. Robust standard errors are clustered at the firm level. $t$-statistics are in parentheses. A constant term is included in all regressions, but not reported. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$CAR \text{ Announce}_{i,t}$</td>
<td>Complex Word$_{i,t}$</td>
<td>Fog Index$_{i,t}$</td>
<td>Smog Index$_{i,t}$</td>
<td>Rix$_{i,t}$</td>
<td>Avg Word$_{i,t}$</td>
</tr>
<tr>
<td></td>
<td>-0.109***</td>
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<tr>
<td>$CAR \text{ Announce}^2_{i,t}$</td>
<td>1.674***</td>
<td>2.646***</td>
<td>1.911***</td>
<td>1.952***</td>
<td>0.321***</td>
</tr>
<tr>
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<td>(16.88)</td>
<td>(7.37)</td>
<td>(10.55)</td>
<td>(7.05)</td>
<td>(5.69)</td>
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<tr>
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<td>Y</td>
<td>Y</td>
</tr>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Quarter-Year FE</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>203748</td>
<td>203748</td>
<td>203748</td>
<td>203748</td>
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<td>Adjusted $R^2$</td>
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<td>0.162</td>
<td>0.251</td>
<td>0.163</td>
<td>0.127</td>
</tr>
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</table>
Table 2: Disclosure complexity, three-day abnormal returns, and institutional ownership

This table provides results examining the non-monotone relation between disclosure complexity and performance. The dependent variable is a measure of disclosure complexity, as specified, for firm \( i \) in quarter \( t \). \( CAR\ Announce_{i,t} \) is the three-day abnormal return around the earnings announcement for firm \( i \) in quarter \( t \). \( CAR\ Announce^2_{i,t} \) is the square of \( CAR\ Announce_{i,t} \). \( Inst\ Own_{i,t} \) is the percentage of firm \( i \)'s shares held by institutional investors in quarter \( t \). Control variables include size, leverage, market-to-book ratio, and return volatility, all lagged to the previous quarter; variable definitions are included in Appendix B. The regressions are run from 1994Q1 to 2019Q3. Robust standard errors are clustered at the firm level. \( t \)-statistics are in parentheses. A constant term is included in all regressions, but not reported. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
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<th>(2) Fog Index(_{i,t})</th>
<th>(3) Smog Index(_{i,t})</th>
<th>(4) Rix(_{i,t})</th>
<th>(5) Avg Word(_{i,t})</th>
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<tr>
<td>( CAR\ Announce_{i,t} )</td>
<td>-0.206***</td>
<td>-0.318***</td>
<td>-0.227***</td>
<td>-0.184**</td>
<td>-0.0530***</td>
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<tr>
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<td>(-6.59)</td>
<td>(-3.16)</td>
<td>(-3.92)</td>
<td>(-2.40)</td>
<td>(-2.97)</td>
</tr>
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<td>( Inst\ Own_{i,t} )</td>
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<td>0.312***</td>
<td>0.219***</td>
<td>0.234***</td>
<td>0.0399***</td>
</tr>
<tr>
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<td>(5.44)</td>
<td>(5.83)</td>
<td>(6.10)</td>
<td>(5.65)</td>
<td>(3.78)</td>
</tr>
<tr>
<td>( CAR\ Announce_{i,t} \times Inst\ Own_{i,t} )</td>
<td>0.199***</td>
<td>0.436***</td>
<td>0.317***</td>
<td>0.248**</td>
<td>0.0744**</td>
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<tr>
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<td>(3.83)</td>
<td>(2.76)</td>
<td>(3.27)</td>
<td>(2.03)</td>
<td>(2.32)</td>
</tr>
<tr>
<td>( CAR\ Announce^2_{i,t} )</td>
<td>1.320***</td>
<td>1.711***</td>
<td>1.107***</td>
<td>0.846*</td>
<td>0.174</td>
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<td>(5.74)</td>
<td>(2.79)</td>
<td>(2.84)</td>
<td>(1.80)</td>
<td>(1.28)</td>
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<tr>
<td>( CAR\ Announce^2_{i,t} \times Inst\ Own_{i,t} )</td>
<td>0.987**</td>
<td>2.152*</td>
<td>2.040***</td>
<td>2.447***</td>
<td>0.540**</td>
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<td>(1.88)</td>
<td>(2.71)</td>
<td>(2.74)</td>
<td>(2.13)</td>
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Controls: Y Y Y Y Y
Industry FE: Y Y Y Y Y
Quarter-Year FE: Y Y Y Y Y
Observations: 148738 148738 148738 148738 148738
Adjusted \( R^2 \): 0.630 0.174 0.257 0.171 0.141
This table provides results examining the non-monotone relation between disclosure complexity and performance. The dependent variable is a measure of disclosure complexity, as specified, for firm $i$ in quarter $t$. $\text{CAR Quarter}_{i,t}$ is the quarterly abnormal return for firm $i$ in quarter $t$. $\text{CAR Quarter}_{i,t}^2$ is the square of $\text{CAR Quarter}_{i,t}$. Control variables include size, leverage, market-to-book ratio, and return volatility, all lagged to the previous quarter; variable definitions are included in Appendix B. The regressions are run from 1994Q1 to 2019Q3. Robust standard errors are clustered at the firm level. $t$-statistics are in parentheses. A constant term is included in all regressions, but not reported. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>(1) Complex Word$_{i,t}$</th>
<th>(2) Fog Index$_{i,t}$</th>
<th>(3) Smog Index$_{i,t}$</th>
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<th>(5) Avg Word$_{i,t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{CAR Quarter}_{i,t}$</td>
<td>-0.126*** (-22.82)</td>
<td>-0.166*** (-9.15)</td>
<td>-0.128*** (-12.52)</td>
<td>-0.103*** (-7.42)</td>
<td>-0.0325*** (-10.04)</td>
</tr>
<tr>
<td>$\text{CAR Quarter}_{i,t}^2$</td>
<td>0.338*** (28.73)</td>
<td>0.416*** (12.34)</td>
<td>0.314*** (14.90)</td>
<td>0.280*** (10.80)</td>
<td>0.0700*** (10.80)</td>
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</table>

Controls: Y Y Y Y Y
Industry FE: Y Y Y Y Y
Quarter-Year FE: Y Y Y Y
Observations: 205195 205195 205195 205195 205195
Adjusted $R^2$: 0.621 0.163 0.251 0.163 0.127
Table 4: Disclosure complexity, quarterly abnormal returns, and institutional ownership

This table provides results examining the non-monotone relation between disclosure complexity and performance, interacted with the level of institutional ownership. The dependent variable is a measure of disclosure complexity, as specified, for firm $i$ in quarter $t$. $\text{CAR Quarter}_{i,t}$ is the quarterly abnormal return for firm $i$ in quarter $t$. $\text{CAR Quarter}_{i,t}^2$ is the square of $\text{CAR Quarter}_{i,t}$. $\text{Inst Own}_{i,t}$ is the percentage of firm $i$’s shares held by institutional investors in quarter $t$. Control variables include size, leverage, market-to-book ratio, and return volatility, all lagged to the previous quarter; variable definitions are included in Appendix B. The regressions are run from 1994Q1 to 2019Q3. Robust standard errors are clustered at the firm level. $t$-statistics are in parentheses. A constant term is included in all regressions, but not reported. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
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<th>(2) $\text{Fog Index}_{i,t}$</th>
<th>(3) $\text{Smog Index}_{i,t}$</th>
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<tbody>
<tr>
<td>$\text{CAR Quarter}_{i,t}$</td>
<td>-0.162***</td>
<td>-0.238***</td>
<td>-0.182***</td>
<td>-0.140***</td>
<td>-0.0502***</td>
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<td>(-8.29)</td>
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<td>(-7.13)</td>
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<tr>
<td>$\text{Inst Own}_{i,t}$</td>
<td>0.127***</td>
<td>0.322***</td>
<td>0.230***</td>
<td>0.243***</td>
<td>0.0410***</td>
</tr>
<tr>
<td></td>
<td>(5.77)</td>
<td>(5.98)</td>
<td>(6.38)</td>
<td>(5.83)</td>
<td>(3.90)</td>
</tr>
<tr>
<td>$\text{CAR Quarter}<em>{i,t} \times \text{Inst Own}</em>{i,t}$</td>
<td>0.0787***</td>
<td>0.165**</td>
<td>0.122***</td>
<td>0.0885*</td>
<td>0.0426***</td>
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<td>(3.01)</td>
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<td>$\text{CAR Quarter}_{i,t}^2$</td>
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<td>0.200***</td>
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<tr>
<td></td>
<td>(10.96)</td>
<td>(5.04)</td>
<td>(5.53)</td>
<td>(3.70)</td>
<td>(3.41)</td>
</tr>
<tr>
<td>$\text{CAR Quarter}<em>{i,t}^2 \times \text{Inst Own}</em>{i,t}$</td>
<td>0.164***</td>
<td>0.303*</td>
<td>0.237**</td>
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</tr>
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<td>(2.59)</td>
<td>(1.95)</td>
<td>(2.30)</td>
<td>(2.48)</td>
<td>(2.86)</td>
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</tbody>
</table>

Controls | Y | Y | Y | Y | Y | Y |
Industry FE | Y | Y | Y | Y | Y |
Quarter-Year FE | Y | Y | Y | Y | Y |
Observations | 149626 | 149626 | 149626 | 149626 | 149626 |
Adjusted $R^2$ | 0.631 | 0.174 | 0.257 | 0.172 | 0.141 |
Appendix

A Proofs

A.1 Proof of Theorem 1

Conjecture a generic equilibrium in which firms observing ⃗{y} ∈ Y choose disclosure type x, where Yₐ, Yₜ, and Yₙ are three disjoint sets (of which some may be empty) with Y = Yₐ ∪ Yₜ ∪ Yₙ. Let πₐ( x), πₜ( y), and πₙ( y) denote the expected payoffs to the firm given each of the respective disclosure choices and let Π ( Yₐ) = ∫ₐ f (t) dt denote the probability that y ∈ Yₐ. Note that:

\[
\piₐ (⃗{y}) = ρₐ⃗{y} + (1 - ρₐ) \frac{βω₁μ + (1 - β) Π ( Yₜ) E ( ⃗{y} | ⃗{y} ∈ Yₜ)}{βω₁ + (1 - β) Π ( Yₜ)};
\]

\[
\piₙ (⃗{y}) = χ ⃗{y} + (1 - χ) \frac{β (1 - ω₁) μ + (1 - β) Π ( Yₙ ∪ Yₜ) E ( ⃗{y} | ⃗{y} ∈ Yₙ ∪ Yₜ)}{β (1 - ω₁) + (1 - β) Π ( Yₙ ∪ Yₜ)};
\]

\[
\piₜ (⃗{y}) = χ (ρₐ⃗{y} + (1 - ρₐ) \frac{βω₂μ + (1 - β) Π ( Yₙ) E ( ⃗{y} | ⃗{y} ∈ Yₙ)}{βω₂ + (1 - β) Π ( Yₙ)}) + (1 - χ) \frac{β (1 - ω₁) μ + (1 - β) Π ( Yₙ ∪ Yₜ) E ( ⃗{y} | ⃗{y} ∈ Yₙ ∪ Yₜ)}{β (1 - ω₁) + (1 - β) Π ( Yₙ ∪ Yₜ)}.
\]

Since ρₐ ∈ (χρₙ, χ), πₐ (⃗{y}) - πₜ (⃗{y}) and πₐ (⃗{y}) - πₙ (⃗{y}) linearly increase and decrease in ⃗{y}, respectively. This implies that, in any equilibrium, it must be that Yₙ and Yₜ are not empty, as sufficiently high and low types always prefer C and O, respectively. Moreover, if Yₜ is nonempty, Yₛ < Yₜ < Yₙ, and if Yₜ is empty, Yₜ < Yₙ. To complete the proof, we need only to show that Yₜ cannot be empty in an equilibrium. Suppose by contradiction that there were an equilibrium in which Yₜ = ∅. Then, we have sup Yₜ = inf Yₙ = τ. Note that τ < μ, since, in such an equilibrium, for any x > μ,

\[
\piₙ (x) - \piₜ (x) = χ (1 - ρₙ) \left[ x - \frac{βω₂μ + (1 - β) F (τ) E ( ⃗{y} | ⃗{y} < τ)}{βω₂ + (1 - β) F (τ)} \right] > 0.
\]

Now, note that, in such an equilibrium, E ( ⃗{y} | ⃗{y} ∈ Yₙ ∪ Yₜ) = μ, and thus:

\[
\piₙ (⃗{y}) = χ ⃗{y} + (1 - χ) μ; \piₚ (⃗{y}) = ρₚ⃗{y} + (1 - ρₚ) μ.
\]

However, since τ < μ and χ > ρₚ, this implies that πₚ (τ) < πₚ (τ) and thus type τ wishes to deviate to S.
A.2 Proof of Proposition 1

We first prove that that there is no equilibrium in which $T_L > \mu$. Note this would imply:

$$Q_2(T_L, T_H) = (1 - \rho_S) \left[ \frac{\beta \omega_1 \mu + (1 - \beta) (F(T_H) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, T_H])}{\beta \omega_1 + (1 - \beta) (F(T_H) - F(T_L))} - T_L \right]$$

$$-\chi (1 - \rho_O) \left[ \frac{\beta \omega_2 \mu + (1 - \beta) F(T_L) \mathbb{E}(\tilde{y}|\tilde{y} < T_L)}{\beta \omega_2 + (1 - \beta) F(T_L)} - T_L \right]$$

$$- (1 - \chi) \left[ \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(T_H) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, T_H])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(T_H) + F(T_L))} - T_L \right] > 0.$$

**Part (i)** To begin, we show that, $\forall T_L < \mu$, there exists a unique value $\gamma(T_L) \in (T_L, \mu)$ such that $Q_1(T_L, \gamma(T_L)) = 0$, and that $\gamma(T_L)$ is continuous. Note:

$$Q_1(T_L, x) = (\rho_S - \chi) x + (1 - \rho_S) \frac{\beta \omega_1 \mu + (1 - \beta) (F(x) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, x])}{\beta \omega_1 + (1 - \beta) (F(x) - F(T_L))}$$

$$- (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(x) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, x])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(x) + F(T_L))}.$$

We have that:

$$\lim_{x \to \mu} Q_1(T_L, x)$$

$$= (1 - \rho_S) \left[ \frac{\beta \omega_1 \mu + (1 - \beta) (F(\mu) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, \mu])}{\beta \omega_1 + (1 - \beta) (F(\mu) - F(T_L))} - \mu \right]$$

$$- (1 - \chi) \left[ \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(\mu) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, \mu])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(\mu) + F(T_L))} - \mu \right] < 0.$$

Next, given that $\rho_S < \chi$,

$$\lim_{x \to T_L} Q_1(T_L, x)$$

$$= (\rho_S - \chi) T_L + (1 - \rho_S) \frac{\beta \omega_1 \mu + (1 - \beta) (F(T_L) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, T_L])}{\beta \omega_1 + (1 - \beta) (F(T_L) - F(T_L))}$$

$$- (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(T_L) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, T_L])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(T_L) + F(T_L))}$$

$$= (\rho_S - \chi) (T_L - \mu) > 0.$$

The existence of a $\gamma(T_L) \in (T_L, \mu)$ such that $Q_1(T_L, \gamma(T_L)) = 0$ now follows by the intermediate value theorem. Next, in order to show that such a $\gamma(T_L)$ is unique, we show that
$Q_1(T_L, \gamma(T_L)) = 0$ implies that $\left\{ \frac{\partial}{\partial x} Q_1(T_L, x) \right\}_{x=\gamma(T_L)} < 0$. Notice that we can write:

$$Q_1(T_L, x) = (1 - \rho_S) \left( \frac{\beta \omega_1 \mu + (1 - \beta) (F(x) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, x])}{\beta \omega_1 + (1 - \beta) (F(x) - F(T_L))} - \frac{(1 - \chi)(\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(x) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, x])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(x) + F(T_L))} - x \right).$$

Now, $\forall x \in (T_L, \mu)$, $\mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, x]) > \mu$, and thus:

$$\frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(x) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, x])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(x) + F(T_L))} - x > 0.$$

Thus, $Q_1(T_L, \gamma(T_L)) = 0$ implies that:

$$\frac{\beta \omega_1 \mu + (1 - \beta) (F(\gamma(T_L)) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, \gamma(T_L)])}{\beta \omega_1 + (1 - \beta) (F(\gamma(T_L)) - F(T_L))} - \gamma(T_L) = \frac{1 - \chi}{1 - \rho_S} \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(x) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, \gamma(T_L)])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(\gamma(T_L)) + F(T_L))} - \gamma(T_L) > 0.$$

Now, notice that this implies:

$$d_1 \equiv \left\{ \frac{\partial}{\partial x} \frac{\beta \omega_1 \mu + (1 - \beta) (F(x) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, x])}{\beta \omega_1 + (1 - \beta) (F(x) - F(T_L))} \right\}_{x=\gamma(T_L)} = (1 - \beta) f(\gamma(T_L)) \frac{\beta \omega_1 \mu + (1 - \beta) (F(\gamma(T_L)) - F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \in [T_L, \gamma(T_L)])}{(\beta \omega_1 + (1 - \beta) (F(\gamma(T_L)) - F(T_L))} < 0.$$

Moreover,

$$d_2 \equiv \left\{ \frac{\partial}{\partial x} \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(x) + F(T_L)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [T_L, x])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(x) + F(T_L))} \right\}_{x=\gamma(T_L)} = (1 - \beta) f(x) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) \left( \int_{t \notin [T_L, x]} t f(t) \ dt \right) (1 - \beta)(1 - F(x) + F(T_L))}{(\beta (1 - \omega_1) + (1 - \beta)(1 - F(\gamma(T_L)) + F(T_L))} \gamma(T_L) > 0.$$

Therefore,

$$\left\{ \frac{\partial}{\partial x} Q_1(T_L, x) \right\}_{x=\gamma(T_L)} = \rho_S - \frac{\alpha}{\gamma(T_L)} + d_1 - d_2 < 0.$$

To see that $\gamma(x)$ is continuous, note that the implicit function theorem implies that for each $T_L$, $\gamma(T_L)$ is the unique solution $x$ to $Q_1(T_L, x) = 0$ in a neighborhood of $T_L$ and
is continuous in this neighborhood. Applying this argument pointwise at each point $T_L$, we have that $\gamma (T_L)$ is globally continuous.

We next show that there exists an $x < \mu$ such that $Q_2 (x, \gamma (x)) = 0$, which completes the proof of part i. Given that $\gamma (x)$ is continuous, we have that $Q_2 (x, \gamma (x))$ is continuous, and thus need only to find two points less than $\mu$ on which $Q_2 (x, \gamma (x))$ takes positive and negative values. Note:

$$Q_2 (x, \gamma (x)) = \rho_s x + (1 - \rho_s) \frac{\beta \omega_1 \mu + (1 - \beta) (F(\gamma (x)) - F(x)) \mathbb{E}(\tilde{y}|\tilde{y} \in [x, \gamma (x)])}{\beta \omega_1 + (1 - \beta) (F(\gamma (x)) - F(x))}$$

Note that, as $\gamma (x) \in (x, \mu)$, $\lim_{x \to \mu} \gamma (x) = \mu$. Therefore, $\lim_{x \to \mu} \mathbb{E}(\tilde{y}|\tilde{y} \in [x, \gamma (x)]) = \mathbb{E}(\tilde{y}|\tilde{y} \notin [x, \gamma (x)]) = \mu$ and:

$$\lim_{x \to \mu} Q_2 (x, \gamma (x)) = -\chi (1 - \rho_o) \left[ \frac{\beta \omega_2 \mu + (1 - \beta) F(\mu) \mathbb{E}(\tilde{y}|\tilde{y} < \mu)}{\beta \omega_2 + (1 - \beta) F(\mu)} - \mu \right] > 0.$$

Moreover,

$$\lim_{x \to -\infty} Q_2 (x, \gamma (x)) = (\rho_s - \chi \rho_o) (-\infty) + (1 - \rho_s) \lim_{x \to -\infty} \frac{\beta \omega_1 \mu + (1 - \beta) (F(\gamma (x)) - F(x)) \mathbb{E}(\tilde{y}|\tilde{y} \in [x, \gamma (x)])}{\beta \omega_1 + (1 - \beta) (F(\gamma (x)) - F(x))}$$

$$= -\lim_{x \to -\infty} \frac{\beta (1 - \omega_1) \mu + (1 - \beta) (1 - F(\gamma (x)) + F(x)) \mathbb{E}(\tilde{y}|\tilde{y} \notin [x, \gamma (x)])}{\beta (1 - \omega_1) + (1 - \beta) (1 - F(\gamma (x)) + F(x))}$$

$$= -\infty;$$

this completes the proof.

**Part (ii)** Note that the equilibrium conditions are equivalent to:

$$Q_1 (T_L, T_H) = 0$$

$$Q_2 (T_L, T_H) - Q_1 (T_L, T_H) = 0.$$

Let $\delta^*$ solve:

$$\delta^* - \frac{\beta \omega_2 \mu + (1 - \beta) F(\delta^*) \mathbb{E}(\tilde{y}|\tilde{y} < \delta^*)}{\beta \omega_2 + (1 - \beta) F(\delta^*)} = 0.$$
We start by proving the following lemma.

**Lemma 1.** Choose any \(T_H > \mu\). Then, \(\forall \Delta_1, \Delta_2 > 0\), there exists a \(\varepsilon (T_H, \Delta_1, \Delta_2) > 0\) such that, for \(\chi - \rho_S < \varepsilon (T_H, \Delta_1, \Delta_2)\), we have that:

(i) There exists a function \(\delta (T_H)\) such that \(Q_2 (\delta (T_H), T_H) - Q_1 (\delta (T_H), T_H) = 0\);

(ii) \(\delta (x)\) is continuous on \([\mu, \Delta_1]\);

(iii) \(|\mathbb{E} [\bar{y} \bar{y} \in (\delta (T_H), T_H)] - \mathbb{E} [\bar{y} \bar{y} \in (\delta^*, T_H)]| < \Delta_2\).

**Proof.** Upon simplifying, it can be shown that:

\[
Q_2 (x, T_H) - Q_1 (x, T_H) = (\rho_S - \chi \rho_O) x + (\chi - \rho_S) T_H - \chi (1 - \rho_O) \frac{\beta \omega_2 \mu + (1 - \beta) F (x) \mathbb{E} (\bar{y} \bar{y} < x)}{\beta \omega_2 + (1 - \beta) F (x)}.
\]

To see that there exists a \(\delta (T_H)\) such that \(Q_2 (\delta (T_H), T_H) - Q_1 (\delta (T_H), T_H) = 0\), note first that the final term in this expression approaches \(\mu\) as \(x \to -\infty\). Thus,

\[
\lim_{x \to -\infty} Q_2 (x, T_H) - Q_1 (x, T_H) = -\infty.
\]

Moreover, adding and subtracting \(\chi (1 - \rho_O) \mu\),

\[
\lim_{x \to \mu^-} [Q_2 (x, T_H) - Q_1 (x, T_H)] = (\chi - \rho_S) (T_H - \mu) - \chi (1 - \rho_O) \left[\frac{\beta \omega_2 \mu + (1 - \beta) F (\mu) \mathbb{E} (\bar{y} \bar{y} < \mu)}{\beta \omega_2 + (1 - \beta) F (\mu)} - \mu\right] > 0.
\]

Thus, we have that the function \(\delta (T_H)\) exists. Next, we show that for \(\rho_S\) sufficiently close to \(\chi\), we can ensure that \(\delta (x)\) is continuous on any interval \((\mu, \Delta_2)\). Observe that:

\[
\frac{\partial}{\partial x} [Q_2 (x, T_H) - Q_1 (x, T_H)] = \rho_S - \chi \rho_O - \chi (1 - \rho_O) \beta f (x) \frac{x - \frac{\beta \omega_2 \mu + (1 - \beta) F (x) \mathbb{E} (\bar{y} \bar{y} < x)}{\beta \omega_2 + (1 - \beta) F (x)}}{\beta \omega_2 + (1 - \beta) F (x)}.
\]

Now, note that:

\[
\lim_{\rho_S \to \chi^-} [Q_2 (x, T_H) - Q_1 (x, T_H)] = \chi (1 - \rho_O) \left(\frac{\beta \omega_2 \mu + (1 - \beta) F (x) \mathbb{E} (\bar{y} \bar{y} < x)}{\beta \omega_2 + (1 - \beta) F (x)} - x\right).
\]

Thus, since \(Q_2 (\delta (T_H), T_H) - Q_1 (\delta (T_H), T_H) = 0\), we must have that:

\[
\lim_{\rho_S \to \chi^-} \chi (1 - \rho_O) \left[\delta (T_H) - \frac{\beta \omega_2 \mu + (1 - \beta) F (\delta (T_H)) \mathbb{E} (\bar{y} \bar{y} < \delta (T_H))}{\beta \omega_2 + (1 - \beta) F (\delta (T_H))}\right] = 0.
\]
Together with expression (4), this implies:

\[
\lim_{\rho_S \to \chi^-} \left\{ \frac{\partial}{\partial x} [Q_2(x, T_H) - Q_1(x, T_H)] \right\}_{x = \delta(T_H)} > 0.
\]

Applying a similar argument to the one in the proof of part (i), this implies that, for any \( x > \mu \), there exists a \( \varepsilon_1(x, T_H) \) s.t. \(|\rho_S - \chi| < \varepsilon_1(x, T_H) \implies \delta(x)\) is continuous at \( x \). Now, note that, as \( \rho_S \to \chi^- \), \( \delta(T_H) \to \delta^* \) pointwise. Given the continuity of the expectation operator, this implies that there exists a \( \varepsilon_2(\Delta_2, T_H) \) such that

\[
|E[\tilde{y}|\tilde{y} \in (\delta(T_H), T_H)] - E[\tilde{y}|\tilde{y} \in (\delta^*, T_H)]| < \Delta_2.
\]

Letting

\[
\varepsilon(T_H, \Delta_1, \Delta_2) = \min \{ \min_{x \in [\mu, \Delta_1]} \{ \varepsilon_1(x, T_H) \}, \varepsilon_2(x, T_H) \},
\]

we have that both parts (ii) and (iii) of the lemma hold.

To complete the proof, we now show that, for \( \rho_S \) sufficiently close to \( \chi \), there exists a \( T_H > \mu \) such that \( Q_1(\delta(T_H), T_H) = 0 \) and \( E(\tilde{y}|\tilde{y} \in [\delta(T_H), T_H]) > \mu \). Note that:

\[
\lim_{x \to \infty} Q_1(\delta(x), x) = (\rho_S - \chi)(\infty) + \lim_{x \to \infty} \frac{(1 - \rho_S)(1 - \beta)(F(x) - F(\delta(x)))E(\tilde{y}|\tilde{y} \in [\delta(x), x])}{\beta \omega_1 + (1 - \beta)(F(x) - F(\delta(x)))} - \lim_{x \to \infty} \frac{(1 - \beta)(1 - F(x) + F(\delta(x)))E(\tilde{y}|\tilde{y} \in [\delta(x), x])}{\beta(1 - \omega_1) + (1 - \beta)(1 - F(x) + F(\delta(x)))}.
\]

Given that the final two terms are bounded, this equals \(-\infty\). Consequently, there exists an \( x > \mu \) such that \( Q_1(T_L, x) < 0 \). Next, by adding and subtracting \((1 - \chi)\mu\), we can rewrite \( Q_1(\delta(x), x) \) as follows:

\[
Q_1(\delta(x), x) = (1 - \chi) \left[ \frac{\beta \omega_1 \mu + (1 - \beta)(F(x) - F(\delta(x)))E(\tilde{y}|\tilde{y} \in [\delta(x), x])}{\beta \omega_1 + (1 - \beta)(F(x) - F(\delta(x)))} - \mu \right] - (1 - \chi) \left[ \frac{\beta(1 - \omega_1) \mu + (1 - \beta)(1 - F(x) + F(\delta(x)))E(\tilde{y}|\tilde{y} \notin [\delta(x), x])}{\beta(1 - \omega_1) + (1 - \beta)(1 - F(x) + F(\delta(x)))} - \mu \right] + (\rho_S - \chi) \left[ \frac{x - \beta \omega_1 \mu + (1 - \beta)(F(x) - F(\delta(x)))E(\tilde{y}|\tilde{y} \in [\delta(x), x])}{\beta \omega_1 + (1 - \beta)(F(x) - F(\delta(x)))} \right].
\]

The first two terms in this expression are positive so long as \( E(\tilde{y}|\tilde{y} \in [\delta(x), x]) > \mu \). Applying the lemma, as \( \rho_S \to \chi^- \), \( E(\tilde{y}|\tilde{y} \in [\delta(x), x]) \to E(\tilde{y}|\tilde{y} \in [\delta^*, x]) \). Choosing \( x \) sufficiently large, this implies \( E(\tilde{y}|\tilde{y} \in [\delta(x), x]) > \mu \). Moreover, note that the final term approaches zero as \( \rho_S \to \chi^- \). Together with the fact that \( \delta(x) \) is continuous, this implies that for \( \rho_S \) sufficiently close to \( \chi \), the intermediate value theorem may be applied to guarantee the existence of a
$T_H$ such that $Q_1(\delta(T_H),T_H) = 0$.

### A.3 Proof of Proposition 2

Note first that in any equilibrium, since sufficiently positive types always prefer $S$ and sufficiently negative types always prefer $O$, it must be the case that there exist two possibly equal thresholds, $T_L$ and $T_H$, such that types $t < T_L$ choose $O$ and types $t > T_H$ choose $S$. Consequently, any equilibrium must take either the form in (i) or (ii). We next characterize when each of these equilibria exist.

**Part (i)** In such an equilibrium, we must have that the following two functions are zero, where the first function equals the relative payoffs of $S$ to $C$ of type $T_H$, and the second equals the relative payoffs of $C$ to $O$ to type $T_L$:

$$Q^d_1(T_H) \equiv (\rho_S - \chi) T_H + (1 - \rho_S) \frac{\beta \omega_1 \mu + (1 - \beta) (1 - F(T_H)) \mathbb{E}(\tilde{y}|\tilde{y} > T_H)}{\beta \omega_1 + (1 - \beta) (1 - F(T_H))} - (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) F(T_H) \mathbb{E}(\tilde{y}|\tilde{y} < T_H)}{\beta (1 - \omega_1) + (1 - \beta) F(T_H)};$$

$$Q^d_2(T_L) \equiv \chi (1 - \rho_O) \left( T_L - \frac{\beta \omega_2 \mu + (1 - \beta) F(T_L) \mathbb{E}(\tilde{y}|\tilde{y} < T_L)}{\beta \omega_2 + (1 - \beta) F(T_L)} \right).$$

Note that $Q^d_1(T_H) > 0$ for any $T_H > \mu$, which implies there is no equilibrium in which $T_H > \mu$. Furthermore, note that:

$$\lim_{T_H \to \mu} Q^d_1(T_H) = (1 - \rho_S) \frac{\beta \omega_1 \mu + (1 - \beta) (1 - F(\mu)) \mathbb{E}(\tilde{y}|\tilde{y} > \mu)}{\beta \omega_1 + (1 - \beta) (1 - F(\mu))} - (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) F(\mu) \mathbb{E}(\tilde{y}|\tilde{y} < \mu)}{\beta (1 - \omega_1) + (1 - \beta) F(\mu)} > 0.$$

Moreover, $\lim_{T_H \to -\infty} Q^d_1(T_H) = (\rho_S - \chi) (-\infty) + (1 - \rho_S) \mu = -\infty$. Thus, there is a $T_H < 0$ such that $Q^d_1(T_H) = 0$. Note that by the minimum principle, there is a unique $\tau^*$ such that $Q^d_2(\tau^*) = \tau^* - \frac{\beta \omega_2 \mu + (1 - \beta) F(\tau^*) \mathbb{E}(\tilde{y}|\tilde{y} < \tau^*)}{\beta \omega_2 + (1 - \beta) F(\tau^*)} = 0$. To aid in the proof of part (ii), let $T_H^d$ equal the maximum of such zeroes, if multiple exist. Moreover, $\frac{\partial}{\partial \tau} \frac{\beta \omega_2 \mu + (1 - \beta) F(\tau) \mathbb{E}(\tilde{y}|\tilde{y} < \tau)}{\beta \omega_2 + (1 - \beta) F(\tau)}$ is negative $\forall \tau < \tau^*$ and positive $\forall \tau > \tau^*$, and, $\forall x < \tau^*$, $\frac{\partial}{\partial x} Q^d_2(x) > 0$. These well-known properties (see Acharya et al. (2011), Guttmann et al. (2014)) can be formally shown by differentiating $Q^d_2(\cdot)$. In order for an equilibrium of the type in part (i) to exist, it must be that $\tau^* < T_H^d$. 

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Now, note that:

\[
\frac{\partial \tau^*}{\partial \beta \omega_2} = -\frac{\partial}{\partial \beta \omega_2} \left[ \tau^* - \frac{\beta \omega_2 \mu + (1 - \beta) F(\tau^*) \mathbb{E}(\tilde{y} | \tilde{y} < \tau^*)}{\beta \omega_2 + (1 - \beta) F(\tau^*)} \right] \propto \mu - \frac{\beta \omega_2 \mu + (1 - \beta) F(\tau^*) \mathbb{E}(\tilde{y} | \tilde{y} < \tau^*)}{\beta \omega_2 + (1 - \beta) F(\tau^*)} > 0.
\]

Moreover, as \( \beta \omega_2 \to 1 \), \( \frac{\beta \omega_2 \mu + (1 - \beta) F(T_L) \mathbb{E}(\tilde{y} | \tilde{y} < T_L)}{\beta \omega_2 + (1 - \beta) F(T_L)} \to \mu \) and as \( \beta \omega_2 \to 0 \), \( \frac{\beta \omega_2 \mu + (1 - \beta) F(T_L) \mathbb{E}(\tilde{y} | \tilde{y} < T_L)}{\beta \omega_2 + (1 - \beta) F(T_L)} \to \mathbb{E}(\tilde{y} | \tilde{y} < T_L) \). Thus, \( \lim_{\beta \omega_2 \to 1} \tau^* = \mu \) and \( \lim_{\beta \omega_2 \to 0} \tau^* = -\infty \). Thus, \( \exists Z \in (0, 1) \) such that \( \beta \omega_2 < Z \implies \tau^* < T_H^d \) and \( \beta \omega_2 > Z \implies \tau^* > T_H^d \).

Part (ii) For such an equilibrium to exist, we need that the firm observing \( T \) is indifferent between \( S \) and \( O \):

\[
0 = Q_1^s(T) \equiv (\rho_S - \chi \rho_O) T + (1 - \rho_S) \frac{\beta \omega_1 \mu + (1 - \beta) (1 - F(T)) \mathbb{E}(\tilde{y} | \tilde{y} > T)}{\beta \omega_1 + (1 - \beta) (1 - F(T))} - (1 - \chi) \frac{\beta (1 - \omega_1) \mu + (1 - \beta) F(T) \mathbb{E}(\tilde{y} | \tilde{y} < T)}{\beta (1 - \omega_1) + (1 - \beta) F(T)} - \chi (1 - \rho_O) \frac{\beta \omega_2 \mu + (1 - \beta) F(T) \mathbb{E}(\tilde{y} | \tilde{y} < T)}{\beta \omega_2 + (1 - \beta) F(T)},
\]

and \( T \) does not prefer \( C \) to \( O \):

\[
Q_2^d(T) = \chi (1 - \rho_O) \left( T - \frac{\beta \omega_2 \mu + (1 - \beta) F(T) \mathbb{E}(\tilde{y} | \tilde{y} < T)}{\beta \omega_2 + (1 - \beta) F(T)} \right) \leq 0. \tag{6}
\]

Observe first that:

\[
\lim_{x \to -\infty} Q_1^s(x) = (\rho_S - \chi \rho_O) (-\infty) + [(1 - \rho_S) - (1 - \chi) - \chi (1 - \rho_O)] \mu = -\infty.
\]

Moreover, from the proof of part (i), note that condition (6) holds if and only if \( T \leq \tau^* \). Thus, it is sufficient to show that there exists a \( T \leq \tau^* \) such that \( Q_1^s(\tau^*) \geq 0 \); then, by the intermediate value theorem, there is a \( T < \tau^* \) such that \( Q_1^s(\tau^*) = 0 \). Observe that:

\[
Q_1^s(\tau^*) = Q_1^d(\tau^*) + Q_2^d(\tau^*) = Q_1^d(\tau^*),
\]

since \( Q_2^d(\tau^*) = 0 \). Since \( T_H^d \) is the largest zero of \( Q^d(x) \), \( \tau^* > T_H^d \implies Q_1^d(\tau^*) > 0 \). Now, from the proof of part (i), \( \beta \omega_2 > Z \implies T_H^d < \tau^* \).
B Variable definitions

- **CAR Announce\(_{i,t}\)**: Three-day cumulative abnormal returns calculated over the window [-1,1] around the earnings announcement date for quarter \(t\).

- **CAR Quarter\(_{i,t}\)**: Cumulative abnormal returns for quarter \(t\) for firm \(i\). Abnormal returns are calculated as the raw return less the value-weighted market return.

- **Inst Own\(_{i,t}\)**: The percentage of shares held by institutional investors.

- **Complex Word\(_{i,t}\)**: Number of complex words in firm \(i\)’s 10-Q filing in quarter \(t\).

- **Fog Index\(_{i,t}\)**: Gunning Fog Readability Index for firm \(i\)’s 10-Q filing in quarter \(t\).

- **Smog Index\(_{i,t}\)**: Smog Readability Index

- **Rix\(_{i,t}\)**: RIX Readability Index

- **Avg Word\(_{i,t}\)**: Average number of words per paragraph

- **Size\(_{i,t-1}\)**: Log of total assets

- **MKB\(_{i,t-1}\)**: Market-to-book ratio, calculated as market value of equity plus book value of liabilities divided by book value of assets

- **Leverage\(_{i,t-1}\)**: Leverage, calculated as the sum of long-term debt and debt in current liabilities divided by total assets.

- **Return Vol\(_{i,t-1}\)**: Return volatility, calculated as the standard deviation of daily stock returns over the quarter.