A Theory of Financial Media*

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Abstract

Despite a growing empirical literature, which documents the economic importance of financial media, much of the existing theoretical work takes public financial news as a model primitive. In this paper, we develop a simple model in which financial media plays an economic role: many investors cannot observe the universe of all firm announcements and rely on a financial journalist to choose which announcements to report and which not to. The model explores implications for the behavior of the journalist, the manager, investors, and for stock prices. We find that the introduction of a journalist induces more informed trading by readers, but inadvertently incentivizes the manager to bias the firm's announcements. We argue that this bias arises *in spite of* the journalist, not because of her. Although the stock becomes mis-priced, readers are better off and prices are more informative. Finally, we find two endogenous biases: extreme financial news is more likely to be reported than mundane news and good news is more likely to be reported than bad news.

Keywords: financial journalism, manipulation, price quality

JEL Classification: D82, G14, M40

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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 function. 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. The manager can *bias* the announcement in the hope that it gets picked up by the journalist. If that happens, the readers will observe this biased information and trade on it. Because these readers are deluded, their collective trades will boost the firm's stock price.

The financial journalist plays two roles in our framework. First, she considers each firm announcement and focuses on announcements that yield the greatest benefit to her readers. Second, if she chooses to report on a firm, she tries to *de*bias the announcement as thoroughly as possible to minimize her readers' exposure to biased announcements. For example, she can fact-check a dubious statement or she can re-word a sensational passage.

Thus, 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 biased. Importantly, this strategic reporting decision influences the firm manager's biasing decision. More specifically, the manager chooses the level of bias in the announcement that balances the positive impact on the stock price 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. In particular, we solve for the unique reporting and manipulation equilibrium and derive the financial market implications. This equilibrium generates several key results, some of which confirm existing empirical findings while others generate novel empirical implications.

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 debias 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.

Third, the presence of a journalist induces firms to bias 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 biased. Hence, these trades result in a stock price that is partially biased. 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 bias and chooses not to report announcements which contain too little information and too much bias.

Fourth, overall 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. 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 bias the announcement. The more the firm biases 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 bias negative (i.e. below-average) news and, perhaps more surprisingly, that they bias more when faced with a highly-skilled journalist. The first result comes from the fact that biasing their announcement reduces the chance that the journalist will write about it in the newspaper. Hence, since the firm wants good news to be reported and bad news not to be reported it biases 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 debias it.

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.

Overall, our paper helps to answer questions such as *what kind of news should be reported by the financial media? How does the medias' presence alter the firm's incentive to manipulate information? Are individual investors better off with media reporting?*

The model makes three important assumptions. First, we consider a journalist who does not pander to firms but instead 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 profitable in the long term. We acknowledge that there is some empirical evidence that journalists *do* pander to the firms on which they report [Dyck and Zingales, 2003; Call et al., 2018; Baloria and Heese, 2018].

Second, we do not assume that the journalist creates new information (e.g. investigative reporting), but rather that her main role is to highlight to her readers a small subset of available information that is of higher importance. This is consistent with some empirical evidence suggesting that the medias' primary role is that of a pass-through [Drake et al., 2014; Tetlock, 2011].

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 journalists 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 increases the bias of reported announcements.

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 medias' 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 biases 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 bias 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.[1] 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 bias it in order to inflate the firm's stock price (as in Goldman and Slezak [2006] or Gao and Zhang [2018], among

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

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 manipulation choice.

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 modelling 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 whose role is to disseminate existing information (the financial journalist), rather than create new information (the analyst).[2]

The remainder of the paper is organized as follows: in section 2, we provide the model details; in section 3, we describe the main results; section 4 concludes. All proofs can be found in Appendix A.1.

2 Model

The model considers a strategic firm manager ("he"), a strategic journalist ("she"), and three type of investors. Figure 1 depicts a graphical representation of 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: (1) decide whether or not to report an announcement and (2) debias the announcement (should she decide to report it).

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 $v \sim U[0, \overline{v}]$

[2]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.

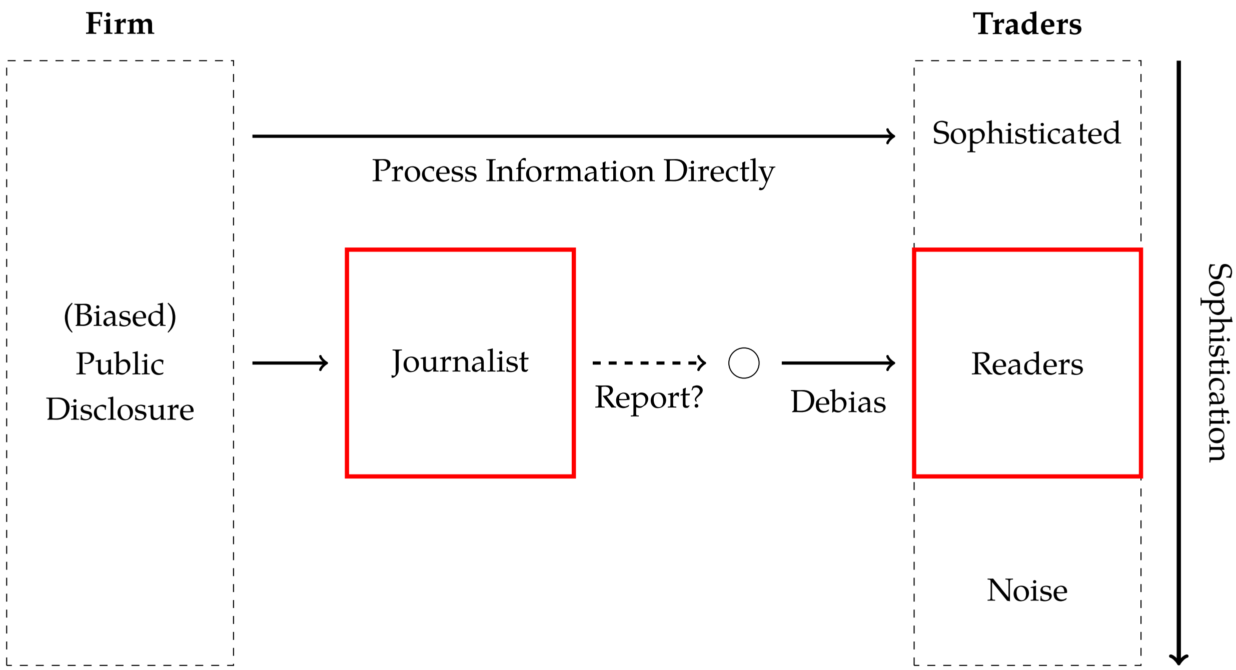

Figure 1: The Three Traders. We distinguish informed from semi-informed traders ("readers") by their ability to process the firm's public disclosure.

with $\overline{v} \in (0, \infty)$ at $t = 3$.[3] 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 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.

[3]We rely on this specific distribution to obtain tractable, closed-form solutions. Our results are robust to a wide range of bounded distributions.

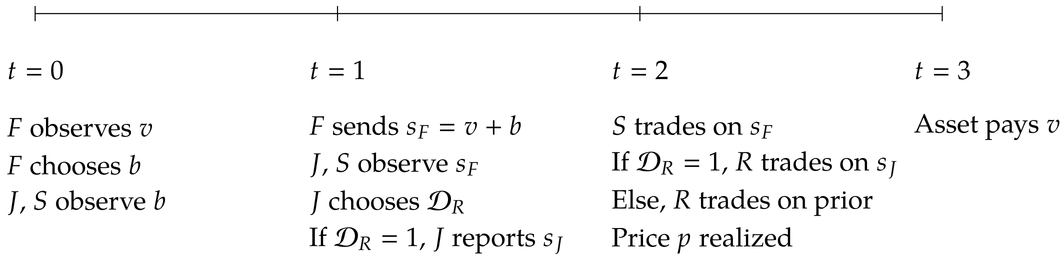

Figure 2: Timeline for the main model. $\mathcal{D}_R \in \{0, 1\}$ denotes the journalist's reporting decision.

Firm bias

At $t = 0$, the firm's manager observes a perfect signal about the future payoff v and issues a potentially biased public signal given as:[4]

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

Therefore, this signal is informative about the future payoff and can be interpreted as a public announcement such as an earnings report or a press release. However, the signal also contains a positive bias $b \in [0, \overline{b}]$ with $\overline{b} \in (0, \infty)$ that is chosen by the manager to inflate the signal regarding the firm's future payoff.[5] The upper limit on the firm's bias ($\overline{b}$) can be interpreted as the highest bias the firm can choose without violating the law or appearing not credible. We follow the existing manipulation literature such as Goldman and Slezak [2006] or Gao and Zhang [2018] and assume that the manager chooses b to maximize the firm's expected stock price, $\mathbb{E}[p|\mathcal{I}_F]$.[6] The manager's information set includes the firm's future payoff and the bias, $\mathcal{I}_F = \{v, b\}$.

Reporting decision

The journalist observes the firm's signal s_F and the manager's choice of b at $t = 1$. It follows that she can retrieve the firm's future payoff from $s_F - b = v$. Based on this

[4]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].

[5]We will show below that the manager does not have an incentive to *deflate* the signal about v. As a result, our assumption that b is (weakly) positive is without loss of generality.

[6]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].

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 bias:

$$s_J = s_F - \alpha b = v + (1 - \alpha)b \tag{2}$$

with $\alpha \in [0, 1)$. Otherwise, she does not issue a report. 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 debias the firm's signal. In the limit $\alpha \to 1$, the firm's biased signal is fully debiased and the readers become perfectly informed about the future payoff. The lower α the higher the residual bias $(1 - \alpha)b$ in s_J. To keep the model tractable, we take the journalist's skill, and therefore α, as given. There are, however, multiple realistic frictions that would give rise to an imperfectly debiased signal such as imperfect knowledge of the firm's bias, quid-pro-quo incentives, or time constraints that prevent the journalist from achieving a perfectly accurate report. In line with the empirical evidence in Gurun and Butler [2012] and Ahern and Sosyura [2014], the firm is able to affect the "tone" of their news coverage through b which is part of the residual bias $(1 - \alpha)b$ 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.

It is important to note that the firm's bias b is observed by the journalist and sophisticated traders which prevents the usual "signal-jamming" effect [see e.g., Goldman and Slezak, 2006]. We deliberately deviate from this literature because our goal is to emphasize the journalist's imperfect ability to fully debias the firm's signal. As a result, another way to think about the three types of traders that are affected by the firm's signal is in terms of their ability to debias. Sophisticated traders can debias perfectly ($\alpha_S = 1$), while readers cannot debias at all *on their own* ($\alpha_R = 0$). The journalist ranks in-between these two types and is able to remove some of the bias added by the manager ($\alpha_J = \alpha \in [0, 1)$).

The journalist's audience is represented by the second group of traders labeled "readers." It follows that 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.

The journalist's decision whether to report or not depends on two factors. First, the anticipated utility gain for her readers and second her opportunity cost. We capture the first factor by the increase in the expected utility of readers through the journalist's reporting:

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

with $\mathcal{I}_J = \{s_F, b, \mathcal{D}_R s_J\}$ such that the journalist's information set is strictly finer that that of the readers. This increase in expected utility can be interpreted as the average long-run gain in trading profits that a reader obtains by learning from the journalist's report. Importantly, 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 $c \sim U[0, \overline{c}]$. This cost can be interpreted as the journalist's utility from reporting on a different topic such as another firm.[7] 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." 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. It follows that the journalist's reporting strategy can be summarized as follows:

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

Trading decision

At $t = 2$, sophisticated traders and readers choose their asset demands x via price-dependent orders 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

[7] 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.

et al. [2017] or Banerjee et al. [2018].[8] 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 takes the following form:

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

where $\mathcal{I}_i$ denotes the information set of type $i \in \{S, R\}$. More specifically, sophisticated traders observe the firm's signal and its bias, i.e. $\mathcal{I}_S = \{s_F, b, \mathcal{D}_R s_J\}$. Readers have to rely on the journalist's report such that $\mathcal{I}_R = \{\mathcal{D}_R s_J\}$.[9]

Sophisticated traders are perfectly informed in our model. They observe the firm's signal s_F and rationally anticipate that this signal is inflated by an amount b. Therefore 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:

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

Thus, 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 *limits 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.

Readers differ from sophisticated traders in two ways. First, they do not observe the firm's signal and depend on the journalist's report to receive additional information about v. Thus, their expectation of v is conditional on $s_J = v + (1 - \alpha)b$ 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

[8]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.

[9]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.

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] or Engelberg and Parsons [2011].

The second difference between readers and sophisticated traders is that readers are not able to debias the journalist's signal perfectly. They believe that the journalist's signal is unbiased, i.e. $b = 0$ or $\alpha = 1$, and treat s_J as a perfect signal of v.[10] Our modeling of readers as credulous or trusting traders follows the existing theoretical literature such as Bolton et al. [2012] or 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 traders, who trade based on non-fundamental information. Using equation (6), we can write their equilibrium demand as

$$x_R = \frac{1}{\kappa}\left(\mathcal{D}_R s_J + (1 - \mathcal{D}_R)\,\mu_v - p\right). \tag{8}$$

If the journalist reports, their conditional expectation of v is equal to s_J. If the journalist does not report, they rely on prior information and the expectation of v is equal to the prior mean $\mu_v = \frac{\overline{v}}{2}$.

In addition to sophisticated traders and readers, there is also a unit continuum of 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:[11]

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

Our equilibrium concept is that of sub-game perfection.[12]

[10] 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.

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

[12] Technically, information is incomplete because the journalist has private information about her op-

Definition 1 *An equilibrium consists of (i) a trading strategy by sophisticated traders and readers, (ii) a reporting policy by the journalist, and (iii) a biasing 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 $b = 0$;*
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 biasing policy $b \in [0, \overline{b}]$ 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 biasing 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 reporting decision $\mathcal{D}_R$:

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

The equilibrium stock price depends on the journalist's reporting decision ($\mathcal{D}_R$) and the firm's bias (b). If the journalist does not cover the firm, the stock price cannot depend on the firm's bias because sophisticated traders can debias the firm's signal perfectly, readers solely rely on their prior information about v, and liquidity demand is not affected by biased public information. 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. As a result, the residual bias in the journalist's signal affects the equilibrium stock price. This bias is

portunity 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.

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

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

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

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

Lemma 1 (Expected utilities) *Conditional on $t = 1$ information, the expected utilities for readers and sophisticated traders are given by:*

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

and

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

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 bias b affects the two types differentially. On the one hand, readers are misled by this bias and achieve lower trading profits. On the other hand, sophisticated traders benefit from it because they can trade against the readers' overoptimism which is caused by their blind trust in the journalist's partially biased signal.

It is important to note that we compute the readers' expected utility under the information set of the journalist rather than of the readers. This utility can be interpreted as the readers' average *realized* trading profits in the long run. 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:

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

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 $(1-\alpha)b$ 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 bias 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 biasing 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 bias 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.[13] 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.

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

3 Equilibrium Bias and Reporting

In this section, we endogenize the journalist's reporting and the firm's manipulation 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:*

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

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

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 bias because (i) sophisticated traders are able to remove b 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 bias is given by:*

$$b^{no-J} = 0$$

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. *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 bias in this setting. Thus, the firm manager has no incentive to manipulate and chooses $b^{no-J} = 0$. 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, $\mathbb{E}_0\left[U_S^{no-J}\right] > \mathbb{E}_0\left[U_R^{no-J}\right]$. 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

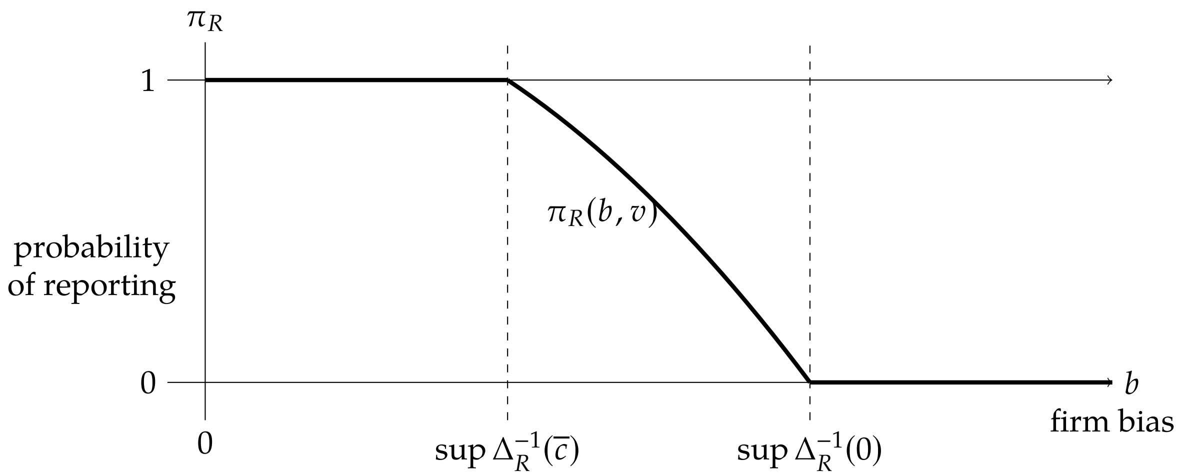

Figure 3: **The Journalist's Reporting Strategy** from Lemma 2. In this example, $\kappa = 1/3$, $\alpha = \chi = 1/2$, $\overline{c} = 1$, $\overline{b} = 4/3$, $v = 3$, and $\overline{v} = 4$.

observed by the journalist, the reporting decision is, ex ante, random and other agents, like 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 $\overline{c}$.

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

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

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 bias which is chosen at $t = 0$. If her readers are worse off from trading on her report ($\Delta_R < 0$), the journalist never reports even if the opportunity cost is low and $\pi_R = 0$. At the other extreme, if the readers' benefit is greater than the largest opportunity cost $\overline{c}$ the journalist always reports and $\pi_R = 1$.

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 bias 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 manipulated by the firm manager. Figure 3 shows the inverse relationship between the firm's bias 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 manipulation choice. The manager chooses b 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

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

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

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

This expression highlights the key trade-off the manager faces when he decides on the firm's bias. On the one hand, a marginal increase in b 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 bias if the journalist chooses to report. On the other hand, a marginal increase in b decreases the expected stock price because it reduces the reporting probability. The journalist anticipates a smaller increase in the readers' expected utility from reporting if the firm's bias is larger. Given that we know from Lemma 2 that a decrease in Δ_R reduces the reporting probability, it follows that an increased b can decrease the expected stock price through this channel if $v - \mu_v + (1-\alpha)b > 0$. It is also worth noting that the firm manager would always choose the highest permissible bias if the journalist's reporting probability was fixed. Hence, the journalist's threat not to report on the firm serves as an endogenous biasing cost and incentivizes the manager to limit the bias in equilibrium. For this reason we do not require an exogenous manipulation cost to achieve an interior equilibrium bias which distinguishes our setting from those in the existing manipulation literature such as Goldman and Slezak [2006], Strobl [2013], Heinle and Verrecchia [2016], or Gao and Zhang [2018].

Assumption 1 *We impose the following two assumptions on the support of b and c:*

1. *The highest permissible bias is sufficiently low:* $\overline{b} < \overline{b}_{max} = \frac{\mu_v}{3(1-\alpha)}$
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 bias, we impose two parameter restrictions on the support of the bias and that of the journalist's opportunity cost. First, we impose that the highest permissible bias cannot exceed an upper bound $\overline{b}_{max}$. 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 bias and the journalist's reporting decision but neither assumption is crucial for our main results. More 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 bias and reporting strategies.

Proposition 2 (Equilibrium Bias and Reporting) *If b and c satisfy the conditions in Assumption 1, there exists a unique reporting and manipulation equilibrium in which:*

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

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

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

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

where $\overline{v}_L = (1-\alpha)\overline{b}$, $\overline{v}_H = 3(1-\alpha)\overline{b}$, and $-\mu_v < -\overline{v}_L < 0 < \overline{v}_H < \mu_v$. The constant K_0 is given by, $K_0 = \frac{1+2\chi}{2\kappa\overline{c}(1+\chi)^2}$. As before, μ_v denotes the mean payoff, $\overline{c}$ the highest opportunity cost for the journalist, and $\overline{b}$ the largest permissible bias.
Proof: *See Appendix A.1.4*

Proposition 2 shows the firm's equilibrium bias and the journalist's equilibrium reporting probability. Starting with the former, we can see that the firm's choice of b 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 bias is maximal and the journalist reports with a positive probability. Second, if the payoff is slightly below the unconditional mean, $v - \mu_v \in [-\overline{v}_L, 0]$, the manager is able to fully prevent journalist from reporting such that $\pi_R^* = 0$. Third, for slightly above-average values of the payoff, $v - \mu_v \in [0, \overline{v}_H]$, the manager's is smaller than before ($\overline{v}_L < \overline{v}_H$), 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 bias 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 bias to its maximum value $\overline{b}$. 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 bias bad news. In this case the manager is less 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 the intermediate range of the payoff, we

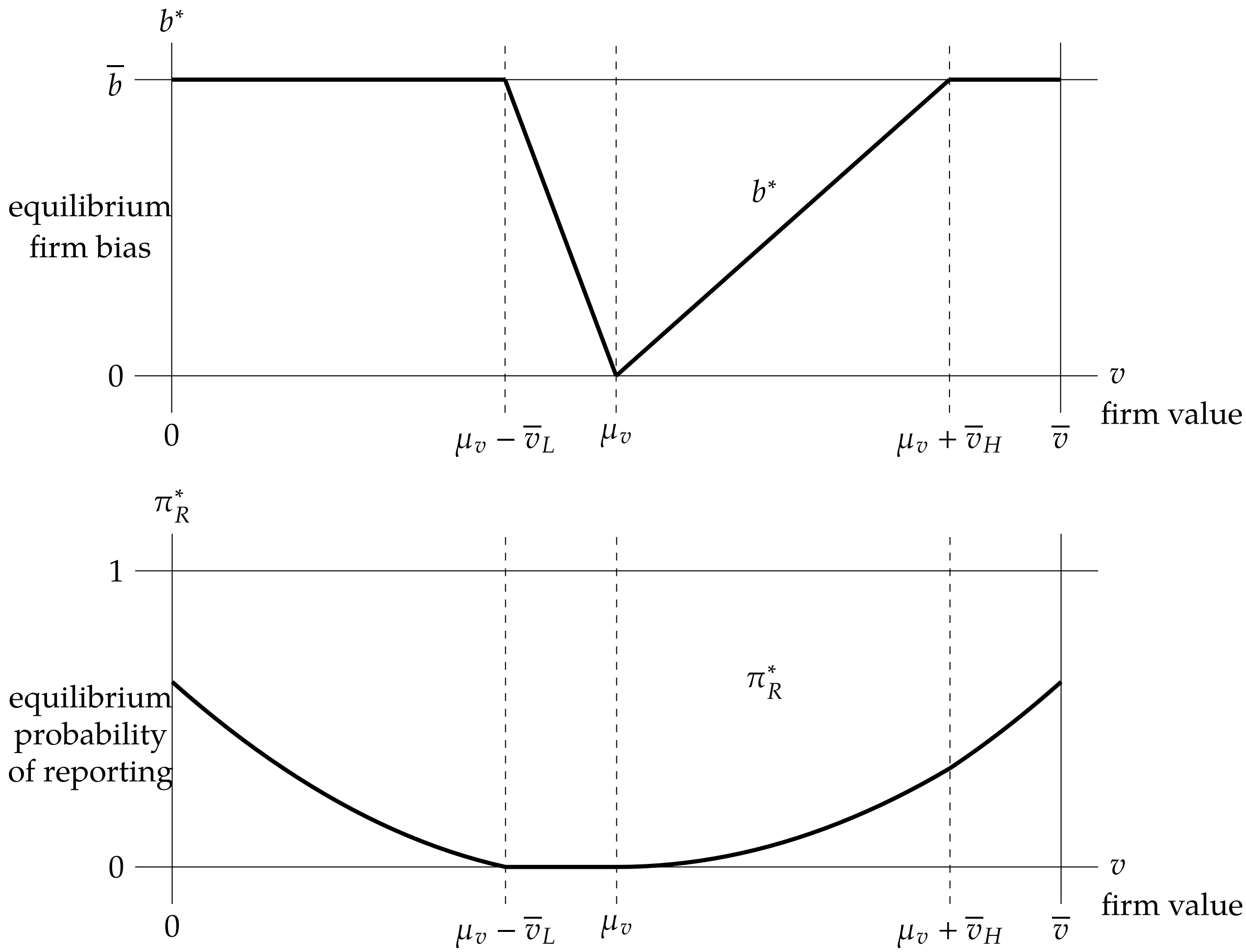

Figure 4: **Equilibrium Bias and Reporting.** In this example, $\kappa = 2/3$, $\alpha = \chi = 1/2$, $\overline{c} = 1$, $\overline{b} = 4/3$, and $\overline{v} = 4$.

get an asymmetric V-shaped pattern for b^* 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 bias. For slightly positive news both b^* and π_R^* increase in v. Without the assumption that $\overline{b} < \overline{b}_{max}$ in Assumption 1, 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 Bias) *Suppose b and c satisfy the conditions in Assumption 1, then:*

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

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

2. *The unconditional expected bias is given by*

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

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

Proof: *See Appendix A.1.5.*

Corollary 1 describes the properties of the firm's equilibrium bias in more detail. First, we show that, on average, the firm manager chooses a higher bias if the underlying news (v) is below-average. In our setting the manager has a higher incentive to bias 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 bias 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.[14] We show that manipulating 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 debiases the signal does not deter manipulation but *increases* it.

Corollary 2 (Properties of Equilibrium Reporting) *Suppose b and c satisfy the conditions in Assumption 1, then:*

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

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

[14]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*

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

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

Proof: *See Appendix A.1.6.*

Corollary 2 shows that the journalist is more likely to report on good news such that 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) bias in its public signal. It should, however, be noted that this 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 manipulate negative news (Corollary 1). To protect her readers from a higher b^*, 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 debiasing ability (α) is higher. This result is intuitive because higher α exposes her readers to a less-manipulated signal such that the expected utility gain from reporting (Δ_R) increases.

Corollary 3 (Incremental Effect of the Media) *Suppose b and c satisfy the conditions in Assumption 1, 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 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 three results. First, it increases the readers' expected utility. Even though the presence of a journalist encourages the firm to manipulate 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 their report does not do any damage to their readers. Second, sophisticated traders always suffer from the presence of the journalist. The fact that the journalist encourages the firm to bias does not affect these trades because they are perfectly aware of the bias 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 such that sophisticated traders benefit less from their more precise information. Third, 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 manipulate 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 biased, 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 its readers the most important financial information, as well as debias the content of the information put out by the firm. The resulting equilibrium demonstrates how the presence of a strategic journalist affects its readers ability to trade, the incentive of firms to bias 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 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 the text 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 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 the text 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 b. As a result, the manager's marginal benefit of biasing is equal to zero and $b^{no-J} = 0$. The results for trader welfare follow from simply evaluating the expressions in Lemma 1 at $\mathcal{D}_R = 0$ and $b = 0$.

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 the text.

A.1.4 Proof of Proposition 2

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

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

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

$$\begin{aligned} b_1 &= \frac{v-\mu_v}{3(1-\alpha)} \\ b_2 &= \frac{\mu_v-v}{(1-\alpha)}. \end{aligned}$$

Plugging these two values back into the second-order condition yields that b_1 (b_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 $b \in [0, \overline{b}]$. Hence, we set $b^* = \overline{b}$ if $v < \mu_v - (1-\alpha)\overline{b}$ and if $v > \mu_v + 3(1-\alpha)\overline{b}$. The journalist's optimal reporting policy follows from substituting in b^* in the expression for π_R derived in Lemma 2.

A.1.5 Proof of Corollary 1

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

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

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

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

It then follows from our assumptions on $\overline{b}$, $\overline{c}$ 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 b 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 $\overline{\beta} \equiv \overline{b}(1-\alpha)$.

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

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

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