A Theory of Financial Media

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Abstract

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Keywords: financial journalism, disclosure, obfuscation, price quality

JEL Classifications: D82 ,G14, M40

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Abstract

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1 Introduction

Financial media plays an important economic role. A growing body of empirical research shows that financial journalists reach a broad swath of investors, affect trading in financial markets, and help form stock prices [Tetlock, 2011; Fang and Peress, 2009; Peress, 2014; Garcia, 2013; Engelberg and Parsons, 2011]. Theory, however, provides little insight into their economic role. Hence, our understanding of the equilibrium interactions between the financial media, investors, and firms is somewhat limited.

In this paper, we aim to fill this gap by explicitly modeling a *financial journalist* whose strategic actions affect her readers, the firms on which she reports, and the asset prices that result. We start with the basic premise that *some* investors (henceforth *readers*) only read financial news written by financial journalists. Thousands of US firms file 10-K statements with the SEC, free for the world to see, and yet few individual investors have the time to read each statement. For this reason, a financial journalist sifts through the many announcements made by firms and reports on those that she finds to be of greatest value to her readers.

In our model, there is a firm manager, a journalist, and a stock market populated by three kinds of investors. The first are *sophisticated* investors who observe the universe of all firm announcements. The second are *liquidity* traders who trade for reasons unrelated to information. The third are the *readers* of financial media. Readers cannot observe firm announcements directly (or find it prohibitively costly to do so). They rely exclusively on the journalist for information, and—importantly—*take her at her word*.

The firm manager receives some information and prepares a public announcement. He influences the announcement through *obfuscation*, understanding that the opaqueness of the announcement affects the journalist's reporting decision. If the journalist decides to report on the announcement, the readers observe the obfuscated information and trade on it. The existing empirical literature has highlighted several channels through which firms can sugarcoat their announcements and mislead investors about firm fundamentals. For instance, Huang et al. [2014] emphasize the tone of words in earnings press releases, while Li [2008] or Bushee et al. [2018] highlight the role of complex language.[1]

The financial journalist plays two roles in our framework. First, she considers each

[1] The importance of strategic obfuscation has lead to a debate about different ways to measure obfuscation. For example, Li [2008] uses the Fog Index to measure the information content of various firm disclosures, while Loughran and McDonald [2014] construct a Readability Index to measure the extent to which a firm disclosure is informative. These papers demonstrate that firms use language to hide or highlight financial information in their disclosed statements.

firm announcement and focuses on announcements that yield the greatest benefit to her readers. This means that more informative announcements are more likely to get reported. Second, if she chooses to report on a firm, she tries to *clarify* the announcement as thoroughly as possible to minimize her readers' exposure to obfuscated announcements. For example, she can fact-check a dubious statement or she can re-word a sensational passage. Therefore, our financial journalist detects some of the distortions in firm announcements and provides a clearer picture to readers in her news report.

The journalist makes a reporting decision that balances the positive impact from reporting an announcement that has significant informational content against the negative impact from reporting an announcement that is heavily obfuscated. Importantly, this strategic reporting decision influences the firm manager's endogenous decision to obfuscate. The manager chooses the level of obfuscation in the announcement that balances the positive impact on the stock price if the announcement gets covered against its negative impact on the journalist's decision to cover the story.

We embed this strategic interaction between the firm manager and the journalist in a relatively standard trading model and solve for the unique reporting and obfuscation equilibrium. This equilibrium generates several key results, some of which confirm existing empirical findings while others generate novel empirical predictions.

First, the model generates an equilibrium probability with which the journalist reports news. We find that financial announcements that provide more extreme information, either positive or negative, are more likely to be reported relative to more mundane announcements. Hence, we argue that journalists are more likely to report extreme news, not because they have an incentive to sensationalize, but because mundane news is too costly to clarify relative to the value of reporting it.

Second, negative information is less likely to be reported relative to positive information. In particular, we find that all good news gets reported with a positive probability, slightly negative news never gets reported, and extremely negative news gets reported with a positive probability which is low. These results stem directly from the strategic actions of the journalist and the firm manager and occur despite the fact that the arrival of good and bad news is equally likely.

Thus, our model predicts that across all firm announcements at a given date those that are more negative would have a lower probability of being reported on because they are expected to contain a higher level of obfuscation. While there is evidence in Tetlock [2007] and Garcia [2013] that negative media reports predict stock market returns, our model predictions are specific to *firm-level* news and these, to the best of our knowledge, have not yet been tested.[2]

The third result of our model is that the presence of a journalist induces firms to obfuscate their announcements. This means that a report by the journalist and a bias in the stock price will appear jointly. Intuitively, because the readers of the newspaper trade only based on the information provided by the journalist, the journalist's report encourages her readers to trade based on a reported announcement that is partially inflated. Hence, these trades result in a stock price that is partially biased and too high, on average. It is important to note that prices become biased when a journalist writes a report even though the journalist tries to eliminate the manager's obfuscation and chooses not to report announcements which contain too little information because they are too heavily obfuscated.[3]

Fourth, we find that stock price efficiency improves when the journalist reports. This is because the benefit of the information provided in the report to the readers outweighs the bias that it introduces in the equilibrium stock price. The journalist chooses to write (or not to write) a report depending on whether it would benefit her readers. This means that the journalist considers the actual content of the firm's announcement as well as the extent to which the firm tries to obfuscate the announcement. The more the firm obfuscates the announcement, the lower is the ability of the journalist to write an article that is useful to her readers.

Fifth, we show that firms have a higher incentive to obfuscate negative (i.e. below-average) news and, perhaps more surprisingly, that they obfuscate more when faced with a highly-skilled journalist. The first result comes from the fact that obfuscating the announcement reduces the chance that the journalist will write about it in the newspaper. Since the firm wants good news to be reported and bad news not to be reported it obfuscates more heavily the announcements of negative news. The second result comes from the fact that a higher skilled journalist is generally more likely to write a report and clarify it.

[2] In a recent working paper, Niessner and So [2018] show that the financial media is more likely to cover firms who subsequently report negative earnings announcements. This finding is in-line with our model's claim that the media strategically selects what to report on. This tilt is consistent with our model, if negative earnings surprises are more newsworthy than positive earnings surprises.

[3] The model considers a journalist who can lower the level of obfuscation of a reported announcement. This does not mean that the journalist investigates the firm's financial statements and conducts an in-depth analysis, but rather that she is able to highlight the economically important aspects of the firm announcement to her readers.

Finally, the model generates additional implications such as how the number of readers affects the equilibrium, and how the trading profits of sophisticated investors depend on the journalist's reporting decision. More generally, our paper helps to answer questions such as *what kind of news should be reported by the financial media? How does the media's presence alter the firm's incentive to release accurate information? Are individual investors better off with media reporting?*

The model makes several important assumptions. First, we consider a journalist who makes a reporting decision based on how her report will impact her readers' ability to trade. This is a benchmark under which the journalist's ability to attract readers depends on whether or not they will view her information as useful in the long term. In the context of financial news this would mean that the information she provides helps readers make better financial decisions which we model as better trading outcomes. Therefore, we follow the existing theoretical literature like Gentzkow and Shapiro [2006] and assume that journalists are primarily concerned about their reputation as providers of accurate and useful information. Importantly, we show that the usefulness of *financial* news differs fundamentally from that of *political* news because readers are able to trade on it.[4]

Second, the journalist's main role in our model is to *disseminate* and *clarify* existing information. She highlights to her readers a small subset of available information that is of higher importance. Thus, our focus is on the day-to-day reporting that happens in financial newspapers such as the *Wall Street Journal*, rather than on investigative reporting which happens less frequently but usually receives more public attention.[5]

Moreover, our model also allows for the journalist to clarify firm announcement by attempting to remove as much obfuscation as possible. As discussed earlier, there is a growing body of empirical work suggesting that firms are strategic in writing firm announcements (see e.g., Huang et al. [2014] or Bushee et al. [2018]). The role of the financial journalist is to detect these distortions and to provide a clearer picture to her readers. However, an alternative formulation of our model is that the journalist simply disseminates information to her readers by pointing them to specific firm announcements (e.g. SEC filings) and lets her readers figure out the informational content of these

[4] We abstract from quid-pro-quo incentives but we do acknowledge that there is some empirical evidence that journalists sometimes pander to the firms on which they report [Dyck and Zingales, 2003; Call et al., 2018; Baloria and Heese, 2018]. However, we think that the incentive to report news that is useful to her readers is of first-order importance for the journalist.

[5] There is some empirical evidence suggesting that retail investors buy stocks that are covered in the media (e.g., Barber and Odean [2008]) as well as that stock prices respond to the media's reporting of stale news (e.g. [Drake et al., 2014; Tetlock, 2011]). Both are consistent with the media's role as a pass-through.

announcements. This alternative interpretation of our model does not change any of our main results.

Our third assumption relates to our definition of *readers*. We think of these readers as partially informed investors similar to strategic retail investors. The literature has termed these traders "credulous" or "blind" in economic contexts like Kartik et al. [2007], Chen [2011], Little [2017], and Bolton et al. [2012]. We assume that they take the journalist's report at "face value" for trading purposes. Trading based on the journalist's news article is profitable but is not as profitable as the trades of sophisticated investors (e.g. institutional investors, hedge fund managers, etc.). In particular, we posit a hierarchy in which sophisticated traders have the most information, the readers of the newspaper have some information—the quality of which depends on the article written by the journalist—and liquidity traders trade for reasons unrelated to information. In our setting we find that these readers are better off with a journalists than without, despite the fact that the introduction of a journalist causes firms to increase the degree of obfuscation in their announcements.

Finally, as a benchmark we assume that there is no explicit cost for the firm to obfuscate and that the cost of not reporting is symmetric for bad news and good news. Thus, any bias in reporting is purely endogenous. One can think of other formulations in which, for example, obfuscating negative news is more costly (relative to positive news) to the firm due to legal considerations, or that not reporting bad news is more costly to the journalist. We view these alternative specifications as plausible, but believe that a benchmark model in which all news is equally likely to be reported on is a more reasonable starting point.

Our paper takes a first step towards a more complete understanding of the role of *financial* news. The theoretical work of Mullainathan and Shleifer [2005] explores the incentive of the media to bias news more generally in order to cater to the beliefs of its readers. Gentzkow and Shapiro [2006] focus on the media's political bias. In both of these papers, the journalist chooses to engage in biased reporting optimally. In our equilibrium we also find the existence of a media bias, but in contrast to these papers, we argue that bias in financial reporting occurs despite the efforts of the journalist to eliminate it and not because of her efforts. Furthermore, our model generates two distinct types of media bias.

First, the journalist is more likely to report positive news than negative news (an ex post bias). Second, the firm obfuscates its announcements to make them rosier than the truth (an ex ante bias). Given the unique features of reporting on financial news our paper also highlights a novel interaction between the journalist's reporting decision and the firm manager's incentive to obfuscate information, which is absent in the work above. Therefore, the specific financial market environment creates novel endogenous forces with non-trivial implications for the media's reporting incentives.

More broadly, our paper contributes to the theoretical literature studying the role of *public information* on stock market trading, price formation, and quality. Building on early contributions like Diamond [1985] or Fishman and Hagerty [1989], several recent papers study the impact of corporate disclosure in a market with sophisticated investors and liquidity traders.[6] For instance, Gao and Liang [2013], Han et al. [2016], and Goldstein and Yang [2019] study the impact of corporate disclosure on private information acquisition and real efficiency. These papers emphasize the delicate interaction between public information provision and private information acquisition. Moreover, Kurlat and Veldkamp [2015] analyze an alternative cost of public information and show that it can lead to a reduction in trading opportunities. In our framework public information is also endogenous. However, unlike the aforementioned papers, we consider a setting where information must be disclosed but where the firm manager can obfuscate it in order to inflate the firm's stock price (as in Goldman and Slezak [2006] or Gao and Zhang [2018], among others). Further, the strategic choice of whether to "disclose" the information is made by the journalist and this adds an endogenous cost to the manager's obfuscation.

Our paper also relates to models of financial analysts who can be viewed as another type of information intermediary (e.g. Langberg and Sivaramakrishnan [2010], Einhorn [2018], and Frenkel et al. [2019]). While these papers typically consider the strategic interaction between analysts and firms, their main assumption is that the firm decides what information to disclose to the market. In contrast to these papers, our key modeling assumption is that it is the journalist (and not the firm) who decides on what corporate announcements should be made public. This results in a very different set of predictions which better match the economic role of an information intermediary who disseminates existing information (the journalist), rather than create new information (the analyst).[7]

The remainder of the paper is organized as follows: Section 2 presents the model setup; Section 3 describes the main results; Section 4 concludes. All proofs are in Appendix A.1.

[6]See Goldstein and Yang [2017] for a recent survey of this literature.

[7]It is worth noting the existence of a recent literature studying the role of credit rating agencies (*CRA*s) which is yet another form of an information intermediary. However, papers in this literature, such as Bolton et al. [2012], Fulghieri et al. [2013], Frenkel [2015], and Piccolo and Shapiro [2018] focus on the attempt of the *CRA* to manage its reputation as an information provider with its ability to maintain a positive interaction with the firm it is rating.

2 Model

There is a strategic firm manager ("he"), a strategic journalist ("she"), and three types of investors. Figure 1 graphically represents the model. The figure highlights the journalist and readers, the two novel ingredients in our model. It also highlights the two roles of the journalist: (i) decide whether or not to report an announcement and (ii) clarify the announcement (should she decide to report it).

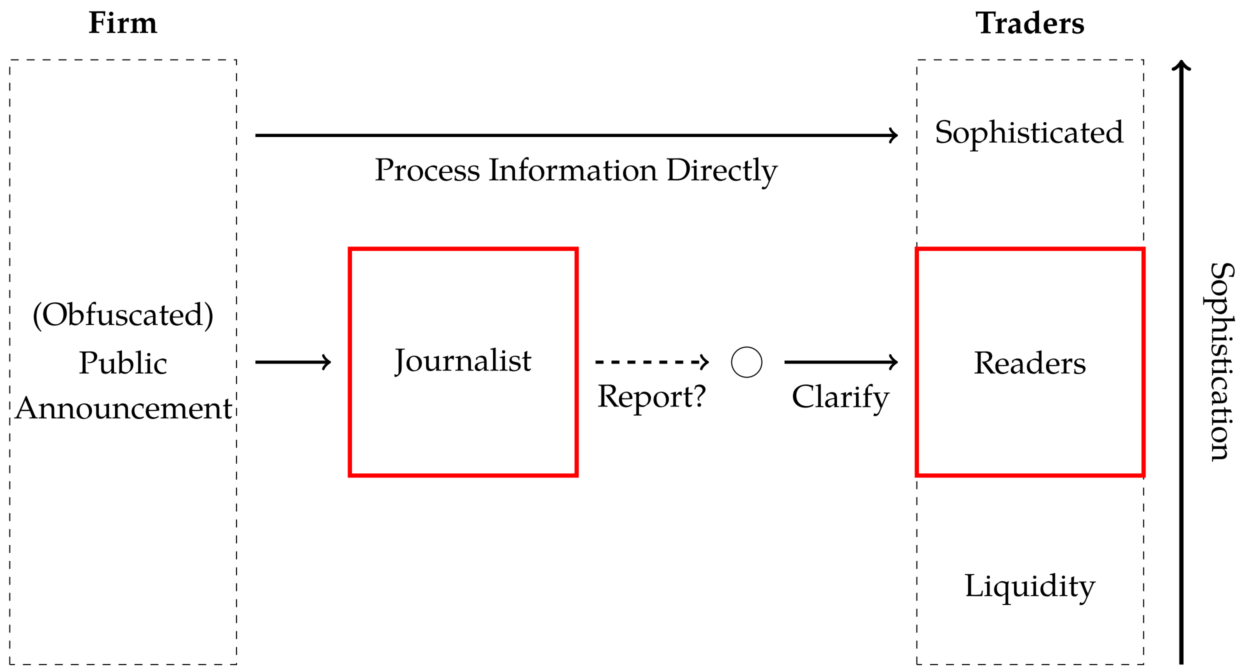

Figure 1: **The Three Traders.** We distinguish sophisticated from less sophisticated traders ("readers") by their ability to process the firm's public announcement.

2.1 Model setup

There are four dates $t \in \{0, 1, 2, 3\}$ and two assets, one risk-free and the other risky. The risk-free asset serves as the numeraire and is in unlimited supply. The risky asset is in zero net supply and pays a uniformly-distributed liquidating dividend $v \sim U[0, \overline{v}]$ with $\overline{v} \in (0, \infty)$ at $t = 3$.[8] We will often refer to the mean of the payoff as $\mu_v \equiv \frac{\overline{v}}{2}$ and to its variance as $\sigma_v^2 \equiv \frac{\overline{v}^2}{12}$. Claims to v are traded at the equilibrium price p at $t = 2$. The

[8]We rely on this specific distribution to obtain tractable, closed-form solutions. We expect our results to be robust to a wide range of bounded distributions.

$t = 0$	$t = 1$	$t = 2$	$t = 3$
F observes v F chooses ω	F sends $s_F = v + \omega$ J, S observe s_F and ω J chooses $\mathcal{D}_R$ If $\mathcal{D}_R = 1$, J reports s_J	S trades on s_F If $\mathcal{D}_R = 1$, R trades on s_J Else, R trades on prior Price p realized	Asset pays v

Figure 2: **Timeline for the main model.**

model features three types of traders: (i) a unit mass of sophisticated traders ("S"), (ii) a mass $\chi > 0$ of less sophisticated readers ("R"), and (iii) a unit mass of liquidity traders ("L"). All traders are risk-neutral and trade competitively. In addition to these three types of traders, there is also a firm manager ("F") and a journalist ("J"). Figure 1 summarizes the key model elements and Figure 2 provides a timeline for the main model.

Obfuscation

At $t = 0$, the firm's manager observes a perfect signal about the future payoff v and issues a potentially obfuscated public signal given as:[9]

$$s_F = v + \omega. \tag{1}$$

The public signal is therefore correlated with the firm's future payoff and can be interpreted as a public announcement such as an earnings report or a press release. Importantly, the manager is also able to obfuscate the signal about v through his choice $\omega \in [0, \overline{\omega}]$ with $\overline{\omega} \in (0, \infty)$, which inflates the signal about the firm's future payoff. We interpret the manager's obfuscation quite generally as any activity he can use to hide bad information or to emphasize good information. In the context of our model, we associate obfuscation with overly positive signals.[10] As mentioned in the introduction, the existing empirical literature has, for instance, highlighted the use of tone management and complex

[9] All of our results are robust to the alternative assumption that the firm manager only receives a noisy signal about v or that the payoff contains an additional, unpredictable component. Moreover, given that the manager always receives a signal about v, he does not have an incentive to withhold negative news due to the well-known unraveling result, see e.g. Grossman [1981] and Milgrom [1981].

[10] We could alternatively model the firm's obfuscation more explicitly through its impact on the *precision* of the announcement. In this case, the firm could add noise to this signal in order to lower the market's perception of v. We view our approach as a more implicit, but also more tractable, approach which is qualitatively identical.

language in corporate announcements rather than of outright manipulation.[11]

The upper limit on the firm's obfuscation ($\overline{\omega}$) can be interpreted as the highest degree of obfuscation the firm can choose without violating the law or appearing not credible. We do not interpret the firm manager's obfuscation as *illegal* manipulation or fraud but rather as a tool to mislead some traders in the market. To highlight the underlying mechanism as cleanly as possible, we do not add an explicit cost to obfuscation.[12]

We follow the existing information manipulation literature such as Goldman and Slezak [2006] or Gao and Zhang [2018] and assume that the manager chooses ω to maximize the firm's expected stock price, $\mathbb{E}[p|\mathcal{I}_F]$.[13] The manager's information set includes the firm's future payoff and the degree of obfuscation, $\mathcal{I}_F = \{v, \omega\}$.

Reporting decision

The journalist observes the firm's signal s_F and the manager's choice of ω at $t = 1$. It follows that she can retrieve the firm's future payoff from $s_F - \omega = v$. Based on this information set the journalist has to decide whether to report on the firm ($\mathcal{D}_R = 1$) or not ($\mathcal{D}_R = 0$). If the journalist decides to report, she issues a public signal s_J that partially offsets the firm's obfuscation. Otherwise, she does not issue a report:

$$s_J = \begin{cases} s_F - \alpha\omega = v + (1-\alpha)\omega & \text{if } \mathcal{D}_R = 1 \\ \emptyset & \text{if } \mathcal{D}_R = 0 \end{cases} \tag{2}$$

with $\alpha \in [0, 1)$. The journalist's report is observed by all agents, but as we will show below, only readers rely on s_J in their trading decision. The constant α captures the journalist's skill or attention that is necessary to clarify the firm's signal to the public. In the limit $\alpha \to 1$, the firm's obfuscated signal is fully clarified and the readers become perfectly informed about the future payoff. The lower α the higher the residual level of obfuscation $(1-\alpha)\omega$ in s_J.

To keep the model tractable, we take the journalist's skill, α, as given. There are, however, multiple realistic frictions that would give rise to an imperfectly clarified signal such as imperfect knowledge of the firm's obfuscation, quid-pro-quo incentives, or time constraints that prevent the journalist from achieving a perfectly accurate report. In line

[11]See e.g. Huang et al. [2014], Li [2008], and Bushee et al. [2018] for empirical evidence.

[12]All of our main results are robust to the introduction of a quadratic obfuscation cost, $\frac{c_\omega}{2}\omega^2$.

[13]The manager's desire to maximize the future stock price can reflect concerns for managerial reputation as in Narayanan [1985] and Scharfstein and Stein [1990] or managerial myopia as in Stein [1989].

with the empirical evidence in Gurun and Butler [2012] and Ahern and Sosyura [2014], the firm is able to affect the "tone" of its news coverage through ω which is part of the residual obfuscation $(1-\alpha)\omega$ in the journalist's report.

It should be noted that in contrast to some of the existing literature, such as Gentzkow and Shapiro [2006] or Mullainathan and Shleifer [2005], the journalist does not have an incentive to "sensationalize" the firm's report, i.e. to add a "media bias" to the firm's signal. We rather view the journalist as a benevolent transmitter of information who tries to report as accurately as possible on the firm.

Furthermore, the journalist and sophisticated traders observe the firm's actual obfuscation ω which precludes the usual "signal-jamming" effect [see e.g., Stein, 1989]. We deliberately deviate from this literature in which ω is perfectly backed out from the obfuscated signal in equilibrium. Our goal is to emphasize the journalist's imperfect ability to fully clarify the firm's signal for her readers. Thus, the journalist is not able to communicate a fully-clarified signal to her readers even though she understands the degree of obfuscation in the firm's signal (s_F). This friction leads to the residual noise $(1-\alpha)\omega$ in the journalist's report (s_J). We interpret s_F as a multi-dimensional signal containing informative pieces, captured by v, and obfuscated pieces, captured by ω. The journalist is aware of the size of both components but finds it difficult to communicate "the truth" to her readers.[14]

The journalist's audience is represented by the second group of traders labeled "readers." The measure of this group (χ) can be interpreted as a proxy for the journalist's readership. The other two types of traders do not rely on the journalist's report. Sophisticated traders are endowed with superior information about the firm's payoff, based on s_F, and cannot learn any additional information from the journalist's signal. Liquidity traders trade for exogenous reasons that are assumed to be independent of the firm's payoff and the journalist's signal.

Assumption 1 (Journalist's objective) *The journalist's reporting decision is made to maximize the readers' expected utility net of a private reporting cost* $c \sim U[0, \overline{c}]$ *with* $\overline{c} \in (0, \infty)$.

Two factors determine the journalist's decision to report. The first factor is the anticipated utility gain for her readers and the second is her opportunity cost. We capture

[14] Alternatively, one can interpret $(1-\alpha)\omega$ as the *readers'* residual bias: the journalist decomposes s_F into v and ω for her readers or highlights a firm announcement to her readers who are unable to remove all obfuscated pieces from s_F.

the first factor by the increase in the expected utility of readers through the journalist's reporting:

$$\Delta_R \equiv \mathbb{E}[U_R|\mathcal{D}_R = 1, \mathcal{I}_J] - \mathbb{E}[U_R|\mathcal{D}_R = 0, \mathcal{I}_J] \tag{3}$$

with $\mathcal{I}_J = \{s_F, \omega, s_J\}$. Note that the journalist's information set is strictly finer than that of the readers, which only contains s_J. The increase in expected utility in equation (3) can be interpreted as the average long-run gain in trading profits that a reader obtains by reading the journalist's report. We compute this utility gain based on the journalist's information set, which captures the idea of a long-run reputation game, similar to Mullainathan and Shleifer [2005] or Gentzkow and Shapiro [2006].

The second factor that influences the journalist's reporting decision is an independent stochastic opportunity cost $c \sim U[0, \overline{c}]$ with $\overline{c} \in (0, \infty)$. This cost can be interpreted as the journalist's utility from reporting on a different topic, such as another firm, and $\overline{c}$ governs the average appeal of these alternative stories.[15] The introduction of an opportunity cost allows us to capture the fact that not all corporate announcements can be reported on the front page. If a certain announcement lacks credibility or simply confirms a widely held view, it should be in the best interest of the reader to shift the focus to a different "story."[16]

It follows that the journalist's reporting strategy can be summarized as follows:

$$\mathcal{D}_R = \begin{cases} 1 & \text{if } \Delta_R > c \\ 0 & \text{if } \Delta_R \leq c. \end{cases} \tag{4}$$

The journalist compares the increase in the expected utility of readers with her opportunity cost.[17]

Trading decision

At $t = 2$, sophisticated traders and readers submit asset demand schedules $x(p)$ to maximize their expected trading profits $x(v - p)$. To keep their demands finite we also introduce a quadratic trading cost $\frac{\kappa}{2}x^2$ with $\kappa > 0$ as in Pouget et al. [2017] and Banerjee

[15] A straightforward way to endogenize c would be to consider a multi-firm setup. A capacity constraint on the journalist would then force her to report on the firm that creates the greater benefit for her readers.

[16] In line with this intuition, Fang and Peress [2009] document that even among NYSE stocks over 25% are not covered (by four major newspapers) in a typical year.

[17] As mentioned earlier, we could model the journalist's cost c as a function of the underlying news v. In order to avoid any "baked-in" asymmetries, we keep the distribution of c constant.

et al. [2018].[18] Putting these two pieces together, we can write the utility function for sophisticated traders and readers as:

$$U_i = x_i(v - p) - \frac{\kappa}{2}x_i^2 \tag{5}$$

with $i \in \{S, R\}$. It follows that the optimal demand for these two types is

$$x_i = \frac{1}{\kappa}\left(\mathbb{E}[v|\mathcal{I}_i] - p\right) \tag{6}$$

where $\mathcal{I}_i$ denotes the information set of type $i \in \{S, R\}$. Sophisticated traders observe the firm's signal, its obfuscation, and the journalist's report: $\mathcal{I}_S = \{s_F, \omega, s_J\}$. Readers have to rely solely on the journalist's report: $\mathcal{I}_R = \{s_J\}$.[19]

Sophisticated traders are perfectly informed in our model. They observe the firm's signal s_F and the degree of obfuscation ω. They are able to retrieve the realization of the firm's payoff v from the signal. It follows from equation (6) that their optimal demand is given by:

$$x_S = \frac{1}{\kappa}\left(v - p\right). \tag{7}$$

Each sophisticated trader observes the mispricing of the firm's stock $(v - p)$ and trades against it. The convex trading cost prevents these traders from taking extremely large positions and generates a limit to arbitrage. This effect is represented by the constant factor $\frac{1}{\kappa}$ in the sophisticated traders' optimal demand. The lower the trading cost, the higher the traders' aggressiveness to exploit mispricing.

Assumption 2 (Readers' observed signals) *Readers do not observe the firm's signal directly. They only observe the journalist's report and cannot remove any residual obfuscation from it.*

Readers differ from sophisticated traders in two ways.[20] First, they do not observe the firm's signal and depend on the journalist's report to receive additional information

[18]We could alternatively use a mean-variance objective function for these two types of traders at the cost of less tractable equilibrium expressions. Our qualitative results are robust to this alternative objective.

[19]It should also be noted that both types can condition their demands on the equilibrium stock price but do not infer any information from it. Since readers act as if they received a perfect signal about the payoff, they do not have an incentive to learn information from the stock price. Sophisticated traders observe v and do not have to learn additional information about the payoff.

[20]For simplicity, we focus on a single trading round. However, one could also imagine that readers receive the reported signal with a lag relative to sophisticated traders. All of our main results are robust to this alternative setting, as long as the stock price does not fully incorporate the firm's fundamental when the journalist decides whether to cover the firm. See Dugast and Foucault [2018] or Foucault et al. [2016] for alternative theoretical settings.

about v. Their expectation of v is conditional on $s_J = v + (1-\alpha)\omega$ if the journalist reports ($\mathcal{D}_R = 1$) or just conditional on prior information if she does not report ($\mathcal{D}_R = 0$). In other words, the journalist acts as an information intermediary and transmits information from the firm to a group of non-sophisticated traders.

In actual markets, these types of traders might be overwhelmed by the amount of information provided by firms and they rely on a journalist to determine the relevance and substance of these signals. Empirically, there is ample evidence that corporate announcements require media coverage to reach parts of the market and that media reporting per se matters for traders, see e.g. Huberman and Regev [2001], Tetlock [2011] and Engelberg and Parsons [2011].

The second difference between readers and sophisticated traders is that readers are not able to further clarify the journalist's signal. They believe that this signal is accurate – $\omega = 0$ or $\alpha = 1$ – and treat s_J as a perfect signal of v. Our modeling of readers as credulous or trusting traders follows the existing theoretical literature such as Bolton et al. [2012] and Chen [2011] and seems to be particularly suitable in the context of financial news. For instance, Ahern and Sosyura [2014] provide empirical evidence that some investors do not fully account for "sensationalism" in financial media and are thus systematically fooled by an upward bias just as in our setting. Readers can therefore be interpreted as a hybrid of informed traders, who trade based on informative signals (v), and noise or liquidity traders, who trade based on non-fundamental information. Using equation (6), we can write their equilibrium demand as

$$x_R = \begin{cases} \frac{1}{\kappa}\left(s_J - p\right) & \text{if } \mathcal{D}_R = 1 \\ \frac{1}{\kappa}\left(\mu_v - p\right) & \text{if } \mathcal{D}_R = 0. \end{cases} \tag{8}$$

If the journalist reports, their conditional expectation of v is equal to s_J. Readers treat the journalist's report as an unbiased signal of the firm's future payoff and set their conditional expectation of v equal to s_J. This a key feature of our model because the reliance on s_J exposes the readers to ω and incentivizes the firm to obfuscate their public signal. If the journalist does not report, they rely on prior information and the expectation of v is equal to the prior mean $\mu_v = \frac{\overline{v}}{2}$.[21]

In addition to sophisticated traders and readers, there is also a unit continuum of

[21] It is straightforward to allow for a distorted prior expectation $\widehat{\mu}_v \neq \mu_v$ for readers such that this group would be overly optimistic or pessimistic without the journalist's report.

liquidity traders with exogenous net demand $u \sim \mathcal{N}(0, \sigma_u)$ which is orthogonal to v (and c). These traders trade for non-fundamental reasons and add additional noise to the equilibrium stock price. Even though no trader has an incentive to learn from the stock price, liquidity traders play an important role in our model because they allow the more sophisticated traders to make positive trading profits in equilibrium.

The market clearing condition sets the asset demands of the three types equal to the fixed zero supply:[22]

$$x_S + \chi x_R + u = 0. \tag{9}$$

Our equilibrium concept is that of sub-game perfection.[23]

Definition 1 *An equilibrium consists of (i) a trading strategy by sophisticated traders and readers, (ii) a reporting policy by the journalist, and (iii) an obfuscation policy by the firm manager such that:*

1. *The sophisticated traders' demand x_S maximizes $\mathbb{E}[U_S|\mathcal{I}_S]$;*

2. *The readers' demand x_R maximizes $\mathbb{E}[U_R|\mathcal{I}_R]$ and they believe $\omega = 0$;*

3. *The journalist's reporting policy $\mathcal{D}_R \in \{0, 1\}$ maximizes $\mathcal{D}_R \Delta_R + (1 - \mathcal{D}_R)\, c$;*

4. *The manager's obfuscation policy $\omega \in [0, \overline{\omega}]$ maximizes $\mathbb{E}[p|\mathcal{I}_F]$.*

2.2 Financial market equilibrium

As a first step, we solve for the financial market equilibrium at $t = 2$ and take the journalist's reporting decision ($t = 1$) and the manager's obfuscation decision ($t = 0$) as given. We solve for these two equilibrium choices afterwards in Section 3.

We plug in the optimal demands for sophisticated traders and readers into the market clearing condition to solve for the equilibrium stock price p as a function of the journalist's

[22]The assumption that the asset is in zero net supply is without loss of generality in our setting due to the traders' risk neutrality.

[23]Technically, information is incomplete because the journalist has private information about her opportunity cost, and therefore our equilibrium concept should be that of sub-game perfect Bayesian Nash-equilibrium. However, neither the sophisticated traders' nor the readers' demands for the risky asset depend on the journalist's opportunity cost, so we can, without loss of generality, consider the game one of complete information and take sub-game perfection as our equilibrium concept.

reporting decision $\mathcal{D}_R$:

$$p = \begin{cases} v + \frac{\chi}{1+\chi}(1-\alpha)\omega + \frac{\kappa}{1+\chi}u & \text{if } \mathcal{D}_R = 1 \\ \frac{1}{1+\chi}v + \frac{\chi}{1+\chi}\mu_v + \frac{\kappa}{1+\chi}u & \text{if } \mathcal{D}_R = 0. \end{cases} \tag{10}$$

In addition to the journalist's reporting decision $\mathcal{D}_R$, the equilibrium stock price also depends on the firm's obfuscation ω. If the journalist does not cover the firm, the stock price cannot depend on the firm's obfuscation because sophisticated traders can clarify the firm's signal perfectly, readers solely rely on their prior information about v, and liquidity demand is not affected by the public signal. In this case, the stock price reflects information about the payoff v with noise u and the signal-noise ratio in p is inversely proportional to the trading cost parameter κ. Furthermore, the price is an unbiased predictor of the future payoff as

$$\mathbb{E}[p|\mathcal{D}_R = 0] = \frac{1}{1+\chi}\mathbb{E}[v] + \frac{\chi}{1+\chi}\mu_v = \mu_v.$$

If the journalist reports, her readers base their equilibrium demand on $s_J = v + (1-\alpha)\omega$. As a result, the residual obfuscation in the journalist's signal affects the equilibrium stock price. This obfuscation is multiplied by a factor $\frac{\chi}{1+\chi}$ that increases in the mass of readers (χ). At the same time, the journalist's report also increases the weight on v because s_J reflects information about the firm's future payoff: the signal-noise ratio increases relative to the no-reporting case. Moreover, the fact that readers rely on the journalist's signal leads to an upward bias in the stock price as

$$\mathbb{E}[p|\mathcal{D}_R = 1] = \mu_v + \frac{\chi}{1+\chi}(1-\alpha)\omega \geq \mu_v = \mathbb{E}[p|\mathcal{D}_R = 0].$$

Next, we compute the expected utility for sophisticated traders and readers at $t = 1$. We take an expectation of U_i conditional on all public signals at $t = 1$: the firm's obfuscation (ω), the journalist's reporting decision ($\mathcal{D}_R$), and the firm's payoff (v):

$$\mathbb{E}_1[U_i] = \mathbb{E}_1\left[x_i(v-p) - \frac{\kappa}{2}x_i^2\right] \tag{11}$$

with $i \in \{R, S\}$. Then, we substitute the optimal demands derived in (7) and (8) into the equilibrium price in (10).

Lemma 1 (Expected utilities) *Conditional on $t = 1$ information, the expected utilities for read-*

ers and sophisticated traders are given by:

$$\mathbb{E}\left[U_R|\mathcal{I}_J\right] = \frac{\kappa^2\sigma_u^2 - \mathcal{D}_R(1+2\chi)(1-\alpha)^2\omega^2 - (1-\mathcal{D}_R)(1+2\chi)\left(v-\mu_v\right)^2}{2\kappa(1+\chi)^2}$$

and

$$\mathbb{E}\left[U_S|\mathcal{I}_S\right] = \frac{\kappa^2\sigma_u^2 + \mathcal{D}_R\chi^2(1-\alpha)^2\omega^2 + (1-\mathcal{D}_R)\chi^2\left(v-\mu_v\right)^2}{2\kappa(1+\chi)^2}.$$

Proof: *See Appendix A.1.1.*

Lemma 1 provides closed-form solutions for the sophisticated traders' and readers' expected utility. We can see from the term $\kappa^2\sigma_u^2$ that both types benefit from the presence of liquidity traders, especially if they can trade aggressively against any mispricing and the trading cost κ is low. Moreover, when there is a news report, the firm's obfuscation ω affects the two types differentially. On the one hand, readers are misled by this obfuscation and obtain lower trading profits. On the other hand, sophisticated traders benefit from it because they can trade against the readers' over-optimism, which is caused by their blind trust in the journalist's partially-obfuscated signal.

It is important to note that we compute the readers' expected utility under the information set of the *journalist* rather than that of the *readers*. This expected utility can be interpreted as the readers' average *realized* trading profits in the long run. Note also, that the expected profits to the readers from following the journalist's report are not necessarily positive. This is because this report is partially obfuscated.

While reader profits may not necessarily be positive, they do have to be larger than their profits from trading on their priors. The reason being that, when the journalist decides whether to report or not, she compares the change in R's long-run trading profits from reporting to the privately-observed opportunity cost c. Evaluating R's expected utility at $\mathcal{D}_R = 1$ and $\mathcal{D}_R = 0$, we can compute this change as:

$$\Delta_R = \frac{1+2\chi}{2\kappa(1+\chi)^2}\left(\left(v-\mu_v\right)^2 - ((1-\alpha)\omega)^2\right). \tag{12}$$

The change in the readers' expected utility comprises three terms: (i) a constant factor that depends on the journalist's readership χ and the trading cost parameter κ; (ii) the squared deviation of the payoff from its unconditional mean μ_v; and (iii) the squared residual bias $(1-\alpha)\omega$ in the journalist's report. In particular, we can see that the journalist's decision to report on the firm does not necessarily increase the readers' expected utility.

On the one hand, they benefit from an informative report because it allows them to trade on an informative signal about v instead of just the prior mean. Such a signal is more beneficial if the realized payoff deviates substantially from the mean.

On the other hand, the journalist's report also exposes readers to the residual obfuscation which reduces their expected utility relative to the no-reporting scenario. We will show below that these two opposing forces are crucial for our main results. In particular, they lead to a non-trivial reporting policy for the journalist and obfuscation policy for the firm manager.

The expression for the readers' utility gain in equation (12) emphasizes the journalist's two primary goals in our setting. On the one hand, she wants to cover firms with fundamentals that deviate from the readers' prior assessment. On the other hand, she also wants to provide accurate information with as little obfuscation as possible. The latter channel is similar to that in Gentzkow and Shapiro [2006] who assume that the media firm wants to build a reputation as a provider of accurate information. However, in their setting our first channel is reversed because the readers have an endogenous preference for news that *conforms* to their prior expectations.[24] It should be noted that readers have a preference for extreme news in our model because they use the journalist's report in their trading decision which is absent in the aforementioned papers.

3 Equilibrium Obfuscation and Reporting

In this section, we endogenize the journalist's reporting and the firm's obfuscation decision. To isolate the effect of the journalist we solve a benchmark model first in which we set the journalist's reporting choice to zero. Two crucial measures for our analysis are the implications of the journalist's reporting on trader welfare and price quality. We define the former measure as the traders' ex ante expected utility conditioned on all public $t = 0$ information, $\mathbb{E}_0[U_R]$. Price quality is formally defined next.

Definition 2 (Price Quality) *Price quality is defined as the negative expected squared deviation of the price from the asset's payoff:*

$$\Lambda \equiv -\mathbb{E}_0\left[\left(v - p\right)^2\right].$$

[24] In Mullainathan and Shleifer [2005] a similar effect arises from a confirmatory cognitive bias of readers.

Our measure of price quality Λ corresponds to the mean-squared error of the equilibrium stock price considered by Banerjee et al. [2018] and Frenkel et al. [2019]. It is maximized at $\overline{\Lambda} = 0$ when the price is fully efficient and $p = v$ with probability one.

3.1 An Economy without a Journalist

To understand the incremental impact of the media in our model, we first consider a world without a journalist ($\mathcal{D}_R = 0$). In this benchmark scenario readers have to rely on their prior information about the payoff because they do not observe the firm's signal. It follows from equation (10) that the equilibrium price in this model is given by

$$p^{no-J} = \frac{v + \kappa u + \chi \mu_v}{1 + \chi}$$

and does not depend on the firm's obfuscation because (i) sophisticated traders are able to remove ω from s_F, (ii) readers do not observe s_F, and (iii) liquidity traders trade for exogenous reasons.

Proposition 1 (No-Journalist Benchmark) *Without the journalist, ($\mathcal{D}_R = 0$), there exists a unique equilibrium in which:*

1. *The firm's equilibrium obfuscation is given by:*

$$\omega^{no-J} = 0.$$

2. *Readers' ex ante expected utility is given by:*

$$\mathbb{E}_0 \left[U_R^{no-J} \right] = \frac{\kappa^2 \sigma_u^2 - (1 + 2\chi)\sigma_v^2}{2\kappa(1 + \chi)^2}.$$

3. *Sophisticated traders' ex ante expected utility is given by:*

$$\mathbb{E}_0 \left[U_S^{no-J} \right] = \frac{\kappa^2 \sigma_u^2 + \chi^2 \sigma_v^2}{2\kappa(1 + \chi)^2}.$$

4. *The expected stock price is given by:*

$$\mathbb{E}_0 \left[p^{no-J} \right] = \mu_v.$$

5. *Price quality is given by:*

$$\Lambda^{no-J} = \frac{-\left(\kappa^2\sigma_u^2 + \chi^2\sigma_v^2\right)}{(1+\chi)^2},$$

where σ_v^2 denotes the ex ante payoff variance.

Proof: *See Appendix A.1.2.*

Proposition 1 summarizes the results in our benchmark scenario without a journalist. As shown above, the equilibrium price p^{no-J} does not depend on the firm's obfuscation in this setting. Thus, the firm manager has no incentive to obfuscate and chooses $\omega^{no-J} = 0$. The ex ante expected utilities for readers and sophisticated traders depend on four parameters: (i) the trading cost (κ), (ii) the mass of readers (χ), (iii) the variance of liquidity demand (σ_u^2), and (iv) the payoff variance (σ_v^2). The sophisticated traders' superior information is reflected in a higher ex ante expected utility, $\mathbb{E}_0\left[U_S^{no-J}\right] > \mathbb{E}_0\left[U_R^{no-J}\right]$. The firm's expected stock price is just equal to the expected payoff, μ_v, and price quality is inversely proportional to sophisticated traders' ex ante expected utility. As expected, price quality decreases in the trading cost parameter κ, liquidity variance σ_u^2, and the payoff variance σ_v^2. The impact of χ is ambiguous and equal to the sign of $\kappa^2\sigma_u^2 - \chi\sigma_v^2$. Loosely speaking, increasing the mass of readers increases price quality if readers are more sophisticated than liquidity traders which depends on the (scaled) variances σ_u^2 and σ_v^2.

3.2 An Economy with a Journalist

In this section, we introduce the journalist and let her decide on whether to report on the firm ($\mathcal{D}_R = 1$) or not ($\mathcal{D}_R = 0$). The reporting decision depends on two factors, the utility gain for her readers Δ_R and the stochastic opportunity cost c. Therefore, the journalist chooses to report on the firm if $\Delta_R > c$. Since the opportunity cost is privately observed by the journalist, the reporting decision is, ex ante, random and the firm manager can only compute a reporting probability:

$$\pi_R \equiv \mathbb{P}\left(\mathcal{D}_R = 1|\mathcal{I}_F\right) = \mathbb{P}\left(\Delta_R > c|\mathcal{I}_F\right). \tag{13}$$

To compute the reporting probability in closed-form, we use the expression for Δ_R derived in equation (12) and the fact that c is uniformly distributed between 0 and $\overline{c}$.

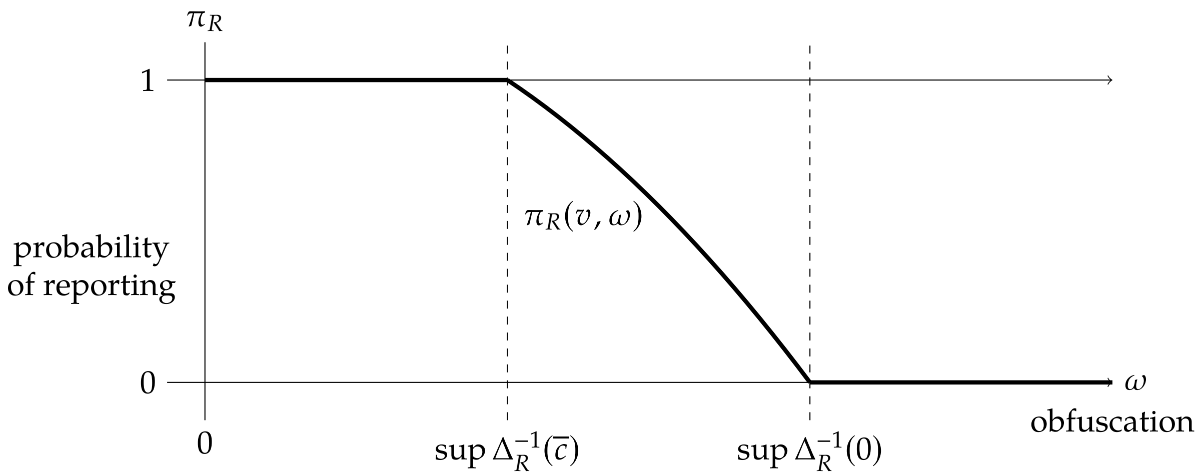

Figure 3: **The Journalist's Reporting Strategy** from Lemma 2. In this example, $\kappa = 1/3$, $\alpha = \chi = 1/2$, $\overline{c} = 1$, $\overline{\omega} = 4/3$, $v = 3$, and $\overline{v} = 4$.

Lemma 2 (The journalist's reporting strategy) *Given the firm's obfuscation ω, the journalist reports with probability*

$$\pi_R(v,\omega) = \begin{cases} 0 & \text{if } \Delta_R < 0 \\ \frac{\Delta_R}{\overline{c}} & \text{if } \Delta_R \in [0, \overline{c}) \\ 1 & \text{if } \Delta_R \geq \overline{c} \end{cases}$$

where the expression for Δ_R is provided in equation (12).
Proof: *See Appendix A.1.3.*

Lemma 2 provides a closed-form solution for the journalist's ex ante reporting probability as a function of the firm's obfuscation which is chosen at $t = 0$. If her readers are worse off from trading on her report ($\Delta_R < 0$), the journalist never reports ($\pi_R = 0$) even if the opportunity cost is low. At the other extreme, if the readers' benefit is greater than the largest opportunity cost $\overline{c}$ the journalist always reports ($\pi_R = 1$).

In the intermediate range, the journalist's reporting probability depends on the readers' utility gain Δ_R. We can see from the expression in Lemma 2 that two opposing forces affect Δ_R and therefore the reporting probability. On the one hand, readers benefit more from the journalist's report if the underlying payoff v is in the tails of its distribution because they would lose a lot from solely trading on the prior mean. On the other hand, readers are hurt by a large residual obfuscation in the journalist's report because their inflated demand for the asset would be exploited by sophisticated traders.

Overall, the journalist has an incentive to report two types of news. First, *extreme news* that move the readers' prior significantly and second, *reliable news* that are not extremely obfuscated by the firm manager. Figure 3 shows the inverse relationship between the firm's obfuscation and the journalist's reporting probability for a set of parameters and a fixed v.

Next, we move back to $t = 0$ and analyze the manager's obfuscation choice. The manager chooses ω to maximize the firm's expected stock price conditional on the payoff v. Therefore, we can use the expression for the equilibrium price in (10) and take an expectation over the journalist's reporting choice, i.e. the privately observed opportunity cost c, and the mean zero demand by liquidity traders. This leads to

$$\mathbb{E}[p|\mathcal{I}_F] = \pi_R(\omega)\left(v + \frac{\chi}{1+\chi}(1-\alpha)\omega\right) + (1-\pi_R(\omega))\left(\frac{1}{1+\chi}v + \frac{\chi}{1+\chi}\mu_v\right). \tag{14}$$

To compute the optimal degree of obfuscation, we differentiate this expression with respect to ω and note that the journalist's reporting probability is a negative function of ω (Figure 3):

$$\frac{\partial \mathbb{E}[p|\mathcal{I}_F]}{\partial \omega} = \frac{\chi}{1+\chi}\left(\underbrace{(1-\alpha)\pi_R}_{(i)} + \underbrace{(v - \mu_v + (1-\alpha)\omega)}_{(ii)}\underbrace{\frac{\partial \pi_R}{\partial \omega}}_{(iii)}\right).$$

This expression highlights the key trade-off the manager faces when he decides on the firm's degree of obfuscation. On the one hand, a marginal increase in ω has a positive impact on the expected stock price because it inflates the signal that the readers use in their trading decision. This positive impact is mitigated by the journalist's skill α and amplified by the reporting probability π_R because the readers are only affected by the residual obfuscation if the journalist chooses to report. This positive effect is captured by term (i) in the expression above. On the other hand, a marginal increase in ω decreases the expected stock price because it reduces the reporting probability (term (iii) in the expression above). The journalist anticipates a smaller increase in the readers' expected utility from reporting if the firm's degree of obfuscation is larger. Given that we know from Lemma 2 that a decrease in Δ_R reduces the reporting probability, it follows that an increased ω can decrease the expected stock price through this channel if $v - \mu_v + (1-\alpha)\omega > 0$ (term (ii) in the expression above).

It is also worth noting that the firm manager would always choose the highest permissible ω if the journalist's reporting probability was fixed at either $\mathcal{D}_R = 0$ (J never reports) or $\mathcal{D}_R = 1$ (J always reports). Hence, the journalist's threat not to report on the firm serves as an endogenous obfuscation cost and incentivizes the manager to limit the degree of obfuscation in equilibrium. For this reason we do not require an exogenous cost to achieve an interior equilibrium level of obfuscation which distinguishes our setting from those in the existing information manipulation literature such as Goldman and Slezak [2006], Strobl [2013], Heinle and Verrecchia [2016], or Gao and Zhang [2018].

Assumption 3 (Cost parameters) *We impose the following two assumptions on the support of ω and c:*

1. *The highest permissible level of obfuscation is sufficiently low: $\overline{\omega} < \overline{\omega}_{max} = \frac{\mu_v}{3(1-\alpha)}$;*
2. *The highest opportunity cost for the journalist is sufficiently high: $\overline{c} > \overline{c}_{min} = \frac{16(1+2\chi)}{9\kappa(1+\chi)^2}\mu_v^2$.*

Before we solve for the manager's equilibrium obfuscation, we impose two parameter restrictions on the support of the level of obfuscation and that of the journalist's opportunity cost. First, we impose that the highest permissible obfuscation cannot exceed an upper bound $\overline{\omega}_{max}$. Second, we assume that the width of the distribution for the journalist's opportunity cost is sufficiently high, i.e. $\overline{c} > \overline{c}_{min}$.

Both assumptions are made to simplify the derivations of the manager's obfuscation and the journalist's reporting decision but neither assumption is crucial for our main results. Specifically, the assumptions ensure that the journalist's probability of reporting (Lemma 2) remains in the interior region. We will come back to this point after the description of the equilibrium obfuscation and reporting strategies.

Proposition 2 (Equilibrium Obfuscation and Reporting) *If ω and c satisfy the conditions in Assumption 3, there exists a unique obfuscation and reporting equilibrium in which:*

1. *The firm's equilibrium obfuscation is given by:*

$$\omega^* = \begin{cases} \overline{\omega} & \text{if } v - \mu_v \in [3\widehat{v}, \mu_v] \\ \frac{1}{3\widehat{v}}(v-\mu_v)\overline{\omega} & \text{if } v - \mu_v \in [0, 3\widehat{v}) \\ \frac{1}{\widehat{v}}(\mu_v - v)\overline{\omega} & \text{if } v - \mu_v \in [-\widehat{v}, 0) \\ \overline{\omega} & \text{if } v - \mu_v \in [-\mu_v, -\widehat{v}) \end{cases}$$

2. *The journalist's equilibrium reporting probability is given by:*

$$\pi_R^* = \begin{cases} K_0\left((v-\mu_v)^2 - \widehat{v}^2\right) & \text{if } v-\mu_v \in [3\widehat{v}, \mu_v] \\ \frac{8}{9}K_0(v-\mu_v)^2 & \text{if } v-\mu_v \in [0, 3\widehat{v}) \\ 0 & \text{if } v-\mu_v \in [-\widehat{v}, 0) \\ K_0\left((v-\mu_v)^2 - \widehat{v}^2\right) & \text{if } v-\mu_v \in [-\mu_v, -\widehat{v}) \end{cases}$$

where $\widehat{v} = (1-\alpha)\overline{\omega}$ and $0 < 3\widehat{v} < \mu_v$. The constant K_0 is given by, $K_0 \equiv \frac{1+2\chi}{2\kappa\overline{c}(1+\chi)^2}$. As before, μ_v denotes the mean payoff, $\overline{c}$ the highest opportunity cost for the journalist, and $\overline{\omega}$ the largest permissible obfuscation.

Proof: *See Appendix A.1.4*

Proposition 2 shows the firm's equilibrium obfuscation and the journalist's equilibrium reporting probability. Starting with the former, we can see that the firm's choice of ω depends on the realization of the fundamental v. In particular, there are four distinct intervals and three distinct outcomes for both equilibrium variables. First, if the payoff is in the far-left or the far-right tail of its distribution, the manager's obfuscation is maximal and the journalist reports with a positive probability. Second, if the payoff is slightly below the unconditional mean, $v - \mu_v \in [-\widehat{v}, 0]$, the manager is able to fully prevent the journalist from reporting such that $\pi_R^* = 0$. Third, for slightly above-average values of the payoff, $v - \mu_v \in [0, 3\widehat{v}]$, the manager's obfuscation is smaller than before, and the journalist reports with a positive probability.

It should be noted that the results are based on the assumption that the range of the journalist's opportunity cost is sufficiently wide, i.e. $\overline{c}$ is above a certain threshold. This assumption ensures that we always remain in the most relevant case that there is a non-zero probability of not reporting and π_R^* is strictly below 1.

Figure 4 evaluates the equilibrium obfuscation and reporting probability for a set of parameters as a function of the firm's payoff v. We can see that the journalist's reporting probability is highest in the tails of the distribution for v because readers benefit a lot from an informative report in this range. This motive allows the manager to set the level of obfuscation to its maximum value $\overline{\omega}$. We can also see that this range is wider for below-average values of v, i.e. the firm manager has a higher incentive to obfuscate bad news. In this case the manager is not concerned about the journalist's not reporting because the expected stock price would increase due to the readers' trading on the prior mean μ_v. In

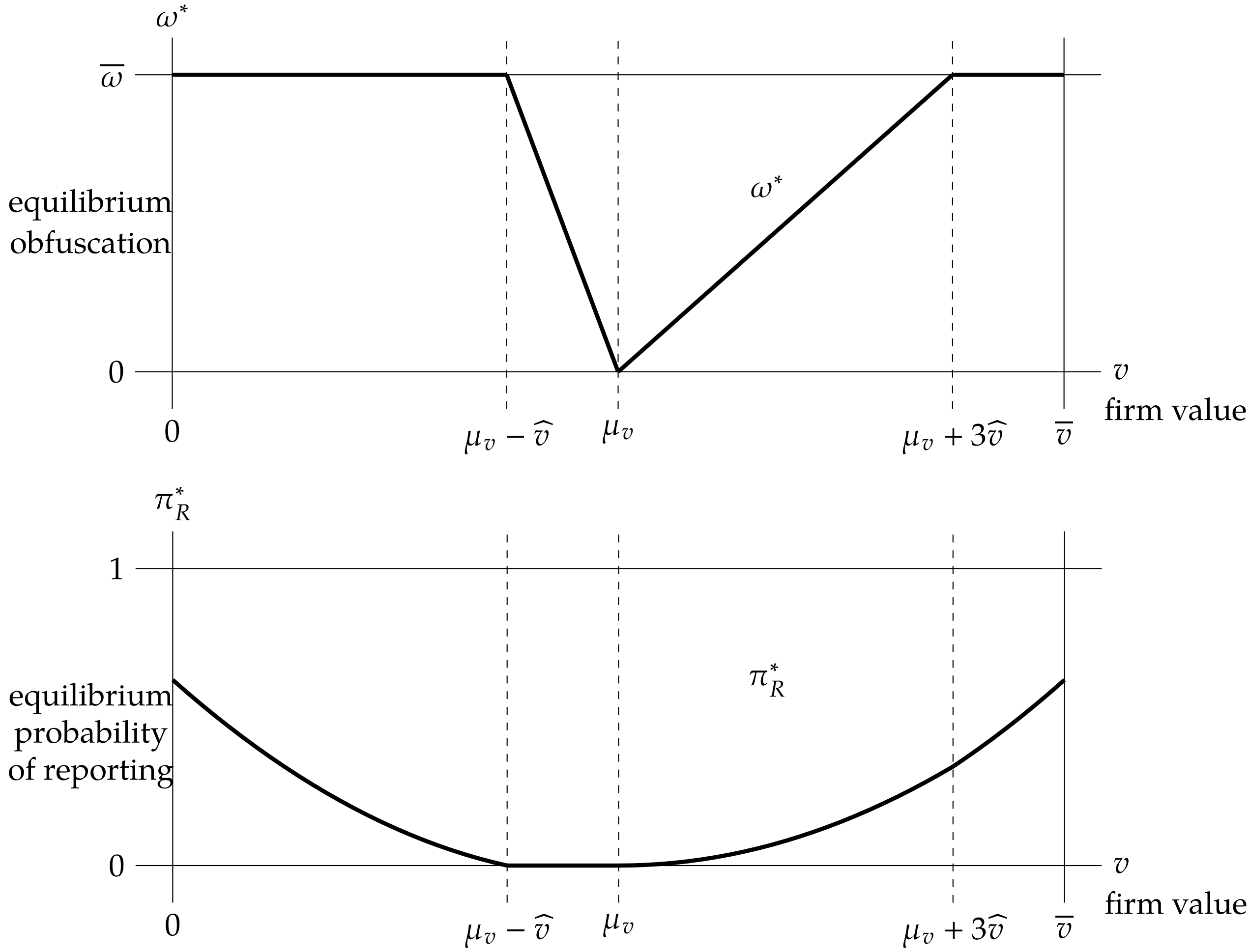

Figure 4: **Equilibrium Obfuscation and Reporting.** In this example, $\kappa = 2/3$, $\alpha = \chi = 1/2$, $\overline{c} = 1$, $\overline{\omega} = 4/3$, and $\overline{v} = 4$. The constant $\widehat{v}$ is defined as $\widehat{v} = (1 - \alpha)\overline{\omega}$.

the intermediate range of the payoff, we get an asymmetric V-shaped pattern for ω^* and an increasing L-shaped pattern for π_R^*. Thus, the manager is able to prevent reporting on slightly negative news by choosing a sufficiently high level of obfuscation. For slightly positive news both ω^* and π_R^* increase in v. Without the assumption that $\overline{\omega} < \overline{\omega}_{max}$ in Assumption 3, the manager would be able to force the journalist's reporting probability to zero for all $v < \mu_v$. Intuitively, the manager benefits from this outcome because he can hide below-average information from the readers who, in turn, push up the stock price by trading on the prior μ_v. At the same time, it is optimal for the journalist not to report because the readers would lose too much in expected trading profits to sophisticated traders who can exploit their overoptimistic demands for the asset.

Corollary 1 (Properties of Equilibrium Obfuscation) *Suppose ω and c satisfy the conditions in Assumption 3, then:*

1. *The firm chooses a higher level of obfuscation (on average) in the presence of bad news:*

$$\mathbb{E}_0[\omega^*|v < \mu_v] > \mathbb{E}_0[\omega^*|v > \mu_v].$$

2. *The unconditional level of obfuscation is given by*

$$\mathbb{E}_0[\omega^*] = \frac{\overline{\omega}\left(\mu_v - (1-\alpha)\overline{\omega}\right)}{\mu_v}.$$

It is increasing in μ_v, α, and $\overline{\omega}$.

Proof: *See Appendix A.1.5.*

Corollary 1 describes the properties of the firm's equilibrium obfuscation in more detail. First, we show that, on average, the firm manager chooses a higher level of obfuscation if the underlying news (v) is below-average. In our setting the manager has a higher incentive to obfuscate negative news because he is less concerned with a reduced reporting probability in this case. If the underlying news is particularly positive, the firm manager wants to ensure that the journalist reports it with a high probability. The equilibrium obfuscation is lower if $v > \mu_v$. These findings are consistent with the empirical evidence in the prior literature that managers take actions to avoid (small) negative earnings surprises.[25] We show that obfuscating the disclosed information is an effective tool because it reduces media coverage and thus the attention of less-sophisticated traders. Second, we show that the degree to which the journalist clarifies the signal does not deter obfuscation but *increases* it.

Corollary 2 (Properties of Equilibrium Reporting) *Suppose ω and c satisfy the conditions in Assumption 3, then:*

1. *The journalist is more likely to report (on average) in the presence of good news:*

$$\mathbb{E}_0[\pi_R^*|v > \mu_v] > \mathbb{E}_0[\pi_R^*|v < \mu_v].$$

[25] See e.g. Burgstahler and Dichev [1997], Degeorge et al. [1999], and Huang et al. [2014].

2. *The unconditional expected reporting probability is given by*

$$\mathbb{E}_0[\pi_R^*] = \frac{1+2\chi}{6\kappa\overline{c}\mu_v(1+\chi)^2}\left(\mu_v^3 - 3\mu_v(1-\alpha)^2\overline{\omega}^2 + 4(1-\alpha)^3\overline{\omega}^3\right).$$

It is increasing in α and μ_v and decreasing in κ, χ, $\overline{\omega}$, and $\overline{c}$.

Proof: *See Appendix A.1.6.*

Corollary 2 shows that the journalist is more likely to report on good news. Therefore, our model creates a form of positive *ex post* media bias. This result is consistent with the empirical evidence in Solomon [2012] that investor relations firms are able to attract more media coverage of its client's good news relative to bad news by "spinning the news." In our setting, the firm's spin is captured by the (positive) obfuscation in its public signal. It should, however, be noted that this type of media bias is in the best interest of the readers because the journalist's reporting decision is made fully benevolently. The reason for this bias is the firm's increased incentive to obfuscate negative news (Corollary 1). To protect her readers from a higher ω^*, the journalist reduces her reporting probability and forces them to trade on their prior belief about v. Corollary 2 also shows that *unconditionally* the journalist is more likely to report if her ability to clarify (α) is higher. This result is intuitive because higher α exposes her readers to a less-obfuscated signal such that the expected utility gain from reporting (Δ_R) increases.

Corollary 3 (Incremental Effect of the Media) *Suppose ω and c satisfy the conditions in Assumption 3, then the introduction of a journalist leads to:*

1. *an increase in readers' welfare;*

2. *a decrease in sophisticated traders' welfare;*

3. *an increase in the expected stock price unconditionally and conditional on $v > \mu_v$;*

4. *a decrease in the expected stock price conditional on $v < \mu_v$;*

5. *an increase in price quality;*

relative to the benchmark economy without reporting.
Proof: *See Appendix A.1.7*

Corollary 3 compares the main model to the benchmark without reporting. We show that the introduction of a journalist leads to the following four results. First, it increases the readers' expected utility. Even though the presence of a journalist encourages the firm to obfuscate its public signal, readers are always better off in the presence of a journalist. This result is intuitive because the journalist's reporting policy makes sure that her report always (weakly) increases readers' welfare.

Second, sophisticated traders always suffer from the presence of the journalist. The fact that the journalist encourages the firm to obfuscate does not affect these traders because they are perfectly aware of the obfuscation and are able to control for it. Without reporting, sophisticated traders can exploit their informational advantage vis-a-vis the less sophisticated traders especially if v is far away from the mean. As shown above, reporting makes readers better informed on net and hence sophisticated traders benefit less from their more precise information.

Third, the presence of a journalist leads to a positive bias in the expected stock price because, on average, the firm successfully inflates the readers' expectations through obfuscation. More interestingly, this effect is mainly driven by a positive bias in the price for above-average realization of v. For below-average values, the presence of a journalist decreases the expected stock price because the journalist might reveal negative news that are too costly for the firm to obfuscate.

Lastly, the presence of a journalist also renders the price more informative in our setting even though there are two opposing forces. On the one hand, the journalist encourages the firm to obfuscate its signal more heavily which tends to decrease price quality. On the other hand, the journalist allows her readers to trade on an informative, albeit obfuscated, signal which tends to increase price quality. Therefore it is not clear, ex ante, what the net effect is. However, it turns out that in our setting the second (positive) effect always dominates such that the presence of the journalist always improves price quality.

4 Conclusion

Financial journalists are part of the ecosystem of agents who take the vast amount of publicly available financial information and process this information to their readers. We consider a model in which the role of the financial journalist is to both identify to her readers the most important financial information, as well as clarify the content of the information put out by the firm. The resulting equilibrium demonstrates the type of news that a strategic journalist will choose to report as well as how her presence affects her readers ability to trade, the incentive of firms to obfuscate their announcements, and the quality of stock prices.

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A Appendix

A.1 Proofs

A.1.1 Proof of Lemma 1

1. First consider an arbitrary sophisticated trader with optimal demand $x_S = \frac{1}{\kappa}(v-p)$. Plugging this demand into the expression for the trader's utility in equation (5) yields:
$$U_S = \frac{1}{\kappa}(v-p)^2 - \frac{1}{2\kappa}(v-p)^2 = \frac{1}{2\kappa}(v-p)^2.$$
Plugging in the equilibrium stock price derived in equation (10) and taking an expectation over $u \sim N(0, \sigma_u)$ and $\mathcal{D}_R \sim Be(\pi_R)$ leads to the expression derived in the Lemma.

2. Consider an arbitrary reader with optimal demand $x_R = \frac{1}{\kappa}\left(\mathcal{D}_R s_J + (1-\mathcal{D}_R)\mu_v - p\right)$. Plugging this demand into the expression for the trader's utility in equation (10) yields:
$$U_R = \frac{1}{\kappa}\left(\mathcal{D}_R s_J + (1-\mathcal{D}_R)\mu_v - p\right)(v-p) - \frac{1}{2\kappa}(v-p)^2.$$
Plugging in the equilibrium stock price derived in equation (10) and taking an expectation over $u \sim N(0, \sigma_u)$ and $\mathcal{D}_R \sim Be(\pi_R)$ leads to the expression derived in the Lemma.

A.1.2 Proof of Proposition 1

As stated in the text, the equilibrium stock price is given by $p = \frac{v+\kappa u+\chi\mu_v}{1+\chi}$ if $\mathcal{D}_R = 0$. As a result, the manager's objective is given by:

$$\mathbb{E}[p|\mathcal{I}_F] = \frac{v+\chi\mu_v}{1+\chi}$$

which does not depend on ω. As a result, the manager's marginal benefit of obfuscation is equal to zero and $\omega^{no-J} = 0$. The results for trader welfare follow from simply evaluating the expressions in Lemma 1 at $\mathcal{D}_R = 0$ and $\omega = 0$.

A.1.3 Proof of Lemma 2

First, note that the journalist reports if and only if $\Delta_R > c$ with $c \sim U[0, \overline{c}]$. Then, the expression for the journalist's reporting probability π_R simply follows from the properties of the uniform distribution. The expression for Δ_R is derived in equation (12).

A.1.4 Proof of Proposition 2

As a first step, we use the expression for $E[p|\mathcal{I}_F]$ derived in equation (14), differentiate it with respect to ω, and set the resulting expression equal to zero which yields:

$$0 = \frac{\chi(1+2\chi)(1-\alpha)}{2\overline{c}\kappa(1+\chi)^3}\left(v - \mu_v + (1-\alpha)\omega\right)\left(v - \mu_v - 3(1-\alpha)\omega\right).$$

The first-order condition leads to the following two optimal values for ω:

$$\begin{aligned}\omega_1 &= \frac{v-\mu_v}{3(1-\alpha)}\\ \omega_2 &= \frac{\mu_v - v}{(1-\alpha)}.\end{aligned}$$

The second derivative of $\mathbb{E}[p|\mathcal{I}_F]$ with respect to ω is given by:

$$\frac{\partial^2\mathbb{E}[p|\mathcal{I}_F]}{\partial\omega^2} = \frac{(1-\alpha)^2\chi(1+2\chi)}{(1+\chi)^3\kappa\overline{c}}\left(\mu_v - v - 3(1-\alpha)\omega\right)$$

Plugging ω_1 and ω_2 into this expression yields:

$$\begin{aligned}\frac{\partial^2\mathbb{E}[p|\mathcal{I}_F]}{\partial\omega^2}\Big|_{\omega=\omega_1} &= -2\frac{(1-\alpha)^2\chi(1+2\chi)}{(1+\chi)^3\kappa\overline{c}}\left(v-\mu_v\right)\\ \frac{\partial^2\mathbb{E}[p|\mathcal{I}_F]}{\partial\omega^2}\Big|_{\omega=\omega_2} &= +2\frac{(1-\alpha)^2\chi(1+2\chi)}{(1+\chi)^3\kappa\overline{c}}\left(v-\mu_v\right)\end{aligned}$$

Hence, ω_1 (ω_2) maximizes the manager's objective if $v \geq \mu_v$ ($v < \mu_v$). In a last step, we have to make sure that these two values satisfy the exogenous constraint that $\omega \in [0, \overline{\omega}]$. Hence, we set $\omega^* = \overline{\omega}$ if $v < \mu_v - (1-\alpha)\overline{\omega}$ and if $v > \mu_v + 3(1-\alpha)\overline{\omega}$. The journalist's optimal reporting policy follows from substituting in ω^* in the expression for π_R derived in Lemma 2.

A.1.5 Proof of Corollary 1

We can use the expression for ω^* as a function of v from Proposition 2 together with the fact that $v \sim U[0, \overline{v}]$ to get:

$$\begin{aligned}
\mathbb{E}_0[b^*|v < \mu_v] &= \frac{\overline{\omega}\left(\overline{v} - (1-\alpha)\overline{\omega}\right)}{4\overline{v}} \\
\mathbb{E}_0[b^*|v > \mu_v] &= \frac{\overline{\omega}\left(\overline{v} - 3(1-\alpha)\overline{\omega}\right)}{4\overline{v}}.
\end{aligned}$$

It then follows from our assumption $\overline{\omega} < \frac{\mu_v}{3(1-\alpha)}$ and $\alpha \in (0,1)$ that $\mathbb{E}_0[\omega^*|v < \mu_v] > \mathbb{E}_0[\omega^*|v > \mu_v]$. The unconditional expectation of ω^* is equal to $\frac{1}{2}\left(\mathbb{E}_0[\omega^*|v < \mu_v] + \mathbb{E}_0[\omega^*|v > \mu_v]\right)$. The comparative statics are straightforward.

A.1.6 Proof of Corollary 2

We can use the expression for π_R^* as a function of v from Proposition 2 together with the fact that $v \sim U[0, \overline{v}]$ to get:

$$\begin{aligned}
\mathbb{E}_0[\pi_R^*|v < \mu_v] &= \frac{1+2\chi}{12\kappa(1+\chi)^2\overline{c}\overline{v}}\left(2(1-\alpha)\overline{\omega} + \mu_v\right)\left(\mu_v - (1-\alpha)\overline{\omega}\right)^2 \\
\mathbb{E}_0[\pi_R^*|v > \mu_v] &= \frac{1+2\chi}{12\kappa(1+\chi)^2\overline{c}\overline{v}}\left(6\overline{\omega}^3(1-\alpha)^3 - 3(1-\alpha)^2\overline{\omega}^2\mu_v + \mu_v^3\right).
\end{aligned}$$

It then follows from our assumptions on $\overline{\omega}$, $\overline{c}$ and α that $\mathbb{E}_0[\pi_R^*|v < \mu_v] < \mathbb{E}_0[\pi_R^*|v > \mu_v]$. The unconditional expectation of π_R^* is equal to $\frac{1}{2}\left(\mathbb{E}_0[\pi_R^*|v < \mu_v] + \mathbb{E}_0[\pi_R^*|v > \mu_v]\right)$. The comparative statics are straightforward.

A.1.7 Proof of Corollary 3

1. Reader welfare. We start with the $t = 1$ expected utility from Lemma 1. Then we take an expectation over the two random variables $v \sim U[0, \overline{v}]$ and $\mathcal{D}_R \sim Be(\pi_R)$. Moreover, we have to take into account that both π_R and ω are a function of v. It follows that the readers' unconditional expected utility in the main model is given

by:

$$
\begin{aligned}
\mathbb{E}_0[U_R] &= \frac{\kappa\sigma_u^2}{2(1+\chi)^2} \\
&- \frac{(1+2\chi)^2\left(10\overline{c}\kappa\mu_v^3\frac{(1+\chi)^2}{(1+2\chi)} - 32\overline{\beta}^5 - 15\overline{\beta}^4\mu_v + 10\overline{\beta}^2\mu_v^3 - 3\mu_v^5\right)}{60\overline{c}\kappa^2\mu_v(1+\chi)^4}
\end{aligned}
$$

with $\overline{\beta} \equiv \overline{\omega}(1-\alpha)$.

It is straightforward to show that this expression is strictly greater than the expected utility in the benchmark model (Proposition 1).

2. Sophisticated trader welfare. We start with the $t = 1$ expected utility from Lemma 1. Then we take an expectation over the two random variables $v \sim U[0, \overline{v}]$ and $\mathcal{D}_R \sim Be(\pi_R)$. Moreover, we have to take into account that both π_R and ω are a function of v. It follows that the sophisticated traders' unconditional expected utility in the main model is given by:

$$
\begin{aligned}
\mathbb{E}_0[U_S] &= \frac{\kappa\sigma_u^2}{2(1+\chi)^2} \\
&+ \frac{\chi^2(1+2\chi)\left(10\overline{c}\kappa\mu_v^3\frac{(1+\chi)^2}{(1+2\chi)} + 256\overline{\beta}^5 - 15\overline{\beta}^4\mu_v + 10\overline{\beta}^2\mu_v - 3\mu_v^5\right)}{60\overline{c}\kappa^2\mu_v(1+\chi)^4}
\end{aligned}
$$

with $\overline{\beta} \equiv \overline{\omega}(1-\alpha)$.

It is straightforward to show that this expression is strictly smaller than the expected utility in the benchmark model (Proposition 1).

3. Price quality. Note that our definition of price quality is $\Lambda = -\mathbb{E}_0[(v-p)^2]$. Plugging in the equilibrium price and taking expectations over v and $\mathcal{D}_R$ gives:

$$
\Lambda = -\frac{\sigma_v^2(\kappa^2+\chi^2)}{(1+\chi)^2} - \frac{\chi^2(1+2\chi)\left(32\overline{\beta}^5 - 15\overline{\beta}^4\mu_v + 10\overline{\beta}^2\mu_v^3 - 3\mu_v^5\right)}{30\overline{c}\kappa\mu_v(1+\chi)^4}
$$

with $\overline{\beta} \equiv \overline{\omega}(1-\alpha)$.

It is straightforward to show that this expression is strictly greater than the expression for price quality in the benchmark model (Proposition 1).

4. Expected stock price. To get the results for the expected stock price we take an unconditional expectation of the expression for $\mathbb{E}[p|\mathcal{I}_f]$ in equation (14).

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