The Impact of Media's Reputation on Equity Financing: Manipulation and Collusion*

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Abstract

Financial media are the most common information sources for retail investors and closely watched by buy-side analysts. Previous literature focuses on media bias, mostly in political context. Studies on the relation between financial media and capital markets have been neglected by researchers. In this paper, I investigate the reputation effect of financial media on asset pricing. In the model, firms need to issue shares to fund an investment project whose value is partially learned by a journalist. Uninformed investors price the new shares based on the articles written by the journalist and the public beleif on his honesty. The journalist's comments are credible to the extend that he truthfully reports his private signals, rather than be corrupted by the firms. In equilibrium, stock prices increase with the journalist's reputation. Firms are willing to pay more bribes to the journalist with a higher reputation. The results also show that the reputation of the journalist may drop when he issues accurate favorable comments because the public anticipate the potential collusion with firms. Therefore, an opportunistic journalist prefers to release unfavorable articles if there is no collusion agreement between him and the firms. To retain his credibility in the long run, the opportunistic journalist randomizes his strategies over colluding, telling the truth, and writing excessively critical articles. The model helps to understand why the market still reacts to the media reports even though investors have doubts about the integrity of journalists.

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1 Introduction

Credibility, the media's most precious asset, is arduously acquired and easily squandered. Recent surveys reveal that the news media's credibility has plunged broadly and steadily. In September 23, 2004, a Gallup Poll reports that only 21% of Americans believe journalists have high ethical standards, ranking them below auto mechanics but tied with members of Congress. which reflects the lowest level of confidence in the media in three decades. Financial journalism, like journalism generally, is also facing a severe trust problem. According to the polls by the Pew Research Center, the share of the respondents who gives the Wall Street Journal the highest credibility rating fell from 41% in 2000 to 26% in 2006, although it remains one of the most believable print outlets,.

Despite their reputation crisis, the financial media are still the most common information sources for retail investors. The Investor National Credibility Index created by Columbia University indicated that 91% of investors hold a company's annual report as the most credible source of information (2000). But it also reported that only 8% of investors go right to companies for information. As a result, the financial advice service provided by the media, such as newspaper columns, online investment newsletters, commentaries through radio and TV programs, etc., is a very lucrative and extremely competitive industry all over the world.

Previous research on media's reputation focuses on media bias, mostly in political context (e.g., Baron, 2006; Gentzkow and Shapiro, 2006). The relation between the financial media and capital markets is still lacking in intensive studies.

In this paper, I examine theoretically the media's reputation effect on the stock price behavior of firms that followed by journalists. In the model, a firm needs to issue new shares in order to finance a project. Observing an efficient but imperfect private signal that tells the value of the project, the journalist publishes an article to inform the public (potential investors). The firm may offer a bribe to the journalist in exchange for a favorable comment. The journalist can be either honest, in which case he always rejects corruption and tells the truth, or opportunistic, in which case he trades off his reputation against the bribe. The investors hold a prior belief on the honesty of the journalist. They price the new shares according to the journalist's report and his reputation. When the return is realized, the investors will reassess the journalist's reputation.

The paper gives an explanation to one of the puzzles in capital markets: why the market still reacts to the media reports when the public have doubts about the reporters' integrity. I show in the model that a favorable (respectively, unfavorable) comment published by a journalist can increase (respectively, decrease) the stock price as long as his reputation is sufficiently high, even though investors antic-

ipate the potential collusion between the firms and the journalist. The model also shows that the price change following the comment depends on how much trust the investors put in his report.

Technically, this paper is close to Benabou and Laroque (1992), in which they extend Sobel's (1985) model of credibility to the case of noisy signals. They show that noisy privileged information allows opportunistic individuals to manipulate public information repeatedly without ever being found out. This paper is different from theirs in several aspects.

First, Benabou and Laroque (1992) focus on the interaction between the journalist (the signal sender) and the investors (the signal receivers). In contrast, I further investigate the behavior of a third party in the market, i.e., firms. I demonstrate that the journalist's reputation affects not only his reporting strategy but also firms' bribing decisions. In equilibrium, a firm is willing to bribe more if the journalist's reputation is higher. When the reputation is sufficiently high, the firm always prefers to bribe, regardless of the quality of its project.

Second, in Benabou and Laroque (1992), insider trading is the key incentive for issuing false reports. By sending investors the messages opposite to his own signals, a journalist can gain extra benefits from stock transactions. In contrast, I here consider the collusion between the journalist and firms as the source of media bias. Due to the fact that truthful transmission is still possible even under collusion (e.g., a good firm prefers to bribe under the journalist's "credible threat"), the media reports are more informative in this case, compared to the case with insider trading.

Both insider trading and corruption are big issues nowadays. But compared to the former, which can be relatively easily verified ex post by tracing insiders' trading process, corruption is more unperceivable. Journalism scandal has long been a big concern in many countries, including well-regulated economies. Enron's "advisory board" is one of the representative examples. This board was served by media pundits who were paid to promote Enron's deregulation schemes in the columns or magazines they edited. The list of journalists recruited by Enron included editors of *The Weekly Standard*, columnists for *The New York Times* and *The Wall Street Journal*. Enron's meltdown triggered a new crumbling of media's reputation.

Another example is about a free-lance financial journalist, Lu Liang, who is responsible to the biggest stock price manipulation lawsuit in Chinese stock market's history. In 1998, a controlling shareholder of a small company "Kangdaer," offered Lu Liang 50% of his shares in exchange for the opportunity to reinvent his company. Lu then issued a series of articles, analyzing the investment value of Kangdaer. He continuously imbued the investors with the idea that this small company owned several highly lucrative projects. His articles successfully quadrupled Kangdaer's stock price in two consecutive years. It was ranked at the top of the least risky stocks

by *Chinese Security Journal*, one of the largest circulating business newspapers in China. As investors later realized that it was a massive scam, once traded at Rmb 84 (US$10), the share fell 90% over a few days in late December and early January in 2001.

Moreover, previous literature generally argues that correct predictions always improve a reporter's credibility. But this paper demonstrates that favorable reports, even they turn out to be accurate, may still hurt the journalist's reputation because the investors anticipate a possibility of corruption. As a result, an opportunistic journalist leans to issue unfavorable comments against a good firm when there is no collusion agreement between them. In turn, I show that in the long run to retain his reputation, instead of systematically mimicking the honest type as suggested by Benabou and Laroque (1992), the opportunistic journalist randomizes his strategies over telling the truth, colluding, and writing excessively critical articles.

Besides media's reputation, the media effect on financial markets is another area that has been neglected by researchers. Dyck and Zingales (2003) is the most related study. They provide empirical evidence showing that stock prices are most reactive to the type of earnings emphasized by the press. This effect is stronger for companies with fewer analysts and when the media outlet is more credible. They also find that the media tends to report information biased in favor of companies. My study gives theoretical analysis on one of their findings: whether there is a relation between the reputation of the media and stock prices. The results show that in equilibrium, the dilution effect of a new share issue decreases with the media's reputation. In addition, the market scale of investment is negatively related to the media's reputation because honest journalists warn investors about bad firms.

Here, I use a journalist's reputation to represent the media's credibility, but the results can be generalized to other financial experts, such as analysts. Analysts are generally affiliated to investment banks or brokerage houses, and hence the public believe that they are more likely to issue biased reports than journalists do. In this case, bribery can be considered as multiple kinds of private benefits that a reporter can get from a firm, including profits from providing other financial services to the firms, and advertisement, etc. Using data from Swedish market, Lidén (2005) shows that recommendations given by journalists generate larger market reaction than those by analysts, and journalists gave about three times more sell recommendations than analysts.

The paper extends as follows. Section 2 describes the basic environment and the timing of the game. In Sections 3, I analyze the effect of the media's reputation on the market and the players' strategies in one-period game. Section 4 discusses the long-run equilibrium. Section 5 summarizes. Proofs are gathered in the Appendix.

2 The Environment

There are three groups of risk neutral players in the economy: a single long-lived journalist, issuing firms and investors. In the beginning of each period, a firm decides to raise money from the stock market in order to finance a project with cost I. For simplicity, we assume that all the investment the firm needs comes from the proceeds of the new share issue. The project is either a success yielding $R > 0$, or a failure giving 0 return with equitable probability. The firm can observe a signal s, either good (g) or bad (b), predicting the outcome of the project. The signal is noisy but efficient in the sense that it could reveal correctly the nature of project with probability $\gamma \in (1/2, 1)$. Formally,

$$prob\left[s = g \mid \widetilde{R} = R\right] = prob\left[s = b \mid \widetilde{R} = 0\right] = \gamma. \tag{1}$$

Because $\widetilde{R} = R$ and $\widetilde{R} = 0$ are equiprobable *a priori*, we also have

$$prob\left[\widetilde{R} = R \mid s = g\right] = prob\left[\widetilde{R} = 0 \mid s = b\right] = \gamma. \tag{2}$$

The journalist ("he") is also able to learn the signal. Before each equity issuing, he makes a report m to predict the value of new shares. m can either be favorable in which case it is denoted by F, or unfavorable in which it is denoted by U. We assume that the only source of extra information for the public is the report from the journalist. The journalist's payoff depends on the accuracy of his reports. We also assume that the investors would not buy the new stocks without reading the report. That is equivalent to say $I > R/2$.[1] At the beginning of a period, the firm may offer a take-or leave-it contract[2] (F, B) to the journalist which proposes him a bribe B if he writes a favorable report F. The journalist may have two types: honest or opportunistic. The honest journalist always transmits the signal truthfully. He reports F (respectively, U) when $s = g$ (respectively, $s = b$). In contrast, the opportunistic type maximizes his expected payoffs by trading off his reputation against the bribe.

The investors are uncertain about the journalist's type, but they hold a prior belief about the honesty of the journalist. This belief stands for the journalist's reputation, which is a probability denoted by $\rho_0 \in [0, 1]$. It is updated at the end

[1] A naive investor's expectation on the return of the project is $E\left[\widetilde{R} \mid \Omega\right] = R/2$, where Ω is the common knowledge about the distributation of $\widetilde{R}$. When this expected return could not cover the cost I, the potential investor without access to private information would not invest.

[2] Collusion contracts are usually tacit. Here, they are implementable because the action of the contract receiver, i.e. the journalist, is observable. Despite that such contracts are not protected by law, in reality the bribee would not breach his commitment after receiving the money from the briber.

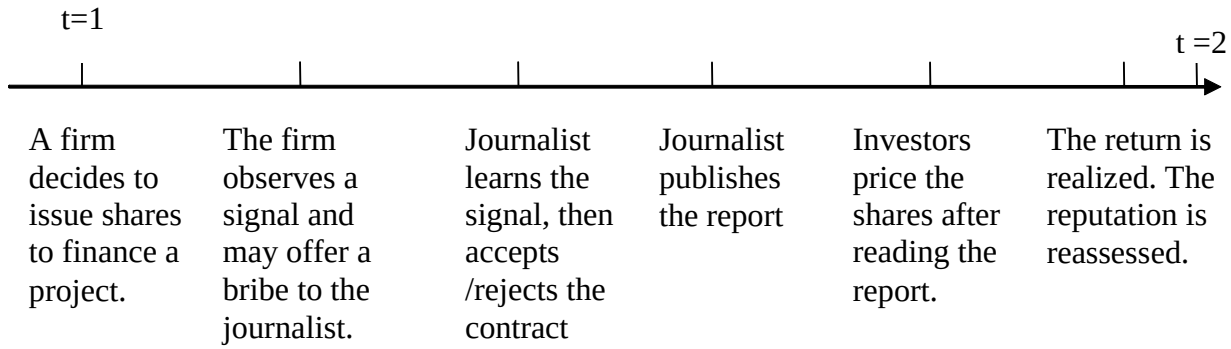

Figure 1: The Timing

of each period, based on the journalist's historical reporting veracity. At time t, his reputation can be written as

$$\rho_t = prob\left[Journalist\ is\ honest \mid reporting\ veracity\ up\ to\ time\ t\right] \tag{3}$$

We assume that all investors on the stock market are rational (There are no noise traders.). At the beginning of the period, the firm commits to distribute a fraction θ of its earnings as dividends. Investors price the new shares after seeing the journalist's report. Comparing the realized return with the previous report they have read, the investors then reassess the reputation of the journalist. This updated belief on the reputation influences the readership or the price of the newspaper, and in turn affects the salary of the journalist. In the long-run game, events occur repeatedly with the same journalist but different firms in each period. The timing is shown in Figure 1.

3 The Collusion in One-period Game

As we mentioned previously, the firm decides whether to offer the journalist a collusion contract after observing its signal. In equilibrium, firms with different signals may employ same or separated strategies. We will show in this Section that firms have two equilibrium strategies in the short-run game:

(1) When the reputation of the journalist is sufficiently high, the firm bribes with probability one, no matter which signal it observes;

(2) When the journalist is less reputable, the firm always bribes if the signal is good, but it is indifferent between colluding and not if he receives a bad signal.

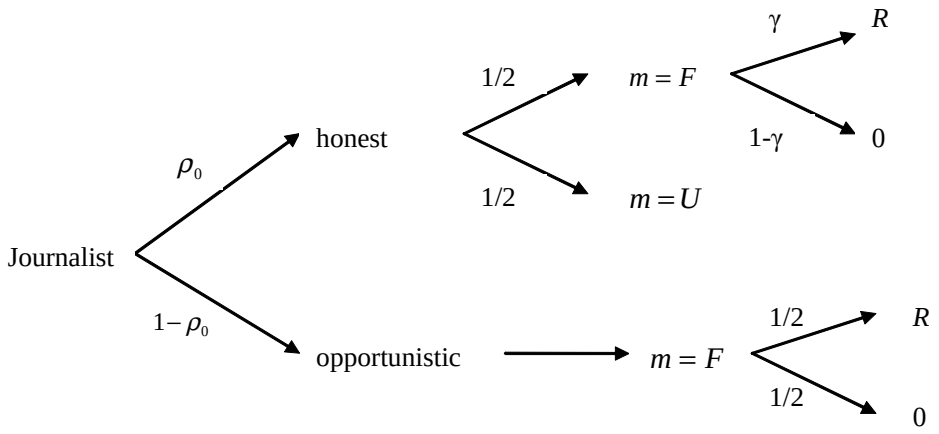

Figure 2: The Equilibirum Path with the Firm's Pure Strategy.

3.1 Firms' Pure Strategy

First, we consider the case where the firm plays a pure strategy. It always offers the collusion contract when facing an opportunistic journalist, and the opportunistic journalist always accepts the contract (as shown in Figure 2).

3.1.1 Investors' Posterior Beliefs and the Players' Strategies

Under such conjectured belief, the journalist's reputation will be updated at the end of the period according to the Bayes' rule. If the journalist writes a favorable article confirmed by a successful project, his reputation becomes

$$\rho^{FR} \equiv prob\left[Journalist\ is\ honest \mid m = F, \widetilde{R} = R\right] = \frac{\gamma\rho_0}{1-(1-\gamma)\rho_0}. \tag{4}$$

But if the favorable report is followed by a failed project, the posterior belief is

$$\rho^{F0} \equiv prob\left[Journalist\ is\ honest \mid m = F, \widetilde{R} = 0\right] = \frac{(1-\gamma)\rho_0}{1-\gamma\rho_0}. \tag{5}$$

As we can see, reports in favor of issuers will damage the journalist's reputation irrespective of the correctness of his predictions: $\rho^{F0} < \rho^{FR} < \rho_0$. However, both ρ^{FR} and ρ^{F0} are increasing with ρ_0. Given that the public anticipates that it is the opportunistic journalist's interest to always accept the bribe, the reputation subsequent to an unfavorable report, denoted by ρ^U, increases to 1. Thus, the opportunistic journalist would prefer to give unfavorable reports even he observes a good signal if no bribe is offered.

After a favorable report, the belief about the probability that the project will succeed is reformed as below:

$$prob(\widetilde{R} = R \mid m = F) = \frac{1 - (1 - \gamma)\,\rho_0}{2 - \rho_0}. \tag{6}$$

It is larger than 1/2, but smaller than γ.Respectively, the posterior belief that the investment will succeed given an unfavorable report is

$$prob(\widetilde{R} = R \mid m = U) = 1 - \gamma, \tag{7}$$

which is lower than the prior belief 1/2. Therefore, the rational investors prefer to purchase the shares after they read a favorable article, but hold their money back if they read an unfavorable one. Consequently, the participation constraint of the potential investors is

$$ER^I = E\left[\theta\widetilde{R} \mid m = F\right] \geq I, \tag{8}$$

which is equivalent to

$$\theta \geq \underline{\theta}\,(\rho_0) \equiv \frac{I\,(2 - \rho_0)}{R\,(1 - (1 - \gamma)\rho_0)}. \tag{9}$$

We assume that the investors are competitive, and hence earn zero surplus. The participation constraint is then binding, and the share of return to the investors when the project succeeds is exactly $\underline{\theta}$. It is easy to find that $\underline{\theta}$ decreases in ρ_0. Intuitively, this means that the higher the reputation of the journalist, the lower the cost of capital will be. The return required by the investors should be feasible in the sense that $\underline{\theta} \leq 1$. This gives us a reputation threshold

$$\underline{\rho_0} = \frac{2I - R}{I - (1 - \gamma)R}. \tag{10}$$

The investors trust the report and would finance the project only if $\rho_0 > \underline{\rho_0}$. Evidently, the profitability of the project and the significance level of the signal jointly determine this threshold. The lower the project's profitability and/or the less informative the signal, the higher reputation is required by the investors to act on buy recommendations.

The next question we are going to consider is the firm's strategy. What is the incentive condition that makes it prefer to bribe even if the potential investors anticipate that the corruption would happen? It can be derived from comparing the firm's expected return under collusion with that without bribery. We suppose that the firm is aware of the type of the journalist since it can easily learn such information by sounding around or based on their former contacts.

When the signal is good, the firm's expected payoff under collusion is

$$\begin{aligned} ER^F\left[\rho_0 \mid C\right] &= E\left[(1-\underline{\theta})\,\widetilde{R} \mid s=g,\ \textit{colluding}\right] - B \\ &= \gamma\,(1-\underline{\theta})\,R - B. \end{aligned} \tag{11}$$

Suppose that the firm deviates from the collusion equilibrium and chooses not to bribe, its expected payoff in this case is 0 because the opportunistic journalist would publish an unfavorable report. The firm then prefers to bribe as long as $ER^F\left(\rho_0 \mid C\right) > 0$. The maximum bribe the firm can afford given a good signal is

$$\overline{B}_g\left(\rho_0\right) = \gamma\,(1-\underline{\theta})\,R. \tag{12}$$

Similarly, the firm with a bad signal can afford a maximum bribe

$$\overline{B}_b\left(\rho_0\right) = (1-\gamma)\,(1-\underline{\theta})\,R. \tag{13}$$

$\overline{B}_b$ is smaller than $\overline{B}_g$, meaning that the good firm is able to pay more bribe than the bad firm.

The journalist's reporting strategy depends on his type. The honest one always tells the truth, and his expected payoff is strictly increasing in his reputation:

$$ER^J\left(\rho_0\right) = k \cdot E[\rho \mid s, \widetilde{R}], \tag{14}$$

where $k > 0$.

The opportunistic journalist trades off the gain from his reputation against the bribe. When the signal is good and he colludes, his expected payoff is[3]

$$\begin{aligned} ER^J\left[\rho_0 \mid C\right] &= B_g + k \cdot E\left[\rho \mid s=g,\ \textit{collusion}\right] \\ &= B_g + k \cdot \left[\gamma\rho^{FR} + (1-\gamma)\,\rho^{F0}\right] \end{aligned} \tag{15}$$

In this conjectured equilibrium, $ER^J\left[\rho_0 \mid C\right]$ is larger than $ER^J\left[\rho_0 \mid NC\right] = k$, which is the expected payoff of rejecting the bribe and reporting U.[4] So, if we have

$$B_g > \underline{B_g}\left(\rho_0\right) \equiv k\left[1 - \gamma\rho^{FR} - (1-\gamma)\,\rho^{F0}\right], \tag{16}$$

[3]Since the honest journalist never changes his strategy, hereafter, ER^J is only used to stand for the expected payoff of the opportunistic type without leading to any confusion.

[4]In this simple model, we do not consider the possibility that the firm can get funding from other financial markets, e.g. bank loans or bonds. If the journalist's report is unfavorable, its correctness can not be verified *ex post* by the investors on the stock market. So, the opportunistic type can choose to report U instead of telling the truth when no bribe is offered.

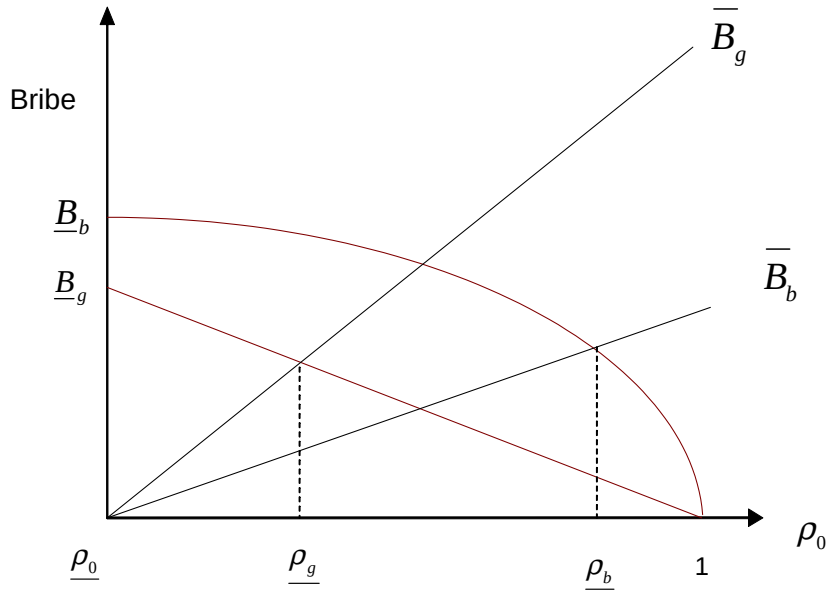

Figure 3: The Existence of Pure-Strategy Equilibrium

the opportunistic journalist would take the bribe when the signal is good.

Similarly, The opportunistic journalist would accept to collude with a bad firm and lie if

$$B_b > \underline{B_b}(\rho_0) \equiv k\left[1-(1-\gamma)\rho^{FR}-\gamma\rho^{F0}\right]. \tag{17}$$

We find that both $\underline{B_g}$ and $\underline{B_b}$ are decreasing functions of ρ_0, but both $\overline{B}_g$ and $\overline{B}_b$ are increasing with ρ_0. There then exists a threshold $\underline{\rho_g} \in (0,1)$ (respectively, $\underline{\rho_b} \in (0,1)$) such that when $\rho_0 > \underline{\rho_g}$ (respectively, $\rho_0 > \underline{\rho_b}$), we have $\overline{B}_g > \underline{B_g}$ (respectively, $\overline{B}_b > \underline{B_b}$). The collusion thus occurs. The size of bribe in equilibrium depends on the bargaining power of the two players, which we will discuss later. A numerical example of the pure-strategy collusion equilibrium[5] is illustrated in Figure 3.

It is easy to justify that $\underline{\rho_0} < \underline{\rho_g} < \underline{\rho_b}$ (see Appendix), which suggests that collusion may not occur whenever there is an investment. When the prior belief belongs to the interval $\left[\underline{\rho_0}, \underline{\rho_g}\right]$, the investors are ready to buy after seeing a favorable report, but the firm may not afford the bribe required by the journalist. The best response for the journalist is then to report U for $\forall s \in \{g, b\}$, rather than collude or tell the truth. When the prior reputation belongs to the interval of $(\underline{\rho_g}, \underline{\rho_b}]$, the journalist will only collude with firms with good signals.

Summarizing the above argument, we arrive at the following result.

Proposition 1. *In the one-period game, there is a pooling pure-strategy equilibrium, where firms always collude with the opportunistic journalist if the reputation*

[5]Given $\gamma = 4/5, I/R = 3/5$ and $k = 1$, we illustrate the existence of the pure-strategy equilibrium.

of the journalist is higher than $\underline{\rho_b} \in (0,1)$. *The equilibrium bribe is either* $B_g \in \left(\underline{B_g}, \overline{B}_g\right)$ *when* $s = g$, *or* $B_b \in \left(\underline{B_b}, \overline{B}_b\right)$ *when* $s = b$. *Investors will finance the project only if the journalist's report is favorable and the prior belief is higher than* $\underline{\rho_0}$.

Proposition 1 is quite intuitive and realistic. Firstly, the value of $\underline{\rho_b}$ depends both on the profitability of the firm (R/I) and on the significance of reputation for the journalist (k). In other words, the firm has to bribe a more reputable journalist if its project is less profitable, and it should offer the journalist a larger bribe if the reputation weighs more in his payoff. Secondly, in the collusion equilibrium, the firm with good project can afford more bribe than the one with bad projects. And all firms are willing to pay more to the journalist with higher reputation. Thirdly, if the journalist has a bad signal about the firm, he will require a larger bribe for accepting collusion. A journalist with poor reputation prefers to publish more critical articles if firms cannot afford enough bribes because favorable reports will do more harm to his credibility. Thus, he requires higher bribes than the one with better reputation. Moreover, $\underline{\rho_g} < \underline{\rho_b}$ implies that a journalist with the reputation lower than $\underline{\rho_b}$ is only willing to collude with good firms. We will show in the next Section that collusion with an unprofitable firm is less probable to a journalist with poor reputation than to a reputable one.

3.1.2 The Uniqueness of the Pure-strategy Equilibrium

The equilibrium described above is unique in the sense that there is no other pooling or separating equilibrium in which both the journalist and firms play pure strategies. The proofs of the following corollaries show the uniqueness of the pure-strategy equilibrium.

Corollary 1. *There is no separating pure-strategy equilibrium, where firms with different signals choose to play different pure strategies.*

Proof: There are two possible separating pure-strategy equilibrium: (1) The firm with good signal bribes, but the firm with bad signal does not; and (2) the reverse. In the first case, the opportunistic journalist's best response is to mimic the honest type. His reputation would not be updated. Therefore, both the bad firm and the opportunistic journalist prefer to deviate and collude. In the second case[6], the opportunistic guy will punish the good firm by giving it an unfavorable report. The good firm would be better off by deviating to collude since its expected payoff under

[6] See the details in Appendix.

bribery will be larger than zero. Based on the contradictions as aforementioned, the separating pure-strategy equilibrium does not exist. ■

We now turn to the media's side. Different types of journalists do not play the same strategy in equilibrium as firms do.

Corollary 2. *In the one-period game, the full honesty equilibrium, where the opportunistic journalist always reports the truth does not exist.*

Proof: This is also can be proved by contradiction. Consider that the public anticipate honesty in both types of journalists. Then, the journalist's reputation would not be reassessed. Thus, accepting the bribe would give the opportunistic journalist a higher payoff than telling the truth, which induces the deviation. ■

Since the reputation can only be increased by reporting U, will the opportunistic guy prefers to reject the bribe and publish unfavorable reports? The answer to this question leads us to

Corollary 3. *The equilibrium where the opportunistic journalist always rejects bribes and publishes unfavorable reports does not exist.*

Proof: Suppose that this was an equilibrium belief. Then once the public see a favorable report, they know that the journalist is honest and update his reputation up to 1. So, the opportunistic type would deviate from his previous strategy $m = U$ to $m = F$, which constructs a contradiction. ■

3.1.3 The Reputation Effect on the Market

In the pure-strategy equilibrium, given a sufficiently high prior belief (i.e. $\rho_0 > \underline{\rho_b}$) about the monopolistic media outlet, we can deduce the expected investment on the market, which is denoted by $EI(\rho_0)$. If the journalist is honest, the investment will occur with probability $1/2$, but if he is opportunistic, the probability is one. Therefore,

$$\begin{aligned} EI(\rho_0) &= \frac{1}{2}\rho_0 + (1-\rho_0) \\ &= 1 - \frac{1}{2}\rho_0. \end{aligned} \tag{18}$$

The total expected investment decreases with the reputation since the reputable journalist is more likely to warn the investors about bad projects. An opportunistic journalist with good reputation, on the other hand, would always collude and give buy recommendations, in which case the market investment will surge.

Provided that a project has been funded by the capital market, the probability that it will succeed is also a function of the reputation:

$$prob\left[\widetilde{R} = R \mid \ project\ is\ funded\right] = \frac{1-(1-\gamma)\rho_0}{2-\rho_0}. \tag{19}$$

This probability is an increasing and convex function of ρ_0. Namely, investors will have a higher probability of receiving payments if the credibility of the financial report is higher. Overall, the honesty of the financial press makes the market investment more cautious and successful.

3.1.4 A Discussion of the Focal Equilibrium under Bargaining

Given $\rho_0 > \underline{\rho_b}$, the game has a range of equilibrium outcomes regarding the size of bribe. On the one hand, firms are able to pay more bribes to the journalist with higher reputation. On the other hand, the less credible journalist requires higher bribes because he would lose more if he issues favorable reports. An interesting question hence comes up: whether the equilibrium bribe level in reality increases or decreases with the reputation of the journalist?

Schelling (1960)'s focal-point-effect theory asserts that in a game with multiple equilibria, one particular equilibrium on which focuses the players' attention is expected by all and thus actually implemented. In our case, a focal equilibrium is determined mainly depending on the players' bargaining power. There is no doubt that the journalist has stronger bargaining power compared to the firm in our setup. That is because a firm's disagreement payoff is only $ER^F\left[\rho_0 \mid NC\right] = 0$, and it is also afraid of the "credible threat" from the journalist. If the opportunistic journalist owns sufficient trust, the firm with clean hands will not obtain external finance. The above argument implies that $\underline{B}$ might not be implemented in equilibrium. This is also the reason why we don't consider the mixed strategy of the opportunistic journalist.

A reasonable outcome under negotiation is most likely to be $B^* = x \cdot \overline{B}$, where $x \in (0,1)$. That is, the firm agrees to pay the journalist a proportion from its issuing proceeds. Obviously, the equilibrium bribe implemented in this way increases with the reputation.[7] We will not discuss in details all the bargaining solutions. This paper hereafter will only focus on the impact of reputation on capital markets.

[7] We also consider another focal equilibrium on the basis of welfare properties of equity and efficiency. Following the axioms for Nash's bargaining solution, there is a unique allocation function achieving the maximum of the Nash product. We find that the journalist' payoff allocation in the focal equilibrium increases with the reputation, but the equilibrium bribe is not necessarily a monotonic function of the reputation. We consider $x \cdot \overline{B}$ is a more intuitive equilibrium outcome. See details in Appendix.

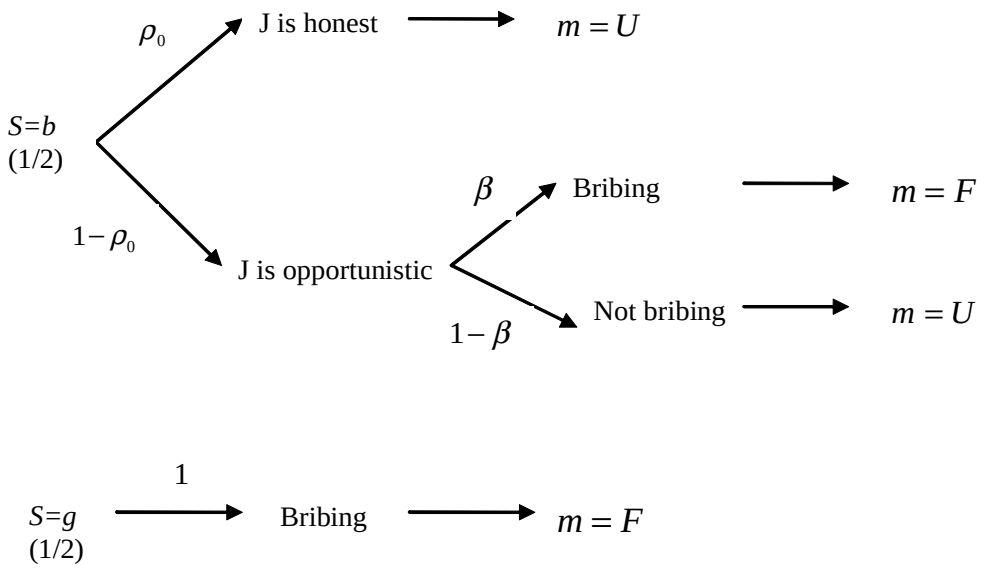

Figure 4: The Equilibirum Path with the Firm's Mixed Strategy.

3.2 Firms' Mixed Strategy

Up to now, we have justified that there is no pure-strategy collusion equilibrium when the reputation of the journalist is lower that $\underline{\rho_b}$. In this section, we conduct a further study on collusion when the media has poorer reputation. Suppose that the firm with a good signal offers a collusion contract with probability $\alpha \in [0, 1]$, and the firm with bad signal bribes with probability $\beta \in [0, 1]$. We will show that the unique mix-strategy equilibrium is semi-separating.

3.2.1 The Existence of Hybrid Equilibrium

We first conjecture a hybrid equilibrium where the good firm always bribes, i.e. $\alpha = 1$ but the bad firm randomizes between bribing and not bribing, i.e. $\beta \in (0, 1)$. The equilibrium path is shown in Figure 4.

Based on this belief, the investors update the reputation after their returns are realized. The posterior belief is denoted by ρ_β. There are three possibilities:

$$\rho_\beta^{FR} \equiv prob\left[Journalist\ is\ honest \mid F, R, \beta\right] = \frac{\gamma\rho_0}{\gamma + \beta(1-\gamma)(1-\rho_0)}, \quad (20)$$

$$\rho_\beta^{F0} \equiv prob\left[Journalist\ is\ honest \mid F, 0, \beta\right] = \frac{(1-\gamma)\,\rho_0}{(1-\gamma) + \beta\gamma(1-\rho_0)}, \quad (21)$$

$$\rho_\beta^{U} \equiv prob\left[Journalist\ is\ honest \mid U, \beta\right] = \frac{\rho_0}{\rho_0 + (1-\beta)\,(1-\rho_0)}. \quad (22)$$

These *ex post* beliefs have a relation as $1 > \rho_\beta^U > \rho_\beta^{FR} > \rho_\beta^{F0}$ for $\forall\beta \in (0,1)$. Similar to the pure-strategy case, favorable reports still always harm the reputation ($\rho_0 > \rho_\beta^{FR} > \rho_\beta^{F0}$), while unfavorable ones improve the journalist's credibility ($\rho_0 < \rho_\beta^U$). We note that both ρ_β^{FR} and ρ_β^{F0} are decreasing in β, but ρ_β^U is increasing in β. Intuitively, the higher the probability of bribery, the lower reputation the journalist will have after publishing a favorable report, but the higher his reputation will be after an unfavorable report.

Due to the equilibrium belief that collusion occurs more likely in the firm with a good project, favorable reports lead to higher posterior beliefs in this hybrid equilibrium than those in the pure-strategy equilibrium. Formally, $\rho_\beta^{FR} > \rho^{FR}$ and $\rho_\beta^{F0} > \rho^{F0}$. However, because of the belief that the opportunistic journalist may publish unfavorable reports in equilibrium, his reputation is not able to reach one when he chooses to do so.

The conditions which ensure the existence of this hybrid equilibrium are summarized in *Proposition 2* and the proof is given in the Appendix.

Proposition 2. *When the prior belief ρ_0 is lower than $\underline{\rho_b}$, the semi-separating equilibrium exist, in which the firm with good signal always offers bribes, while the firm with bad signal colludes with probability $\beta^* \in (0, \beta_b)$. $0 < \beta_b < 1$ is increasing in ρ_0, but decreasing both in k and in I/R. The opportunistic journalist always prefers to take the bribe and reports F. But if the firm does not bribe, he reports U. The investors buy the new shares only if $m = F$ and when the prior belief is higher than $\underline{\rho_0^\beta}$.*

The results imply that the semi-separating equilibria exist only if the investors believe that the probability of collusion between the journalist and the firm with the bad signal is low enough, i.e. $\beta^* < \beta_b$. β_b is positive related to the profitability of the project, but negative related to k. More specifically, when the reputation is much valued by the journalist (i.e. k is large), the journalist is not willing to collude except that the bribe is big enough. The collusion hence occurs at a lower probability. The less profitable the project is, the smaller bribe the firm is able to offer, and hence the less probable that the collusion occurs. We note that β_b is a

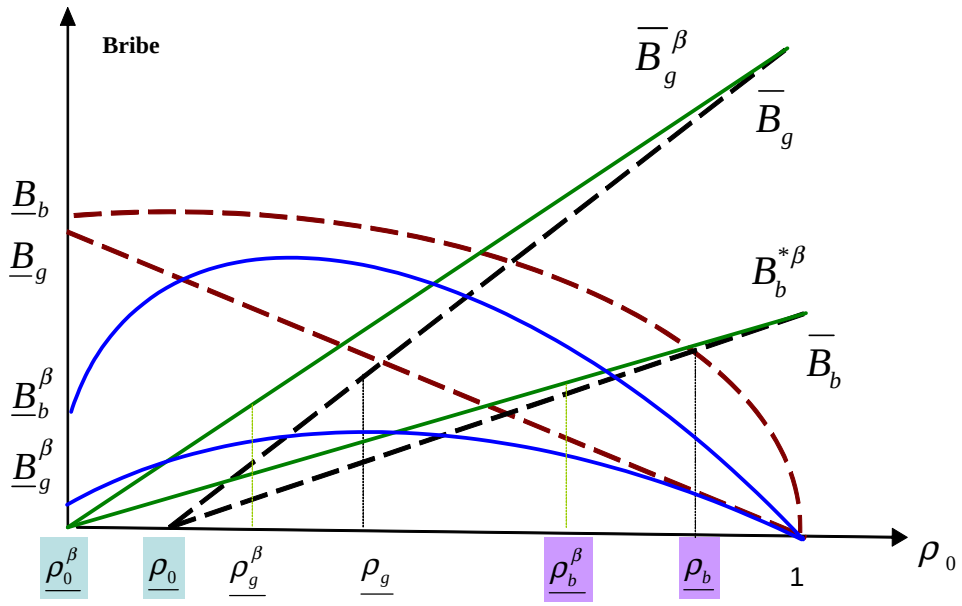

Figure 5: The comparison between the pure-strategy and the hybrid equilibrium.

increasing function of ρ_0. The more the public trust the media reports, the more the firm is willing to bribe, and hence the higher the probability of collusion is.

Analogous to the previous case, there exists a reputation threshold $\underline{\rho_0^{\beta}}$, above which the investors will defer the journalist's buy recommendation. When the firm bribes with a larger β^*, this threshold will be higher. We also note that in equilibrium where $\beta^* < \beta_b(\rho_0)$, we always have $\rho_0 > \underline{\rho_0^{\beta}}$, indicating that investors are active in the hybrid equilibrium.

The comparison between the pure-strategy and the mixed-strategy equilibrium is illustrated in Figure 5 and discussed below.

Firstly, the pure-strategy equilibrium dominates the semi-separating equilibrium when the reputation of the journalist is sufficiently high such that $\rho_0 > \underline{\rho_b}$. In this case, the collusion always exists as long as the journalist is opportunistic.

Secondly, when $\underline{\rho_0^{\beta}} < \rho_0 < \underline{\rho_0}$, the equity offering will not succeed if the investors believe that the firm always bribes no matter its signal is good or bad. But they may invest if they believe that the firm is indifferent between colluding and non-colluding if $s = b$.

Thirdly, the investors ask for a smaller share of return in the hybrid-strategy equilibrium (i.e. $\underline{\theta}^{\beta} < \underline{\theta}$). Similar to the pure-strategy equilibrium, the dilution level $\underline{\theta}^{\beta}$ decreases in the reputation ρ_0, in the signal's informativeness γ, and in the profitability R/I;

In addition, at the mixed-strategy equilibrium, the firm is able to pay a larger bribe (i.e. $B_b^{*\beta} > \overline{B_b}$ and $\overline{B_g^{\beta}} > \overline{B_g}$), and the minimum bribe required by the journalist is smaller (i.e. $\underline{B_b^{\beta}} < \underline{B_b}$ $\underline{B_g^{\beta}} < \underline{B_g}$). In fact, the journalist whose

reputation lower than $\underline{\rho_0}$ will extract all the surplus from the issuing firm with a bad signal. The more credible his reports are, the more bribe he can obtain.

We should also note an extreme case: $\rho_0 \to 0$. When the reputation of the journalist tends to zero, i.e. the public is almost sure that he is opportunistic, publishing critical articles would not effectively improve his reputation. But as long as with little chance he is going to collude with bad firms and the investors believe so, projects can be financed given favorable comments because $\underline{\theta}^{\beta}(\beta \to 0) < 1$ for $\forall \rho_0 \in [0, 1]$.

3.2.2 The Uniqueness of the Mixed-strategy Equilibrium

The semi-seperating equilibrium defined as *Proposition 2* is a unique mixed-strategy equilibrium, in the sense that there are no other semi-separating or separating equilibria. We show in this Section that the mixed-strategy equilibria enumerated below do not exist (see the detailed proofs in Appendix).

Conjecture (i) : The firm with good signal plays mixed strategy, but the opposite type always colludes.

The opportunistic journalist's strategy in this case is to criticize the firm with good signal, but recommend the firm with bad signal. Thus, with a high probability the bad project is financed. The reputation threshold required by the investors is hence even higher than that in the pure-strategy equilibrium. The good firm has to offer a very large bribe in order to obtain a favorable comment. Its mixed strategy is obviously dominated by its pure strategy. So, such semi-separating equilibrium does not exist.

Conjecture (ii) : The good firm randomizes its strategy, and the bad type does not bribe.

Under such belief, the best response for the opportunistic journalist is to punish the good firm by reporting U when it does not bribe, and to tell the truth when the firm has a bad signal. But then, the journalist would be better off if he deviates and publishes F for any s. So the good firm would deviate and play $\alpha = 0$, which constructs a contradiction.

Conjecture (iii) : The good firm does not bribe, but the bad one plays mixed strategy.

The reason that such equilibrium does not exist is similar to the analysis of case (i). The good firm would be better off if it deviates and always bribes.

Conjecture (iv) : Both types of firms play mixed strategy, i.e. $0 < \alpha < 1$, and $0 < \beta < 1$.

As shown in Figure 5, $\underline{\rho_g^{\beta}}$, the critical value at which the good firm is indifferent between colluding and not, does not belong to the interval $(\underline{\rho_b^{\beta}}, \underline{\rho_b})$. As long as the reputation of the journalist is higher than $\underline{\rho_b^{\beta}}$, bribing with probability one is always

the good firm's best strategy. Such equilibrium, therefore, does not exist either.

We can now arrive at the following result.

Corollary 4. *There is no equilibrium where both types of firms play mixed strategy, nor is there the equilibrium where they play separating strategies. If the firm with $s = b$ plays mixed strategy, then the firm with $s = g$ will always collude with probability $\alpha = 1$.*

4 The Long-run Game

In the one-period game, the opportunistic journalist can take the bribe without totally losing his reputation. However, if he colludes continuously in a long time, his type will be revealed, and eventually he will lose his credibility.[8] In order to retain his reputation, the opportunistic type systematically changes his strategy. Let $\lambda(\rho_t)$ represent the journalist's probability of accepting bribery at date t. In contrast to Benabou and Laroque (1992), we will show that the way to maintain a certain reputation is not mimicking the honest type, but randomizing between colluding and reporting excessively unfavorable news. Given ρ_t, no matter firms play pure strategy or mixed strategy, the following result holds.

Corollary 5. *In the long-run reputation game, the opportunistic journalist would not mimic the honest type, even when he rejects the bribes.*

Proof: Consider first that the opportunistic journalist mimics the honest type at any time t. Under such belief, the investors will not reassess the reputation of the journalist. Therefore, the opportunist type will deviate from this equilibrium, and collude whenever he is offered of arbitrary small amount of bribe $B \to 0^+$.

We then prove that the opportunistic journalist does not tell the truth even when he refuses to collude. At date t, we suppose the public believe that the journalist accepts to collude with probability $\lambda(\rho_t)$ and refuses to do so with probability $1 - \lambda(\rho_t)$. The posterior beliefs of the Bayesian investors in such equilibrium are related as $\rho_{t+1}^{F0} < \rho_{t+1}^{FR} < \rho_{t+1}^{U}$, for $\forall \rho_t \in (0,1)$. Thus, reporting U is always a better response than telling the truth when he does not collude. The detailed proof is given in the Appendix. ■

[8] At any time t, when $s = g$, we have $E\left[\rho_{t+1} \mid \rho_t,\ colluding\right] = \gamma\rho_{t+1}^{FR} + (1-\gamma)\rho_{t+1}^{F0}$, which is smaller than ρ_t no matter what strategies (α, β) firms play. Therefore, the equilibrium reputation process $\{\rho_t\}_{t\in N}$ would converge to zero if the journalist lies repeatedly. The same can be applied to the case where $s = b$.

Consider now the public believe that the best strategy of the opportunistic journalist is to report unfavorable news in the non-collusion case. Mathematically speaking, if firms play pure strategy[9], the probability that an opportunistic journalist publishes an unfavorable report is

$$prob(m = U \mid J \textit{ is opportunistic}) = 1 - \lambda(\rho_t).$$

The posterior beliefs when both types of firm always bribe are respectively

$$\rho_{t+1}^{FR} = \frac{\gamma\rho_t}{\gamma\rho_t + \lambda(1-\rho_t)}, \tag{23}$$

$$\rho_{t+1}^{F0} = \frac{(1-\gamma)\rho_t}{(1-\gamma)\rho_t + \lambda(1-\rho_t)}, \tag{24}$$

$$\text{and } \rho_{t+1}^{U} = \frac{\rho_t}{\rho_t + 2(1-\lambda)(1-\rho_t)}. \tag{25}$$

A necessary condition for the existence of such equilibrium is $\rho_{t+1}^{U} > \rho_{t+1}^{FR}$, under which the opportunistic journalist prefers to publish critical articles when there is no collusion. This equivalently requires $\lambda(\rho_t) > \frac{2\gamma}{1+2\gamma}$. In other words, when the probability of colluding is believed to be sufficiently large, the opportunistic journalist's best strategy is reporting U when he rejects bribes.

From the investors' point of view, the journalist's reports are still informative because $prob(\widetilde{R} = R \mid F, \lambda) > \frac{1}{2}$ and $prob(\widetilde{R} = R \mid U, \lambda) < \frac{1}{2}$.[10] If the project is financed, the expected investment return is $\underline{\theta}^{\lambda}(\lambda)$[11]. The dilution level $\underline{\theta}^{\lambda}$ is lower than $\underline{\theta}$ due to the expectation that the opportunistic type plays mixed strategy $\lambda(\rho_t) < 1$ in the long run.

The objective of the opportunistic journalist is to maximize the sum of discounted expected future payoffs. He makes the collusion decision $D_t \in \{C, NC\}$ at each period t by taking into account of his decision's future effect. We denote $V(\rho_t)$ the sum of discounted expected payoffs at the beginning of period t. The function $V(\rho_t)$ is continuous and non-decreasing in ρ_t and can be written as

$$V(\rho_t) = \max_{D_t \in \{C,NC\}} \{V(\rho_t \mid D_t = C), V(\rho_t \mid D_t = NC)\}.$$

where

$$V(\rho_t \mid D_t = C) = B_t + k \cdot E\left[\rho_{t+1} \mid C\right] + \delta V\left(E\left(\rho_{t+1} \mid D_t = C\right)\right)$$

[9] The result can be generalized to the firm's mixed strategy case (see Appendix).

[10] $prob(\widetilde{R} = R \mid F, \lambda) = \frac{\gamma\rho_t + \lambda(1-\rho_t)}{\rho_t + 2\lambda(1-\rho_t)} > \frac{1}{2}$, and $prob(\widetilde{R} = R \mid U, \lambda) = \frac{(1\gamma)\rho_t + (1-\lambda)(1-\rho_t)}{\rho_t + 2(1-\lambda)(1-\rho_t)} < \frac{1}{2}$. Therefore, the investors will submit to the buy recommendation, and will not invest if the report is unfavorble.

[11] $\underline{\theta}^{\lambda}(\lambda) = \frac{I}{R} \cdot \frac{1}{p^{\lambda}}$, where $p^{\lambda} = prob(\widetilde{R} = R \mid F, \lambda)$.

is the discounted payoff in expectation if he chooses to collude at time t, and

$$V\left(\rho_t \mid D_t = NC\right) = k \cdot E\left[\rho_{t+1} \mid NC\right] + \delta V(E\left(\rho_{t+1} \mid D_t = NC\right))$$

is the expected sum of discounted payoff if he rejects the bribe. $0 < \delta < 1$ is the discount factor.

By solving this deterministic problem, we obtain

Proposition 3. *Given an initial value $\rho_0 \in (0,1)$, the opportunistic journalist's long-run equilibrium reputation process $\{\rho_t\}_{t\in N}$ is unique, continuous, and never converges to zero.*

At each period, there is a threshold ρ_t^λ such that when $\rho_0 > \rho_t^\lambda$, the collusion occurs. So given a high initial reputation, the agents may collude consecutively at first periods, until the reputation falls just under the critical value of the corresponding term. Whereas, if the journalist's reputation is poor, he will not collude at early stages. He strives to improve his credibility by keeping telling the truth. Once the reputation is rebuilt, collusion may occur again.

Proposition 3 also suggests that publishing repeatedly buy recommendations may drive the public's belief on λ to grow. The media's reputation will get hurt, which in turn will reduce his incentive to collude. By switching his strategy, the opportunistic type can pull the belief on λ down, therefore retain his reputation.

5 Conclusions

It is commonly believed that financial media have access to private information about public firms, which gives journalists both the incentive and opportunity to take bribes from these firms. Previous studies attempt to explain why the media are biased and how journalists can strategically manipulate public information. But the research on the relation between media's reputation and equity prices is lagged behind.

In this paper, I consider a reputation game, in which the journalist observes private signals and may collude with firms, to investigate how the journalist's reputation influences the market reaction to his reports. The results show that stock prices are positively related to the journalist's reputation, and bribes offered by firms increase in the journalist's reputation. A journalist with a poor reputation would rather issue unfavorable reports than take bribes from bad firms. Good firms also prefer to collude when facing a dishonest journalist because the credible threats from him. Investment scale on the market is smaller when journalists tends to be honest,

because they warn the public about bad firms. In contrast to previous literature, the paper shows that in the long run, an opportunistic journalist does not just mimic the honest type. He tries to retain a certain level of reputation by randomizing his strategies over telling the truth, colluding, and spreading excessively pessimistic news to the market.

There are reasons to expect that increasing the competition of the media market can abate the corruption problem. However, if the public believe that all kinds of experts, including journalists, analysts, specialists and fund managers, etc., might strategically transmit their signals (no matter the incentives come from the supply side or from the demand side), the competition among these information senders may not be very effective in constraining the collusion. For instance, Best and Zhang (1993) show that the number of analysts forecasting a firm's earnings is not related to the stock price reaction. In addition, especially for the financial media, herding behavior is very common in media markets, which can even exacerbate corruption in thriving markets.

Further, it is interesting to investigate the competition on the capital market. Firms competing for external findings may choose different collusion contracts (e.g., exclusive or non-exclusive contracts) in order to gain advantages against their rivals. A journalist, based on his reputation, would also have preferences over a certain type of collusive contracts. Empirical studies will shed more lights on this issue.

6 Appendix

Proof of Proposition 1.

In the one-period pure-strategy equilibrium, the competitive investors receive $\underline{\theta}$ at the end of the period. It is decreasing in the prior belief because of $\frac{d\underline{\theta}}{d\rho_0} < 0$. When $s = g$, the firm can afford to pay a maximum bribe $\overline{B}_g = \gamma(1-\underline{\theta})R$. Obviously, $\frac{d\overline{B}}{d\rho_0} > 0$,meaning that it is a strictly increasing function. On the other hand, the opportunistic journalist requires a minimal bribe $\underline{B_g} = k\left[1-\gamma\rho^{FR}-(1-\gamma)\rho^{F0}\right]$ in order to accept the collusion. Because both $\frac{d\rho^{FR}}{d\rho_0} > 0$ and $\frac{d\rho^{F0}}{d\rho_0} > 0$, namely, the updated reputations are strictly increasing, we get $\frac{d\underline{B_g}(\rho_0)}{d\rho_0} < 0$. The collusion occurs only if $\overline{B}_g > \underline{B_g}$.

$\underline{B_g}$ arrives at its minimum when $\rho_0 = 0$, and $\min \underline{B_g} = \gamma(R-2I) < 0$. But $\overline{B}_g$ reaches its maximum when $\rho_0 = 1$, and $\max \overline{B}_g = \gamma R - I > 0$. In addition, $\max \underline{B_g} = \underline{B_g}(\rho_0 = 0) = k > 0$ and $\min \underline{B_g} = \underline{B_g}(\rho_0 = 1) = 0$. Therefore, $\overline{B}_g(\rho_0)$ and $\underline{B_g}(\rho_0)$ only intersects once in the region $\rho_0 \in (0,1)$. There exists a threshold $\underline{\rho_g} \in (0,1)$ such that when $\rho_0 > \underline{\rho_g}$, we have $\overline{B}_g > \underline{B_g}$.

We can apply the same analysis for the existence of $\underline{\rho_b}$ when $s = b$.

Moreover, because $\overline{B}_g\left(\underline{\rho_0}\right) = \overline{B}_b\left(\underline{\rho_0}\right) = 0$, $\overline{B}_g(1) > \overline{B}_b(1)$, $\underline{B_g}(0) < \underline{B_b}(0)$, and $\underline{B_g}(1) = \underline{B_b}(1) = 0$, and because $\overline{B}_g$, $\overline{B}_b$, $\underline{B_g}$ and $\underline{B_b}$ are all monotonic functions of ρ_0, we obtain $\underline{\rho_0} < \underline{\rho_g} < \underline{\rho_b}$.

We then have proved that the pure-strategy collusion equilibrium exists for $\forall s$. In this equilibrium, the firm with a bad signal pay higher bribe to the journalist. ■

Proof of Corollary 1.

See the proof of Case (1) in the text.

The following is the proof of Case (2): The good firm does not bribe, while the bad one does.

There are two possible responses for the opportunistic journalist under such belief.

Firstly, suppose that he tells the truth when the $s = g$, and lies when $s = b$. That means that he will always publish favorable news just like in the collusion equilibrium. In this case, he prefers to threat the firm with the good signal in order to obtain the bribe. Therefore, this is not an equilibrium.

Secondly, suppose that the opportunistic guy reports U for the firm with a good signal, and issues F for the bad one. Then the posterior beliefs on the reputation become

$$\rho^{FR} = \frac{\gamma\rho_0}{1-\gamma-\rho_0+2\gamma\rho_0} > \rho_0 \tag{26}$$

$$\rho^{F0} = \frac{(1-\gamma)\rho_0}{(1-\gamma)\rho_0+\gamma(1-\rho_0)} < \rho_0 \tag{27}$$

$$\rho^{U} = \rho_0 \tag{28}$$

So, only the accurate report can improve the media's reputation.

The investors' decision depends on the revised expectation about success after reading the reports:

$$prob(\widetilde{R} = R \mid F) = \gamma\rho_0 + (1-\gamma)(1-\rho_0), \tag{29}$$

$$prob(\widetilde{R} = R \mid U) = \gamma(1-\rho_0) + (1-\gamma)\rho_0 < 1/2. \tag{30}$$

We find that a favorable report is valuable information, i.e. $prob(\widetilde{R} = R \mid F) > 1/2$, only if $\rho_0 > 1/2$. This in turn gives us a reputation threshold $\underline{\rho_0} = 1/2$, above which investors would trust the favorable reports.

The good firm does not bribe in equilibrium, which requires that its expected payoff under collusion is smaller than that without collusion, i.e. $E\left[(1-\theta)\widetilde{R} \mid Colluding\right] - B_g < 0$. This incentive constraint is equivalent to $B_g > \gamma(1-\theta)R$. The bad firm bribes, where its incentive condition is written as $B_b < (1-\gamma)(1-\theta)R$. The opportunistic journalist accepts the bribe if $B_b > k\left[\rho_0 - (1-\gamma)\rho^{FR} - \gamma\rho^{F0}\right]$.

Evidently, the good firm could offer a bribe B_g, larger than $k\left[\rho_0-(1-\gamma)\rho^{FR}-\gamma\rho^{F0}\right]$ but smaller than $\gamma\left(1-\theta\right)R$ such that, it makes the journalist agree to collude with him. The deviation induces a larger positive expected return to the good firm. This separating strategy equilibrium hence does not exist. ■

Discussion of a focal equilibrium on the basis of equity and efficiency.

In our case, another possible equilibrium may be determined or selected is based on the welfare properties of equity and efficiency. Following the axioms for Nash's bargaining solution, there is a unique allocation function $\phi\left(v, ER_f^{NC}, ER_J^{NC}\right)$ achieving the maximum of the Nash product. Here, v represents total gains from collusion, which is equal to $\overline{B}-\underline{B}$. ER_f^{NC} and ER_J^{NC} represent the disagreement payoffs of the firm and the journalist, respectively. It is easy to see $ER_f^{NC}=0$ and $ER_J^{NC}=k$. Let ϕ_f and ϕ_J denote the Nash solution of payoff allocation to the firm and the journalist, we obtain $\phi_f=\frac{\overline{B}-\underline{B}-k}{2}$ and $\phi_J=\frac{\overline{B}-\underline{B}+k}{2}$. It is easy to see that v increases with the reputation. The payoff allocations for the firm and the journalist in the focal equilibrium are both positively related to the reputation. But if we consider the bribe only, the equilibrium bribe level here is $B^*=(\overline{B}+\underline{B})/2$, which is not monotonic in ρ_0 for some parameters $\gamma, I/R$ and k. Intuitively, journalists concern more the amount of bribery. So, B^* may not be appropriate outcome when it does not satisfy the monotonicity condition. ■

Proof of Proposition 2.

Given a belief of $\alpha=1$ and $\beta\in(0,1)$, the investors reevaluate the project's probability of success after reading articles written by the journalist, based on the Bays' rule:.

$$prob(\widetilde{R} = R \mid F,\beta)=\frac{\gamma+\beta\left(1-\gamma\right)\left(1-\rho_0\right)}{1+\beta(1-\rho_0)}>1/2, \tag{31}$$

$$prob(\widetilde{R} = R \mid U,\beta)=1-\gamma<\frac{1}{2}. \tag{32}$$

Both favorable reports and unfavorable ones are still believed to be informative. The *ex post* expectation in success after seeing a favorable report (respectively, unfavorable) is higher (lower) than the *ex ante* belief. Therefore, the investors are willing to buy the new shares if the report is optimistic, and will refuse to invest when the report is pessimistic.

The participation constraint of the investors becomes

$$E(\theta\widetilde{R} \mid F,\beta)\geq I$$

In turn, the dividends committed by the firm under such belief is $\underline{\theta}^{\beta}=\frac{I}{p^{\beta}R}$, where $p^{\beta}=prob(\widetilde{R}=R \mid F,\beta)$. The new share issue will succeed only if $\underline{\theta}^{\beta}<1$. In order

words, the probability of bribery is lower than a threshold $\overline{\beta}$, given a prior belief ρ_0.

We now turn to examine the problem of the firm. In the conjectured equilibrium, the incentive constraint of the bad type, who plays mixed strategy, is binding. Namely, the bribe he has to pay is just equal to his expected return under collusion. We denote his return in expectation by $ER_{f,b}^{C}$, and the bribe he pays in equilibrium by $B_b^{*\beta}$.

$$ER_b^F\left(\rho_0 \mid C\right) = E\left[\left(1-\underline{\theta}^{\beta}\right)\widetilde{R} \mid Collusion\right] = B_b^{*\beta} \tag{33}$$

Therefore, we get $B_b^{*\beta}\left(\beta\right) \equiv \left(1-\gamma\right)\left(1-\underline{\theta}^{\beta}\right)R$.

The good firm's collusion incentive constraint, on the other hand, is not binding. It only determines an upper bound of the equilibrium bribe: $\overline{B_g^{\beta}}\left(\beta\right) \equiv \gamma\left(1-\underline{\theta}^{\beta}\right)R$.

From the journalist's point of view, he agrees to collude only if $ER^J\left(\rho_0 \mid C\right) > ER^J\left(\rho_0 \mid NC\right)$. The best response of the opportunistic journalist when he is not offered a collusion contract is to report U because we have shown in the text that $\rho_\beta^U > \rho_\beta^{FR} > \rho_\beta^{FR}$. In this case, $ER^J\left(\rho_0 \mid NC\right) = k\rho_\beta^U$.

The existence of such equilibrium requires the satisfaction of two inequalities:

$$\overline{B_g^{\beta}} > \underline{B_g^{\beta}} \equiv k\left(\rho_\beta^U - \gamma\rho_\beta^{FR} - \left(1-\gamma\right)\rho_\beta^{F0}\right), \tag{34}$$

$$B_b^{*\beta} > \underline{B_b^{\beta}} \equiv k\left(\rho_\beta^U - \left(1-\gamma\right)\rho_\beta^{FR} - \gamma\rho_\beta^{F0}\right). \tag{35}$$

The above conditions say that both types of firms can afford to pay the bribes required by the journalist. Both $\overline{B_g^{\beta}}$ and $B_b^{*\beta}\left(\beta\right)$ are decreasing functions of β since $\underline{\theta}^{\beta}$ is negatively related to β, but both $\underline{B_g^{\beta}}$ and $\underline{B_b^{\beta}}$ are increasing functions of β because ρ_β^{FR} and ρ_β^{F0} decrease in β and ρ_β^U increases in β.

When the signal is bad and $\beta = 0$, the firm offers a bribe $B_b^{*\beta}\left(0\right) = \frac{1-\gamma}{\gamma}\left(\gamma R - I\right) > 0$, and the journalist requires a minimum bribe $\underline{B_b^{\beta}}\left(0\right) = 0$. But if $\beta = 1$,then we are in the case of pure strategy equilibrium, and we will have $B_b^{*\beta}\left(1\right) < \underline{B_b^{\beta}}\left(1\right)$ when $\rho < \underline{\rho_b}$. Therefore, there always exists a threshold $\beta_b \in \left(0,1\right)$ such that when $\beta < \beta_b$, the first inequality holds. Applying the similar reasoning to the inequality (34) , we obtain another threshold $\beta_g \in \left(0,1\right)$ such that $\overline{B_g^{\beta}}\left(\beta_g\right) = \underline{B_g^{\beta}}\left(\beta_g\right)$. Since we can see that $\overline{B_g^{\beta}} > B_b^{*\beta}\left(\beta\right)$ and $\underline{B_b^{\beta}} > \underline{B_g^{\beta}}$, we have $\beta_b < \beta_g$.

In summary, given a prior belief ρ_0, the semi-separating equilibria exist when $\beta < \beta_b$.

Now, we compare the regions in terms of reputation in which the pure-strategy and the hybrid equilibrium exist, respectively. We note that the pure-strategy equilibrium exists when $\rho_0 > \underline{\rho_b}$. Given a belief about the probability of bribing of the bad firm, i.e. $\beta_b^* \in \left(0,1\right)$, we find that the hybrid equilibria exist only if $\rho_0 > \underline{\rho_b^{\beta}}\left(\beta_b^*\right)$, where $\underline{\rho_b^{\beta}}\left(\beta_b^*\right) < \underline{\rho_b}$. The pure-strategy equilibrium dominates the hybrid one when $\rho_0 > \underline{\rho_b}$, because collusion brings strictly positive payoff to the bad firm.

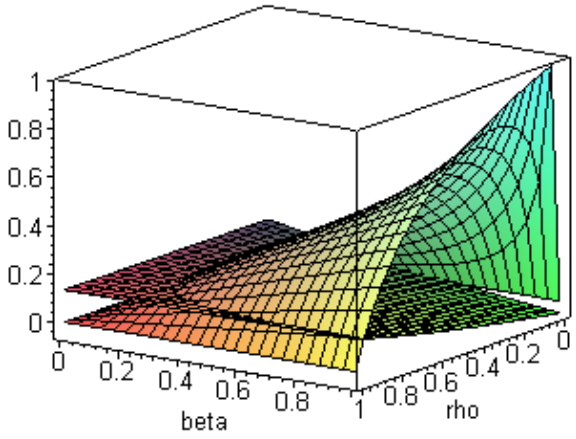

Figure 6: The journalist accepts the bribes when $\beta < \beta_b$.

In addition, in an equilibrium with a belief $\beta^* < \beta_b$, the investors will purchase the new shares only if $\rho_0 > \underline{\rho_0^\beta}$, where $\underline{\rho_0^\beta}$ is such that $\underline{\theta}^\beta\left(\underline{\rho_0^\beta}\right) = 1$.

A numerical example.

Given naive investors with the prior belief equal to 1/2, the significance of the journalist's signal 3/4, the investment cost 2, the gross return of the project 3, and $k = 1$, we get $\beta_g \simeq 0.22$, and $\beta_b \simeq 0.08$. The hybrid equilibria exist when the bad firm bribes with a probability smaller than 0.08.

The illustration of the multiple hybrid equilibria are shown in Figure 6. We can see that the bribe offered by the firm is larger than that is asked by the journalist only if β is low enough.

Proof of the uniqueness of the mixed-strategy equilibrium.

Case (i) : Conjecture that the equilibrium belief is $\beta = 1$ and $\alpha \in (0,1)$.

The rational investors with such a belief update the journalist's reputation based on his report and the realized return. We denote ρ_α the posterior belief in this case.

$$\rho_\alpha^{FR} = \frac{\gamma\rho_0}{\gamma\rho_0 + (1-(1-\alpha)\gamma)(1-\rho_0)} \tag{36}$$

$$\rho_\alpha^{F0} = \frac{(1-\gamma)\rho_0}{(1-\gamma)\rho_0 + (1-\gamma+\alpha\gamma)(1-\rho_0)} \tag{37}$$

$$\rho_\alpha^{U} = \frac{\rho_0}{\rho_0 + (1-\alpha)(1-\rho_0)} \tag{38}$$

All these updated beliefs are increasing in ρ_0. The opportunistic journalist's non-colluding optimal strategy is reporting U for any signal s.[12]

[12]Even though $\rho_\alpha^U > \rho_\alpha^{FR}$ is satisfied only if $\alpha > (2\gamma-1)/2\gamma$, the opportunisic journalist will

The probabilities that the project will succeed after reading the report are respectively

$$prob(\widetilde{R} = R \mid F, \alpha) = \frac{\gamma\rho_0 + (1-(1-\alpha)\gamma)(1-\rho_0)}{1+\alpha(1-\rho_0)}, \tag{39}$$

$$prob(\widetilde{R} = R \mid U, \alpha) = \frac{(1-\gamma)\rho_0 + \gamma(1-\alpha)(1-\rho_0)}{\rho_0 + (1-\alpha)(1-\rho_0)}. \tag{40}$$

We find that $prob(\widetilde{R} = R \mid F, \alpha)$ is larger than $1/2$ (as well as $prob(\widetilde{R} = R \mid U, \alpha)$ is smaller than $1/2$)only if $\alpha > (1-2\rho_0)/(1-\rho_0)$.This means that the favorable reports convey valuable when the publish believe that the good firm will bribe with high probability

In this case, the investors' participation constraint is written as

$$ER^I = E[\theta\widetilde{R} \mid F, \alpha] \geq I. \tag{41}$$

Under the assumption that the investors are competitive, (41) is binding and the share of return goes to the investors is $\theta^\alpha = \frac{I}{p^\alpha R}$. Note that θ^α is a decreasing function of both ρ_0 and α. There exists $\underline{\rho_0^\alpha} \in (0,1)$ such that the public may invest only if $\rho_0 > \underline{\rho_0^\alpha}$.

We find that $\theta^\alpha > \underline{\theta}$, which shows that the dilution level is higher when the good firm does not always colludes. This consists to the fact that the good firm will not obtain the funds since the opportunistic journalist would punish it by misreporting the signal if the good firm refuses to bribe. So, the higher probability that the good firm bribes, the higher the issuing price will be. In turn, we have $\underline{\rho_0^\alpha} > \underline{\rho_0}$, which indicates that the reports released by poor reputable journalist which are credible in pure strategy case now become untrustworthy.

By comparing the expected payoffs under bribing ($ER^F[\rho_0 \mid C]$) with that without bribe ($ER^F[\rho_0 \mid NC]$), we can derive the incentive constraint for bribery. For the firm with good signal, who is indifferent between bribing and not, we have

$$ER^F[\rho_0 \mid C] = E[(1-\theta^\alpha)R \mid s = g, collusion] - B_g^\alpha = 0, \tag{42}$$

which gives $B_g^\alpha = \gamma(1-\theta^\alpha)R$.

not tell the truth (i.e. reporting $m = F$) when the good firm does not bribe. If this was the equilibrium belief, the opportunistic journalist is mimicking the honest type. His reputation will not be updated. Therefore, he would prefer to collude with the good firm as long as it provides a bribe slightly positive. In this case, the good firm would deviate and plays $\alpha = 1$.

On the other hand, reporting F regardless of the type of the signal is definitely not his best reponse, either.

The journalist will collude only if

$$B_g^\alpha > ER^J\left(\rho_0 \mid C\right) = k\left(\rho_\alpha^U - \gamma\rho_\alpha^{FR} - (1-\gamma)\,\rho_\alpha^{F0}\right). \tag{43}$$

The equation (43)gives us a threshold ρ_g^α such that when $\rho_0 < \rho_g^\alpha$, the collusive between the firm and the journalist occurs. But we find $\rho_g^\alpha > \underline{\rho_g}$.[13] Since playing pure strategy gives the firm positive return, its mixed strategy is dominated by the pure strategy. Therefore, this is not an equilibrium.

Case (ii). Conjecture that the equilibrium belief is $\alpha \in (0,1)$ and $\beta = 0$. Son the posterior beliefs are respectively

$$\rho_\alpha^{FR} = \frac{\gamma\rho_0}{\gamma\rho_0 + \alpha\gamma(1-\rho_0)}, \tag{44}$$

$$\rho_\alpha^{U} = \frac{\rho_0}{\rho_0 + (2-\alpha)(1-\rho_0)}. \tag{45}$$

It is easy to find out that $\rho_\alpha^{FR} > \rho_\alpha^U$. Thus, without bribery, the opportunistic journalist would choose to tell the truth, and such collusion equilibrium does not exist. ■

Proof of Corollary 5.

Conjecture an equilibrium in which the public believe that the opportunistic journalist colludes with probability $\lambda\left(\rho_t\right)$ or mimics the honest type when he does not collude, at period t.

Since $prob\left(s=g\right) = prob(s=b) = 1/2$, the opportunistic type's reporting strategy is $prob(m = F \mid No\ Collusion) = prob(m = U \mid No\ Collusion) = 1/2$.

The updated belief after the realization of investment return are respectively

$$\rho_{t+1}^{FR} = \frac{\gamma\rho_t}{\gamma\rho_t + \left(\lambda\left(\rho_t\right) + \gamma\left(1-\lambda\left(\rho_t\right)\right)\right)(1-\rho_t)}, \tag{46}$$

$$\rho_{t+1}^{F0} = \frac{(1-\gamma)\rho_t}{(1-\gamma)\rho_t + \left(\lambda\left(\rho_t\right) + \gamma\left(1-\lambda\left(\rho_t\right)\right)\right)(1-\rho_t)}, \tag{47}$$

$$\rho_{t+1}^{U} = \frac{\rho_t}{\rho_t + \left(1-\lambda\left(\rho_t\right)\right)\rho_t}. \tag{48}$$

We find that $\rho_{t+1}^U > \rho_{t+1}^{FR} > \rho_{t+1}^{F0}$ for any ρ. It implies that the opportunistic journalist would prefer to report U instead of telling the truth when no collusion occurs, which is contradictory to the conjectured equilibrium belief. Therefore, being honest in the non-collusion case is not an equilibrium strategy for the opportunistic journalist. ■

Proof of Proposition 3.

[13] This is because $\theta^\alpha > \underline{\theta}$, $\rho_\alpha^U < 1$, $\rho_\alpha^{FR} > \rho^{FR}$ and $\rho_\alpha^{F0} > \rho^{F0}$.

When the firm always prefers to bribe no matter which signal he observes, the deterministic problem D_t is solved at each period, by comparing the discounted sum of expected payoffs under collusion with that without collusion. The reporting strategy $D_t = C$ is chosen if we have

$$V(\rho_t \mid D_t = C) > V(\rho_t \mid D_t = NC),$$

and $D_t = NC$ is implemented if otherwise.

Precisely, the discounted sum of expected payoffs are

$$\begin{aligned} V(\rho_t \mid D_t = C) &= B_t + k \cdot E\left(\rho_{t+1} \mid C\right) + \delta V\left(E\left(\rho_{t+1} \mid D_t = C\right)\right), \quad (49) \\ V(\rho_t \mid D_t = NC) &> k \cdot E\left(\rho_{t+1} \mid NC\right) + \delta V(E\left(\rho_{t+1} \mid D_t = NC\right)). \quad (50) \end{aligned}$$

Suppose $s_t = g$, the expected reputation with collusion is $E\left(\rho_{t+1} \mid D_t = C\right) = \gamma\rho_{t+1}^{FR} + (1-\gamma)\rho_{t+1}^{F0}$. we denote it by ρ_{t+1}^{C}. Thus, the discounted payoff at the beginning of t under collusion is

$$V(\rho_t \mid D_t = C, s_t = g) = B_t + k\rho_{t+1}^{C} + \delta V\left(\rho_{t+1}^{C}\right). \quad (51)$$

If the journalist does not collude at t, his discounted payoffs is

$$V(\rho_t \mid D_t = NC) = k\rho_{t+1}^{U} + \delta V\left(\rho_{t+1}^{U}\right).$$

$V(\cdot)$ is continuous and non-decreasing function in ρ_t. At time t, the collusion incentive condition gives us a bribery threshold

$$\underline{B_t} = k\left[\rho_{t+1}^{U} - \rho_{t+1}^{C}\right] + \delta\left[V\left(\rho_{t+1}^{U}\right) - V\left(\rho_{t+1}^{C}\right)\right] \quad (52)$$

such that if $\underline{B} > \underline{B_t}$, the journalist accepts the bribe at time t.

Because $d^2\left(\rho_{t+1}^{U}\right)/d\left(\rho_t\right)^2 < 0$, $d^2\left(\rho_{t+1}^{FR}\right)/d\left(\rho_t\right)^2 > 0$ and $d^2\left(\rho_{t+1}^{F0}\right)/d\left(\rho_t\right)^2 > 0$, similar to the proof of *Proposition 2*, the lower bound of equilibrium bribe is concave in ρ_t . We note that in this equilibrium, the posterior beliefs after issuing favorable reports are negatively related to $\lambda(\rho_t)$, while the posterior given an unfavorable report is positively related to $\lambda(\rho_t)$. Therefore, $\underline{B_t}$ is strictly increasing function of $\lambda(\rho_t)$.

From the investors' side, they will buy the new shares if $m = F$ because $prob(\widetilde{R} = R \mid F, \lambda) > \frac{1}{2}$, and they will not buy if $m = U$ because $prob(\widetilde{R} = R \mid U, \lambda) < \frac{1}{2}$.The share of return to the investors is $\underline{\theta}^{\lambda} = \frac{I}{R} \cdot \frac{1}{p^{\lambda}}$, where $p^{\lambda} = prob(\widetilde{R} = R \mid F, \lambda)$. The dilution level $\underline{\theta}^{\lambda}$ is lower than $\underline{\theta}$ due to the belief that the opportunistic type plays mixed strategy $\lambda(\rho_t) \in (0,1)$ in the long run.

At each period, the firm makes its decision just as the static game. So, the upper

bounds of bribery in equilibrium $\overline{B}_{g,t} = \gamma\left(1-\underline{\theta}^{\lambda}\right)R$ and $\overline{B}_{b,t} = (1-\gamma)\left(1-\underline{\theta}^{\lambda}\right)R$ are increasing in the reputation. Since the probability of success for investing in a project provided a favorable report is negatively related to $\lambda(\rho_t)$, $\overline{B_t}$ is hence strictly decreasing function of $\lambda(\rho_t)$.

In the text, we have argued that the equilibrium reporting strategy of the opportunistic journalist $\lambda^*(\rho_t)$ do not take two polar values, namely 0 and 1. We now look at two extreme cases: $\lambda(\rho_t) \to 0$ or 1.

At time t, when $\lambda(\rho_t) \to 0$, we have $\rho_{t+1}^{FR}(0) = \rho_{t+1}^{F0}(0) \to 1$ and $\rho_{t+1}^{U} \to \frac{\rho_t}{2-\rho_t} < 1$. Thus $\underline{B_t}(0) \to 0$ and $p^{\lambda} \to \gamma$, which in turn means $\underline{\theta}^{\lambda} \to \frac{I}{\gamma R} < 1$ and $\overline{B_t}(0) > \underline{B_t}(0)$.

When $\lambda(\rho_t) \to 1$, we have $\rho_{t+1}^{FR}(1) \to \rho^{FR}$, $\rho_{t+1}^{F0}(1) \to \rho^{F0}$ and $\rho_{t+1}^{U} \to 1$. In other words, the results converge to those of the firm's pure-strategy equilibrium in Section 3. Thus, we will have either $\underline{B_t}(1) < \overline{B_t}(1)$ if $\rho_t > \underline{\rho_b}$, or $\underline{B_t}(1) < \overline{B_t}(1)$ if $\rho_t > \underline{\rho_b}$.

Summarizing the above argument, there is a unique solution $\lambda^*(\rho_t) \in (0,1)$ for the long run reputation game. At a given period t, the opportunistic journalist accepts the bribe when $\rho_t \geq \underline{\rho_b}$. He randomizes his strategies when $\rho_t < \underline{\rho_b}$. In the long run, issuing $m = F$ will decrease his reputation under the belief $\lambda(\rho_t) > \gamma$, but increases the reputation if $\lambda(\rho_t) < \gamma$. Issuing U can either improve his reputation if $\lambda(\rho_t) > 1/2$, or harm his reputation if otherwise. Overall, given an initial value $\rho_0 > 0$, the dynamic game always have an equilibrium strategy $\lambda^*(\rho_t)$ ensuring the the reputation does not converge to zero.

The results can be applied to the case where firms play mixed strategy. The only thing changes here is that the posterior beliefs are now functions of both λ and β. We would still find a unique long-run reporting strategy $\lambda(\rho_t)$ such that the journalist can retain his reputation by randomizing between colluding (in which case $m = F$) and non-colluding (in which case $m = U$). However, due to the fact that the public believe now the journalist does not always take bribes, we should expect the reputation threshold for investment is even lower than those in the previous cases. ■

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