Indifferent Public, Passionate Advocates, and Strategic Media

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Very preliminary. Comments are welcome.

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Abstract

We present a dynamic model of news reporting by a profit-maximizing media outlet whose credibility is uncertain to the public. In each period, the media outlet chooses its source of news: a costly independent investigation or, possibly, a free report prepared by an interest group. The revenue of the media outlet consists of the subscription fees for the public and the access fees for interest groups. We characterize the equilibrium structure of information transmission with and without interest groups. In particular, we demonstrate that the presence of interest groups may enhance the amount of information transmission while decreasing the probability of correct decisions by the public.

JEL Codes: D72, D82.

Key Words: media ethics, strategic information transmission, reputation.

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> The public is misled by individuals who present themselves to be independent, unbiased experts or reporters, but are actually shills promoting a prepackaged corporate agenda. ... Shoddy practices make it difficult for viewers to tell the difference between news and propaganda.
>
> Statement of FCC Commissioner Adelstein, August 14, 2006

1 Introduction

On August 14, 2006 the Federal Communications Commission (FCC) issued 42 inquiries to 77 news broadcasting companies to determine whether the source of news was properly disclosed during broadcasts.[1] The investigation is triggered by a complaint of a watchdog organization, Center for Media and Democracy, whose study suggests the widespread and undisclosed use of video news releases (VNRs) prepared by third parties.[2] The watchdog organization believes that undisclosed VNRs undermine the public trust in the integrity of news programming and urges stricter disclosure rules.[3] By contrast, a statement filed with FCC by the Radio-Television News Directors Association that represents the news industry argues that determining when and how to identify sources is the responsibility of journalists and should be removed from government oversight.[4]

In this paper, we discuss the effects of disclosure on the incentives for media outlets to acquire and report information truthfully and on the decisions made by the public. First, we argue that if the costs of independent information acquisition by the media outlets are sufficiently high relative to the subscription fees that can be collected from the public, *no* disclosure might lead to *more* information acquisition and more informative reporting: If the public is influenced by the media reports and there is no disclosure, the media outlet can earn additional surplus from a third party by reporting in its interest. Hence, no disclosure increases the incentives for the media outlet to be influential, which translates into a higher willingness to pay to acquire information useful for the public.

[1] See FCC press release on August 14, 2006.

[2] See FCC press release on August 14, 2006, the report "Fake TV News: Widespread and Undisclosed" by Center for Media and Democracy released on April 6, 2006, and the follow-up report "Still Not the News" released on November 14, 2006.

[3] See the letter from Free Press to FCC signed by Campaign Director of Free Press and Executive Director of Center for Media and Democracy on April 6, 2006, p. 2.

[4] See the letter from Wiley Rein and Fielding LLP to FCC on October 5, 2006, p. 16.

Nevertheless, the public does not benefit from the increased incentives for the media outlet to acquire information: the probability of correct decisions by the public is always *higher* under *stricter* disclosure. The reason behind this somewhat counterintuitive result is that without disclosure the public becomes confused about the source of the reports and mistrusts the media reports even though they contain information with higher probability. The only purpose of the additional information acquisition by the media outlet is to confuse the public; from the public's perspective, this information acquisition is wasteful.

We make these points in a dynamic model of reporting by a profit-maximizing media outlet. In our model, the media outlet can be of two types: strategic and truthful (non-strategic). In each period, the strategic media outlet can choose its news from one of two sources: a costly independent investigation that perfectly reveals the truth or, possibly, a free report prepared by an interest group. By contrast, the truthful media outlet always conducts an independent investigation.[5]

The revenue of the media outlet consists of the subscription fees for the public and, for the strategic type, the payment from the interest group. The readers are uncertain about the type of the media outlet and believe that it is very likely to be strategic. In each period in our model, the readers observe the news reported by the media outlet and choose an action that affects their payoffs and the payoff of the interest group. After that, they learn the realization of the state of nature and update their beliefs about the type of the media outlet.

Our analysis focuses on the situation in which the cost of independent investigation for the strategic media outlet is higher than the subscription fees that can be collected from the public and, as a result, there would be no information acquisition by the strategic media outlet if the source of the reports had to be disclosed to the public.[6] Nevertheless, we show that some information acquisition is possible in equilibrium under no disclosure. As long as the media outlet has low credibility, it will randomize between independent investigation and getting a report from the interest group. Costly independent investigation increases the belief of the public that the media outlet is truthful and makes the future reports more credible, enabling the

[5]In our model, one can think of the truthful, non-strategic, media outlet as a modeling shortcut for a strategic media outlet that has either a very low cost of independent investigation or experiences a positive utility from reporting truthfully to the public. We provide a model that makes this interpretation precise in section 5.2.

[6]If the source of the report is commonly known, the reports prepared by the interest group cannot influence the public and hence the media outlet cannot collect positive payments from the interest group.

strategic media outlet to collect higher revenues in the future from the public and the special interest group. In equilibrium, the expected increase in the future revenue is offset by the current cost of investigation, making the media outlet indifferent about its actions. The probability of independent investigation is decreasing in the credibility of the media outlet and eventually becomes zero.

The result that the probability of correct decision by the public decreases under the no disclosure policy now follows. In equilibrium, the public cannot distinguish informative reports from uninformative ones; it behaves cautiously and ignores the reports of the media outlet until it becomes convinced that the media outlet is likely to be the truthful type. Unfortunately, once the strategic media outlet achieves credibility it stops acquiring information and starts publishing the reports of the special interest group. Thus, in equilibrium the public ignores the informative reports in the early stages of the game and, if the strategic newspaper succeeds in building its reputation, follows the uninformative reports prepared by the interest group.

The literature has identified several reasons why media outlets might find it optimal to distort their reports in equilibrium. In Besley and Prat [2], for example, media outlets can be captured by a politician interested in hiding bad news. In their model, the media outlet does not have concerns about its reputation. Furthermore, unlike in our model, the information is verifiable. Mullainathan and Shleifer [9] assume the readers have a preference for news that confirms their prior beliefs and media outlets choose to slant their news accordingly. Gentzkow and Shapiro [4] present a reputation model in which there is uncertainty about the quality of the information possessed by the media outlet. In order to increase its reputation, a media might distort the news in the direction of the reports that are more likely according to the prior beliefs of the readers.

Research on cheap-talk with reputation concerns originates from Sobel [13]. In his model, an expert and a decision maker repeatedly interact. The decision maker is uncertain whether the expert is a friend or foe. Sobel shows it is possible for the decision maker's foe to convey accurate information at the beginning to maintain reputation, so as to take advantage of the decision maker later. Bénabou and Laroque [1] further develop this idea in the context of insiders attempting to manipulate other traders to make profits. They extend the model by allowing the expert to have imperfect information. Morris [8] also allows imperfect information and show that it is possible for an unbiased expert to distort her report so as not to be perceived as biased. Kim [5] and Stocken [14] study repeated strategic information transmission and construct equilibria where cheap-talk is credible and enhances welfare. Finally,

some cheap-talk models focus on reputational concerns about other aspects of the expert. Ottaviani and Sorensen [11] and [12] allow uncertainty about the expert's competence, and Olszewski [10] assumes, similarly to our model, that the expert would like to be perceived honest. Our model is closest to the one of Sobel [13]. We compare our models in section 5.1.

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 looks at a two-period example to derive intuition. Section 4 develops an infinite-horizon model and characterizes the equilibrium. In section s:discussion, we discuss possible modifications of the model and relation to the literature. We conclude in section 6. Some of the results and proofs are provided in the appendix.

2 Model

There are three players in the game: a newspaper, a reader, and an interest group. There are multiple periods; all parties have the same discount factor $\delta \in (0,1)$. In each period, the reader takes an action $y \in \{0,1\}$ that affects both his own and the interest group's payoff. The interest group prefers high actions and its utility function $\tilde{U}$ can be expressed as

$$\tilde{U}(y) \quad = \quad \lambda y,$$

where $\lambda \geq 0$ measures the interest group's stake on the issue (relative to the reader). The reader's utility from an action depends on the state of the world, θ. The state of the world is a random variable taking a value of either 0 or 1. Let q be the probability of $\theta = 1$. We assume that $q < 1/2$. The reader prefers the action that matches the state of the world and his utility function U can be expressed as

$$U(y,\theta) \quad = \quad \begin{cases} 1, & y = \theta; \\ 0, & \text{otherwise.} \end{cases}$$

There are two types of newspapers: strategic and truthful. The former chooses strategies that maximize its expected payoff, while the latter always investigates and reports the true state.[7] It is commonly known that the newspaper is of the truthful

[7]We assume the truthful newspaper will take the same actions as the strategic newspaper. In effect, the truthful newspaper has no conscious strategic choices to make. Therefore, when we discuss the newspaper's strategies, we refer exclusively to those of the strategic type. In section 5.2, we consider a version of the model in which the 'truthful' type is also strategic, but has a lower cost of information acquisition. We show that for some cost parameters there exist equilibria that are observationally equivalent to the equilibria in the model with non-strategic truthful type.

type with probability $p_1 \in (0,1)$. A strategic newspaper has two sources for its news. The first source is through investigation at cost c, which yields the true state with certainty. The other source is from the interest group.

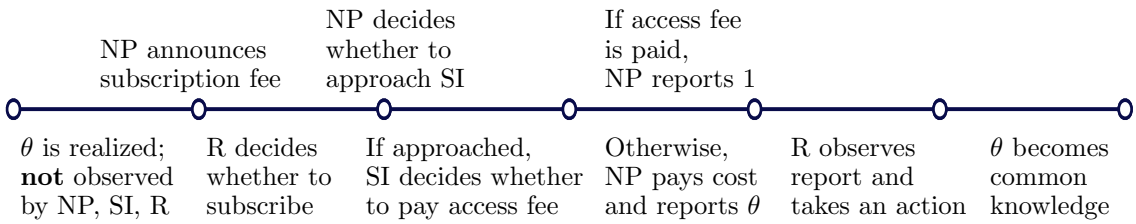

Figure 1: Timing of the stage game. Notation: NP – the newspaper, R – the reader, SI – the special interest group. If the reader does not subscribe, he does not receive any report from the newspaper and takes optimal action given his prior.

We will consider two different games. Our main interest will lie in the game in which the newspaper does not disclose the source of its reports. The timing of the game is as follows (see Figure 1). At the beginning of each period, the state is realized. We assume that the state is independent across periods. The state is not immediately observable to the newspaper, the reader, or the interest group. The newspaper announces a subscription fee, ϕ. The reader decides whether to subscribe to the newspaper. If the reader does not subscribe, then the rest of the period proceeds without any role for the newspaper or the interest group. If the reader does subscribe, a strategic newspaper will be faced with two options: (i) propaganda – charging the interest group an access fee, α, and choosing the group's favorite report;[8] (ii) investigative journalism – incurring cost c to conduct an investigation and reporting the true state. (In our model, the newspaper cannot shutdown and cannot make up messages; it has to investigate and report the truth if the reader has subscribed and the interest group does not provide a report. In section 5.4, we consider a two-period version of the model in which shut down and cheap talk messages are possible.)

Let the newspaper's report be denoted by m. The reader makes a decision based on his prior and if he has subscribed to the newspaper, the newspaper's report. Let y_m represent the action taken by the reader after receiving report m.

At the end of each period, all three parties observe the true state, and the current-period payoffs of the reader and the interest group are realized. The reader updates

[8]Our assumption that the newspaper can accept money from interest groups to give them favorable reports should be viewed as a modelling shortcut. In reality, though monetary payments are not usually observed, a newspaper can implicitly benefit from advertising commitments, access to interviews, etc.

his belief about the type of the newspaper. The reputation of the newspaper is the probability with which it is believed to be of the truthful type.

In addition, we will consider the game in which the source of the newspaper's report is disclosed to the reader. The timing of this game is described in Figure 1. We will use this game as a benchmark against which we evaluate the equilibria in the game without disclosure.

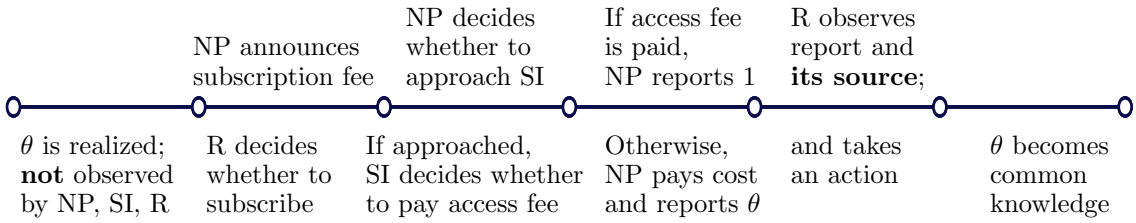

Figure 2: Timing of the stage game. Notation: NP – the newspaper, R – the reader, SI – the special interest group. The reader observes the source of the report.

The equilibrium concept is stationary Markov perfect equilibrium, in which the Markov state is the reader's belief about the type of the newspaper: That is, the past play may influence the future play only through the newspaper's reputation; the players' actions must be independent of the other aspects of the history. The equilibrium is stationary because the actions do not depend on the length of history either. (See Section 5.5.2 in Mailath and Samuelson [7] for a definition of stationary Markov perfect equilibrium. Although the game we study does not belong to the class of games considered by Mailath and Samuelson, their definition extends straightforwardly to our setting.)

In addition, we focus on equilibria that satisfy the following restrictions: First, the newspaper sets the subscription and access fees equal to the current period expected benefit from its reports to the parties. Second, we consider only equilibria the strategic newspaper whose type is common knowledge chooses propaganda with probability one.[9] Third, we require the reputation of the newspaper to drop to zero whenever the reader finds out that it chose propaganda.[10]

We will demonstrate that an equilibrium that satisfies these conditions exists.

[9]Our interest in this paper is in equilibria in which investigative journalism occurs with positive probability. The incentives for the newspaper to select investigative journalism are improved as the punishment for engaging in propaganda becomes stronger. The worst possible punishment is, after the reader observes the newspaper has obtained its report from the interest group, to play the continuation equilibrium in which propaganda is chosen with probability one.

[10]On the equilibrium path, this restriction reduces to Bayesian updating and hence is innocuous. Imagine, however, that the strategic newspaper has convinced the reader that it is truthful by deviating to costly investigation when it was expected to choose propaganda. What should the

3 Example: Two Periods

In this section, we look at a two-period version of our model to derive intuition about our results. We focus on the more interesting case in which the cost of the information acquisition is high, $c > q$, and the prior probability that the newspaper is of the truth-telling type is small

$$p_1 \quad < \quad \left(\frac{1-2q}{1-q}\right)^2.$$

The assumption about prior probability q implies, in particular, that the reader would not follow report 1 if he did not know the type of the newspaper and expected the strategic newspaper to always choose propaganda.

3.1 Disclosure

We start with the benchmark model in which the reader observes the source of the newspaper. The model can be solved backward. Clearly, the reports supplied by the group cannot influence the decisions of the reader because of disclosure and, therefore, the newspaper has no value for the special interest group. As a result, in equilibrium the access fee is zero.

On the other hand, the reader's willingness to pay for the reports of the newspaper might be positive and depends on the newspaper's reputation: the probability with which the newspaper is of the truthful type. Let p_2 denote the reputation of the newspaper in the beginning of the second period.

Now, observe that the reader makes his subscription decision *before* the newspaper's report. In addition, the newspaper cannot commit to its strategies in advance. Since investigative journalism is costly and propaganda is not, the only reason for the newspaper to choose the former is to enhance its reputation. Thus, in the second period, the strategic newspaper will never acquire information: it will set an access fee of zero and obtain the report from the interest group.

If the reader does not subscribe to the newspaper in the second period, he will take the optimal action given his prior beliefs and obtain the expected payoff of $1-q$. By contrast, if the reader subscribes to the newspaper he knows that the newspaper's reports will be informative if the newspaper is truthful and uninformative otherwise. In this case, his payoff will be $p_2 \cdot 1 + (1-p_2) \cdot (1-q)$. In equilibrium, the newspaper

reader believe if the newspaper now reveals its type by choosing propaganda? Since we are free to assign beliefs off the equilibrium path, we will study equilibria in which in this event the reader corrects his mistake by revising his belief about truthful type from one to zero.

will ask for the subscription fee that is equal to the difference between these payoffs, $\phi(p_t) = p_2 q$.

We now consider the incentives of the strategic newspaper to choose investigative journalism in the first period. First, observe that the subscription fee collected in the beginning of the period is sunk and does not affect the newspaper's decision between propaganda and investigation.

The benefit of the investigative journalism in the first period depends on the state: If the state is high, the newspaper's reputation stays the same in the second period, as the newspaper will always report 1 in this state regardless of whether it chooses propaganda or investigative journalism. Thus, investigative journalism provides no benefit in this case. If, however, the state is zero, investigative journalism leads to a higher reputation in the second period. In this state, if the newspaper chooses propaganda and reports 1, its reputation will be destroyed and its payoff will be zero. By contrast, if it chooses to investigate, its reputation will increase and it will collect the subscription fee in the second period be equal to $p_2(p_1, r) \cdot q$, where

$$p_2(p_1, r) \quad = \quad \frac{p_1}{p_1 + (1 - p_1)r}.$$

Therefore, the expected benefit of investigative journalism in the first period is equal to $\delta(1 - q)p_2(p_1, r) \cdot q$ which is less than q. However, we have assumed that the cost of investigative journalism c is greater than q and hence the newspaper will never investigate in the first period.

3.2 No disclosure

We now turn to the model in which the source of the report is not known to the reader. The reasoning identical to the one in the model with disclosure implies that in the second period the strategic newspaper will engage in propaganda. Thus, when the reader receives report 0 in the second period, he infers that it must come from the truth-telling newspaper and hence $\theta = 0$. He then takes action

$$y_0 \quad = \quad 0.$$

On the other hand, if the reader receives report 1, he knows that it might come from the strategic newspaper that chooses propaganda. Therefore, the action taken by the reader depends on the newspaper's reputation at the beginning of the second period: the probability that the newspaper is of the truth-telling type. Let p_2 denote this probability. After report 1, the reader believes that $\theta = 1$ with probability

$$q_2(p_2) \quad = \quad \frac{p_2 q + (1 - p_2)q}{p_2 q + (1 - p_2)} = \frac{q}{1 - p_2(1 - q)}.$$

Let

$$p^* = \frac{1-2q}{1-q}. \tag{1}$$

After report 1, the reader is convinced that both states are equally likely ($q_2(p_2) = 1/2$) if $p_2 = p^*$, that the high state is more likely if $p_2 > p^*$, and that the low state is more likely otherwise.

The reader maximizes his expected payoff by taking an action that corresponds to the more likely state of the world. Hence, if the newspaper reports 1 in the second period, the reader will take action

$$y_1(p_2) = \begin{cases} 0, & \text{if } p_2 < p^*; \\ \tilde{y}, & \text{if } p_2 = p^*; \\ 1, & \text{otherwise;} \end{cases}$$

where $\tilde{y}$ could be either 0 or 1.

The reader's willingness to pay for the subscription to the newspaper is his utility difference between making his decision based on the newspaper's report and doing so solely based on the prior. Recall that $q < 1/2$ and hence in the absence of the newspaper's report, the reader takes action 0. Imagine now that the reader can choose his action after observing the newspaper's report. If $q_2(p_2) < 1/2$, the reader takes action 0 regardless of the report. In this situation, the newspaper has no value for the reader. Furthermore, if $q_2(p_2) = 1/2$, the reader is indifferent about which action to choose after report 1 and hence his willingness to pay for the reports is also zero. On the other hand, if $q(p_2) > 1/2$, the newspaper's report is valuable to the reader. The expected payoff of the reader from observing the reports is $q + (1-q)p_2$. If he does not observe the reports, he obtains the payoff of $1 - q$. As a result, he is willing to pay for the subscription to the reports up to the difference between these payoffs, $2q - 1 + p_2(1-q)$.

Therefore, at the beginning of the second period, the newspaper charges a subscription fee equal to the reader's willingness to pay:

$$\phi(p_2) = \begin{cases} 0, & \text{if } p_2 \leq p^*; \\ 2q - 1 + p_2(1-q), & \text{otherwise.} \end{cases}$$

Observe that the subscription fee is increasing in the newspaper's reputation, p_2.

For the interest group the newspaper is valuable if and only if the newspaper's report of 1 affects the reader's decision, $y_1(p_2) = 1$. In this case, if the interest

group does not buy access, then the newspaper has to conduct an investigation and reports 1 with probability q and 0 with probability $1-q$.[11] If the interest group does buy access, then it ensures that the newspaper publishes its favorite report, 1. The newspaper charges an access fee equal to the interest group's willingness to pay:

$$\alpha(p_2) = \begin{cases} 0, & \text{if } p_2 < p^*; \\ \tilde{z}\lambda(1-q), & \text{if } p_2 = p^*; \\ \lambda(1-q), & \text{if } p_2 > p^*; \end{cases}$$

where $\tilde{z}$ is the probability that the reader takes action 1 after report 1 when $p_2 = p^*$.

Thus, the payoff of the strategic newspaper in the second period whose reputation is p_2 equals

$$V(p_2) = \begin{cases} 0, & \text{if } p_2 < p^*; \\ \tilde{z}\lambda(1-q), & \text{if } p_2 = p^*; \\ q + (\lambda + p_2 - 1)(1-q), & \text{otherwise.} \end{cases}$$

The value of $V(p_2)$ is depicted in Figure 3.

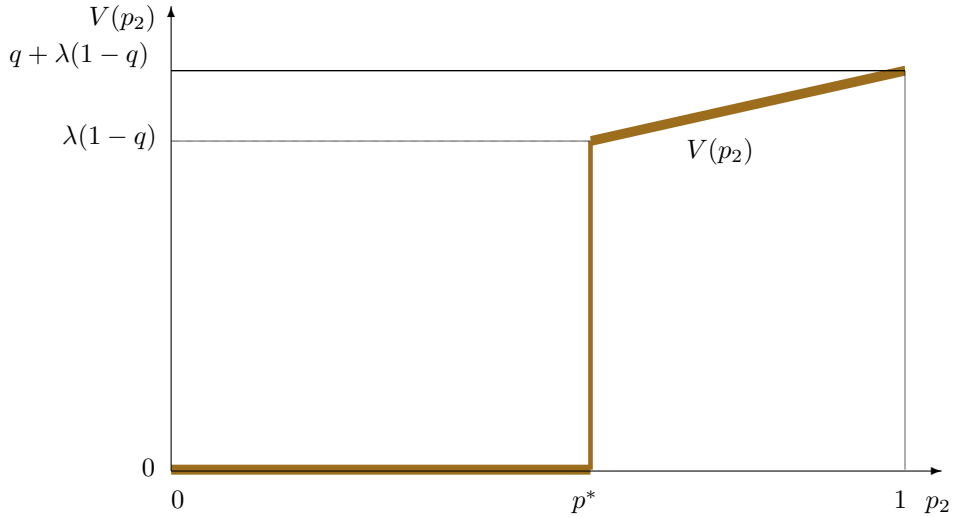

Figure 3: The value of reputation in the second period, $V(p_2)$. The horizontal axis represents p_2 and the vertical axis represents $V(p_2)$.

We now turn to the first period. Let $r \in [0,1]$ be the probability with which the reader expects the newspaper to choose investigative reporting in the first period.

[11] We have assumed that the newspaper cannot shut down and has to deliver a report if the reader has paid a subscription fee. In section 5.4, we consider a version of the model in which a shut-down is possible.

Similarly to the second period, if the reader observes report 0 in the first period, he infers that it cannot represent the message from the special interest group and hence chooses action $y_0 = 0$.

If, however, the reader receives report 1, he knows that it reflects the true state of the world with probability

$$q_1(p_1, r) = \frac{p_1 q + (1-p_1)q}{p_1 q + (1-p_1)(q + (1-q)(1-r))} = \frac{q}{1-(1-q)(p_1 + (1-p_1)r)}.$$

The value of $q(p_1, r)$ is increasing in the newspaper's prior reputation, p_1, and the probability of costly investigation by the strategic newspaper, r.

Let

$$r_*(p_1) = \left(\frac{1-2q}{1-q}\frac{1}{p_1} - 1\right)\frac{p_1}{1-p_1},$$

the interpretation of which is as follows. After observing report 1, the reader believes that both states are equally likely if $r = r_*$, that the high state is more likely if $r > r_*$, and that the low state is more likely otherwise. Hence, if the newspaper reports 1 in the first period, the reader will take action

$$y_1(p_1) = \begin{cases} 0, & \text{if } r_1 < r_*; \\ \tilde{y}, & \text{if } r_1 = r_*; \\ 1, & \text{otherwise;} \end{cases}$$

where $\tilde{y}$ could be either 0 or 1.

The newspaper is valuable for the interest group in the first period if and only if the newspaper's reports affect the reader's decisions. In this case, if the interest group does not buy access, then the newspaper has to conduct an investigation and will report 1 with probability q and 0 with probability $1-q$. If the interest group buys access, then the newspaper will publish its favorite report, 1, with certainty.

If the newspaper chooses propaganda, it will charge an access fee equal to the interest group's willingness to pay:

$$\alpha(p_1, r) = \begin{cases} 0, & \text{if } r < r_*; \\ \tilde{z}\lambda(1-q), & \text{if } r = r_*; \\ \lambda(1-q), & \text{if } r > r_*; \end{cases}$$

where $\tilde{z}$ is the probability that the reader takes action 1 after report 1 when $r = r_*$. The value of the access fee is depicted in Figure 4.

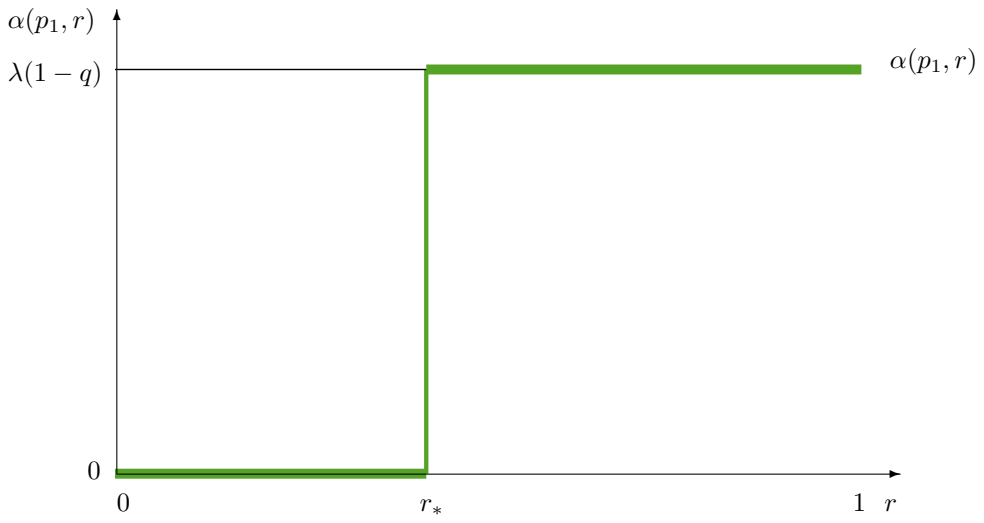

Figure 4: The access fee in the first period, $\alpha(p_1, r)$. The horizontal axis represents the probability of investigation in the first period, r, and the vertical axis represents the value of the access fee, $\alpha(p_1, r)$.

We can now analyze incentives for the strategic newspaper to investigate in the first period. First, because the subscription fee is collected in the beginning of the period, it is sunk and does not affect the newspaper's decision between propaganda and investigation. On the other hand, the access fee is paid to the newspaper only if it chooses propaganda. Hence, the opportunity cost of investigative journalism consists of the lost access fee as well as the cost of information acquisition, $c + \alpha(p_1, r)$.

At the same time, the benefit of the investigative journalism depends on the state: If the state is high, the newspaper's reputation stays the same in the second period, as the newspaper will always report 1 in this state regardless of whether it chooses propaganda or investigative journalism. Thus, investigative journalism provides no benefit in this case. If, however, the state is zero, investigative journalism leads to a higher reputation in the second period. In this state, if the newspaper chooses propaganda and reports 1, its reputation will be destroyed and its payoff will be zero. By contrast, if it chooses to investigate, its reputation will increase and its payoff will be equal to $V(p_2(p_1, r))$, where

$$p_2(p_1, r) \quad = \quad \frac{p_1}{p_1 + (1 - p_1)r}.$$

Therefore, the expected benefit of investigative journalism in the first period is equal to $\delta(1-q)V(p_2(p_1, r))$, where $\delta \in (0, 1)$ is the discount factor and $1 - q$ is the probability of low state. Figure 5 depicts the cost and the benefit of investigative reporting.

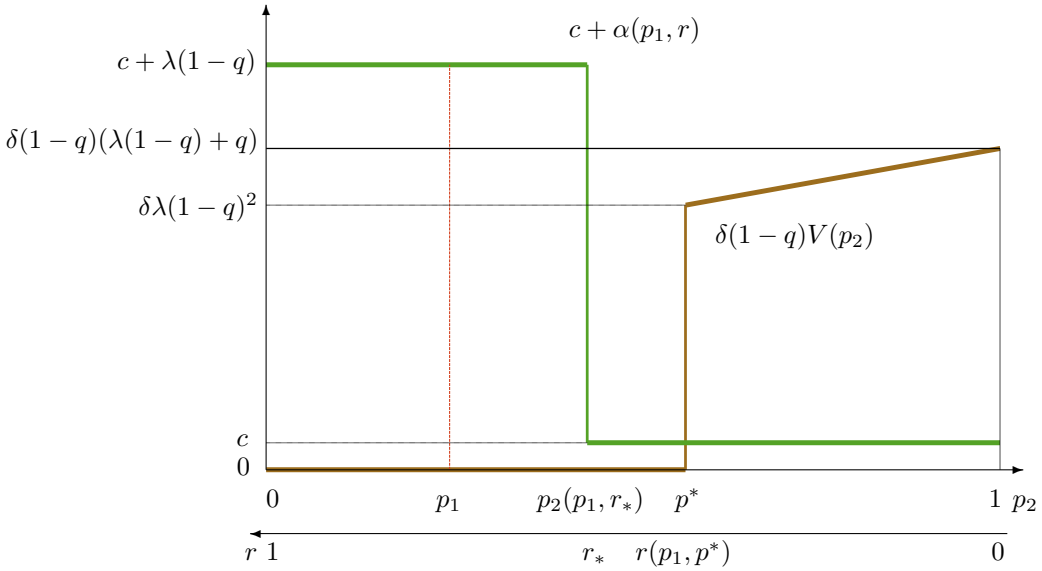

Figure 5: The cost and the benefit of investigative reporting when $p_1 < (p^*)^2$. The upper horizontal axis represents p_2. The lower horizontal axis represents r. The parameters are: $\delta = 1$, $\lambda = 2$, $p_1 = 1/4$, $c = 1/10$, $q = 3/10$.

Thus, if $r \in (0, 1)$ in equilibrium, the following must hold:

$$c + \alpha(p_1, r) \quad = \quad \delta(1-q)V(p_2(p_1, r)).$$

The left hand side of the above equation represents the net cost of selecting investigative reporting in the first period – the lost access fee and the incurred cost of information acquisition. The right hand side represents the benefit from choosing investigative journalism – the gain in subscription and access fees in the future due to enhanced reputation. Note that the "temptation" for choosing propaganda is increasing in r, since the willingness to pay by the interest group and the reader in the first period are increasing in r – they are higher when the newspaper's report is more influential to the reader – and the value of reputation in the second period is decreasing in r – the reputation is lower if the strategic newspaper is more likely to report truthfully. If $r = 1$ in equilibrium, or the newspaper always chooses investigative journalism, we need the left hand side to be not more than the right hand side. If $r = 0$ in equilibrium, or the newspaper always chooses propaganda, we need the left hand side to be not less than the right hand side. Thus, in order for there to exist an equilibrium in which the strategic newspaper chooses investigative journalism with a positive probability (possibly one), it is necessary and sufficient that the left hand side is lower than the right hand side when $r = 0$, which can be written

$$c \quad < \quad \delta \cdot (1-q)(q + \lambda(1-q)),$$

or

$$\delta \quad > \quad \frac{c}{(1-q)(q+\lambda(1-q))}.$$

This condition is satisfied when either δ or λ are large enough, which means that the future is important enough for the newspaper or the interest group has a high enough stake. In particular, if $\delta = 1$ and $\lambda = 1$, the condition reduces to $c < 1 - q$.

3.3 Disclosure versus no disclosure

Our model captures a seemingly paradoxical phenomenon. Under the assumption $c > q$ and no disclosure, the market for news breaks down in that the reader does not subscribe to the newspaper and receives no information at all, as the reader does not have a strong enough interest in "truth" to make him willing to finance the investigation cost. However, if the newspaper can *hide* the source of its reports, with some probability it will acquire information and provide informative reports to the reader. The interest group, whose sole interest is to use the newspaper to distort information transmitted to the reader and hence his decision, complements the reader in providing the financial incentive for the newspaper to conduct investigative journalism. The interest group is willing to pay more to the newspaper in the future if the newspaper maintains its reputation of honest journalism. This prevents the newspaper from always choosing propaganda in the present. As long as δ is above a threshold, which means the future is important enough, and as longs λ is large enough, which means the interest group feels passionate enough about the issue, in equilibrium the newspaper chooses investigative journalism with positive probability.

At the same time, the reader does not benefit from more information provided by the newspaper in the first period: the probability of correct decision, in fact, goes down if the newspaper can hide the source of its reports. In the model with disclosure, the reader will follow the report if the newspaper is truthful and take an action according to his prior beliefs otherwise. Hence, the probability that the reader makes a correct decision in each period is equal to $1 - (1 - p_1)q$. By contrast, in the model without disclosure, the reader cannot distinguish between the types of the newspaper. In the first period in equilibrium, the reader never strictly prefers to follow the report of the newspaper. Thus, he takes the correct action with probability $1 - q$, which is less than the probability under disclosure. In the second period, the reader follows the report of the newspaper with positive probability. However, the strategic newspaper never investigates in the second period and hence the probability of correct action is also lower than in the case of disclosure.

4 An Infinite-Horizon Model

In the example in the previous section, we have demonstrated that when $c > q$ the ability of the newspaper to conceal the source of its reports may enable operation of the otherwise broken-down market for news, so as to have influence on the reader. Nevertheless, the reader does not benefit from this market; the newspaper confuses the reader and the probability of correct decision goes down. In this section, we construct an infinite-horizon model to show that our results do not rely on the two-period structure of the model in the previous section. We conduct our analysis under the assumption that the cost of investigation satisfies

$$c_* < c < c^*,$$

where

$$\begin{aligned} c_* &= \frac{\delta(1-q)q}{1-\delta q} - \frac{\lambda(1-q)(1-\delta)}{1-\delta q}, \\ c^* &= \frac{\delta(1-q)q}{1-\delta q} + \frac{\delta\lambda(1-q)^2}{1-\delta q}. \end{aligned} \tag{2}$$

(In the appendix, we also present the results for $c \leq c_*$ and $c \geq c^*$. In particular, if $c \geq c^*$, the strategic newspaper can never recover the cost of independent investigation through the fees collected from the reader and the special interest group, even if its reputation is one. As a result, for these costs there is no equilibrium with information acquisition regardless of the disclosure policy. On the other hand, if $c \leq c_*$, there is an equilibrium in which the strategic newspaper conducts costly investigation with probability one regardless of the disclosure policy. Finally, observe that $c_* < c < c^*$ could only hold if $\lambda > 0$.)

4.1 Disclosure

We start with analysis of the benchmark model with disclosure. Our interest is in the equilibria in which the newspaper investigates with the highest probability.

Similarly to the two-period setting, the reports supplied by the group cannot influence the decisions of the reader and, therefore, the newspaper has no value for the special interest group. As a result, in equilibrium the access fee is zero.

We now determine the subscription fee and behavior of the strategic newspaper in equilibrium. Imagine that in equilibrium the strategic newspaper investigates with probability one. Hence, the reader will be able to always take the correct action and achieve the payoff of 1 if he subscribes to the newspaper. On the other hand, the

reader will obtain the payoff of $1-q$ if he does not subscribe and takes action according to his prior beliefs. In equilibrium, the newspaper will charge the subscription fee equal to the difference of these payoffs, q. Then, its expected payoff is equal to

$$\begin{aligned} v &= -c + q + \delta V \\ &= \frac{-c+q}{1-\delta}. \end{aligned}$$

If the newspaper deviates and does not investigate, it will save the cost of c, but has to take the report from the interest group. The reader will observe this and the parties will move to the continuation equilibrium in which the reader does not subscribe and the newspaper's payoff is zero. Hence, the newspaper will find optimal to investigate with probability one if and only if

$$c \leq \delta \frac{-c+q}{1-\delta}$$

or, equivalently,

$$c \leq \delta q.$$

Furthermore, v is the maximal payoff that the strategic newspaper, with any reputation, can hope to obtain in equilibrium if it chooses investigative journalism. Therefore, if $c > \delta q$, the newspaper chooses propaganda with probability one.

We summarize these observations in the following proposition.

Proposition 1. *Let the source of the report be commonly known. Then, if $c \leq \delta q$, there exists an equilibrium in which the newspaper chooses independent investigation with probability one. If, however, $c > \delta q$, there is a unique equilibrium in which the newspaper never chooses investigation.*

Observe that there exist parameter constellations for which $c_* < \delta q < c^*$. Hence, both types of equilibria can occur under our restriction on costs, (2).

4.2 No disclosure

We now study the model in which the source of the report is not disclosed to the reader. The structure of the equilibrium is similar to the one in the two-period version of the model. In the beginning of the game, the strategic newspaper randomizes between costly investigation and propaganda. Costly investigation increases the future reputation of the newspaper and, as a result, the expected future revenue from the fees collected from the reader and the interest group. In equilibrium, the current

cost of investigation is equal to the additional revenues expected in the future, which makes randomization an equilibrium action. The probability of costly investigation is decreases in the reputation of the newspaper and becomes zero for any reputation more than or equal to p^*, defined in (1).

We now explain how we construct the equilibrium. Let p_t denote the reputation of the newspaper at the beginning of period t and r_t denote the probability with which the reader believes the newspaper will choose costly investigation in this period. Given our solution concept, described in section 2, the expected payoff of the newspaper is a stationary function of its reputation, $V(p_t)$, where $V(0) = 0$.

Now consider the incentives of the newspaper deciding between propaganda and investigative journalism. If the newspaper chooses propaganda, then it receives the access fee from the interest group for the current period, $\alpha(p_t, r_t)$. Furthermore, its reputation will become 0 if the state is 0, which happens with probability $1 - q$, and will not change if the state is 1, which happens with probability q.[12] Finally, it receives the subscription fee, $\phi(p_t, r_t)$. Therefore, the benefit from propaganda is

$$\mathcal{P}(p_t, r_t) \quad = \quad \alpha(p_t, r_t) + \phi(p_t, r_t) + \delta q V(p_t).$$

On the other hand, if the newspaper chooses investigative journalism, it gets no access fee and incurs the cost of investigation, c. At the same time, its reputation will increase to

$$p_{t+1}^{s_0}(p_t, r_t) \quad = \quad \frac{p_t}{p_t + (1 - p_t)r_t}$$

if the state is 0, which happens with probability $1 - q$, and will not change if the state is 1, which happens with probability q. Finally, it also receives the subscription fee. Therefore, the benefit from investigation is

$$\mathcal{I}(p_t, r_t) \quad = \quad -c + \phi(p_t, r_t) + \delta q V(p_t) + \delta(1 - q)V\left(p_{t+1}^{s_0}\right).$$

It follows that the net benefit from investigation, which determines the behavior of the newspaper, is

$$\mathcal{L}(p_t, r_t) \quad = \quad -c - \alpha(p_t, r_t) + \delta(1 - q)V(p_{t+1}^{s_0}).$$

[12]The newspaper which chooses propaganda reports 1. if the state is zero, it reveals itself to the reader at the end of the period. If the state is 1, then both types of newspaper report 1 regardless of the source of the report for the strategic type and hence the reader's posterior belief about the type of the newspaper does not change.

The difficulty with this expression is that the value of reputation, $V(p_{t+1}^{s_0})$, is determined endogenously and depends on the behavior of the newspaper. We resolve this difficulty by finding the value of reputation recursively, first, for high values of reputation and, then, for low values of reputation.

High reputations. First, we analyze the behavior of the newspaper with reputation $p_t > p^*$, We start by considering the (hypothetical) strategic newspaper with reputation one. Because the newspaper is believed to be truthful, the subscription and access fees do not depend on the newspaper's behavior and can be easily calculated. This allows us to determine the optimal behavior of the newspaper. As we show in the appendix, given our assumptions on the cost of investigation, $c > c_*$, the newspaper with reputation one, would choose propaganda with probability one and its expected payoff would be

$$V(1) \quad = \quad \frac{\lambda(1-q)+q}{1-\delta q}.$$

Next, we make the following important observation: The incentives to investigate, as expressed by $\mathcal{L}(p_t, r_t)$ are maximized if the reader expects the newspaper to investigate with probability zero, $r_t = 0$. In this case, if the newspaper reports zero when the state is zero, it will acquire the reputation of the truthful type, $p_{t+1}^{s_0} = 1$, and will obtain the largest feasible continuation payoff, $V(1)$.

Now, recall from the definition of p^*, the reader will find it optimal to follow the reports of the newspaper with $p_t > p^*$ with probability one even if she expects the strategic type to choose propaganda. This implies that the access fee, $\alpha(p_t, r_t)$, is constant for all $p_t \in (p^*, 1]$ and $r_t \in [0, 1]$. As a result, the maximal benefit from investigative reporting, $\mathcal{L}(p_t, 0)$, achieved if $r_t = 0$, is constant for all $p_t > p^*$. We conclude that in equilibrium the newspaper with reputation $p_t > p^*$ must choose propaganda with probability one because the newspaper with $p_t = 1$ does so.

Low reputations. Let us now consider the newspaper with reputation $p_t < p^*$.[13] Again assume that $r_t = 0$, in which case $p_{t+1}^{s_0} = 1$ and the incentives for investigative journalism are maximized. For these value of reputation, the access fee $\alpha(p_t, 0) = 0$ as the reader will not follow the high report of the newspaper with $p_t < p^*$ if she believes that the newspaper will choose propaganda, $r_t = 0$. We now obtain that

$$\mathcal{L}(p_t, 0) = -c + \delta(1-q)V(1) > 0,$$

where the last inequality follows from $c \leq c^*$.

[13] We do not discuss the argument for $p_t = p^*$. The formal argument for this case is given in the appendix.

Hence, if the newspaper were expected to choose propaganda, it would find optimal to investigate. This cannot happen in equilibrium.

At the same time, in equilibrium it cannot be that the newspaper chooses investigative journalism with probability one: If this were the case, its reputation would not change over time and its payoffs from investigative journalism and propaganda would be the same as of the newspaper with reputation one. Yet, the newspaper with reputation one never chooses investigation in equilibrium.

We are led to conclude that in equilibrium, if it exists, the newspaper must be randomizing between investigative journalism and propaganda, which implies

$$c + \alpha(p_t, r_t) = \delta(1-q)V(p_{t+1}^{s_0}(p_t, r_t)), \qquad (p_t < p^*). \tag{3}$$

The final step in the construction of equilibrium is as follows. We know the behavior of the newspaper with high reputation and hence the value of reputation $V(p_t)$ for all $p_t > p^*$. This allows us to find pairs of p_t and r_t satisfying (3) for some interval $p_t \in (h, p^*]$. Next, we calculate the value of the reputation on this interval. This allows us to construct another interval and so on.

The following proposition shows this construction can be done and describes the behavior of the newspaper and the reader. Figure 6 describes the value of reputation. Let

$$r_*(p_t) \;=\; \left(\frac{1-2q}{1-q}\frac{1}{p_t} - 1\right)\frac{p_t}{1-p_t}.$$

be the probability with which the newspaper should investigate to make the reader indifferent about whether to follow the high report.

Proposition 2. *Assume that the source of the report is unknown to the reader and that the costs of investigation satisfy (2). Then, there exists an equilibrium in which the newspaper chooses investigation with probability*

$$r_t(p_t) \;=\; \begin{cases} 0, & \text{if } p_t \geq p^*; \\ r_*(p_t), & \text{if } p'p^* \leq p_t < p^*; \\ \frac{p_t}{1-p_t}\frac{1-p'}{p'}, & \text{otherwise;} \end{cases}$$

where $p' \in (0, p^*)$, and the reader follows the high report of the newspaper with probability one if $p_t > p^*$ and less than one if $p_t < p^*$.

Proof. The proof follows from Proposition 5 proven in the appendix. □

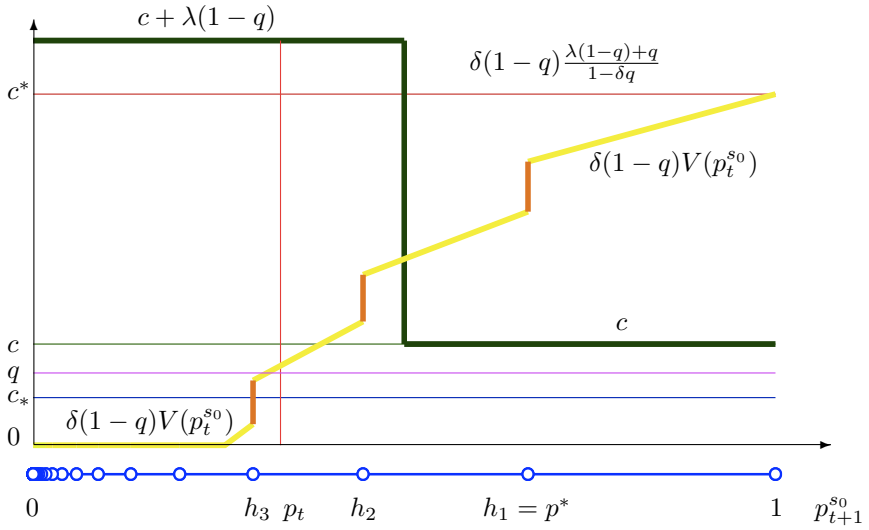

Figure 6: The horizontal axis represents the reputation. The vertical axis represents the values of payoffs and costs. The parameters are: $q = 1/4$, $p_t = 1/3$, $c = 0.35$, $\delta = 0.95$, $\lambda = 1.4$. The blue dots depict the values of h_n. The green curve depicts the opportunity cost of investigation for $p_t = 1/3$. The yellow curve represents the value of reputation for $p_t \in (h_{n+1}, h_n)$ discounted by $\delta(1-q)$. The orange curve represents the set of values of reputation for $p_t = h_n$ for $\tilde{z} \in [z^*, 1]$, discounted by $\delta(1-q)$.

4.3 Disclosure versus no disclosure

The infinitely repeated version of the model confirms the intuition obtained earlier in the two-period example. In particular, if the cost of investigation is medium and satisfies, $\delta q < c < c^*$, the strategic newspaper chooses propaganda under disclosure, but may engage in costly investigation under no disclosure. Hence, the existence of the truthful type may increase the probability of information acquisition even in the infinite-horizon model. Nevertheless, similarly to the two-period example, the reader cannot benefit from the information acquired by the strategic newspaper under no disclosure policy. In the equilibrium without disclosure, the newspaper's report is not followed until it either reaches the reputation $p_t > p^*$ or reveals itself to be truthful. Furthermore, the strategic newspaper engages in propaganda whenever its reputation if more than p^* and its report is followed. Thus, the probability of correct decision is lower under no disclosure.

We can also compare the effects of different disclosure policies for other parameter constellations. If the cost of information acquisition is large, $c > \max\{\delta q, c^*\}$, the strategic newspaper does not acquire information under either of disclosure policies. Nevertheless, even in this case, there is a difference between disclosure policies. In the

model with disclosure, the reader will follow the reports of the truthful newspaper and will follow its prior beliefs if the newspaper is strategic. The probability of the correct decision in this situation is $1-(1-p_0)q$. By contrast, in the model without disclosure, the reader who does not know the type of the newspaper will ignore the reports of the newspaper and follow his prior beliefs, taking correct action with probability $1-q$. This is less than in the other regime by $p_0 q$.

Recall that under disclosure the strategic newspaper chooses to investigate with probability one if $c \leq \delta q$, whereas under no disclosure it does so if $c \leq c_*$. Observe that $\delta q > c_*$ and hence in the model with disclosure the information is acquired with certainty for a bigger set of parameters. Furthermore, because c_* is decreasing in λ, the set of parameters for which information is always acquired grows with the stake of the special interest group.

5 Discussion

We have developed a model in which a media outlet either serves as an honest investigator and messenger or a propagandist. In this section, we discuss the relationship of our research to the literature, and investigate possible modifications to our model.

5.1 Comparison to Sobel [13]

Adopting a purely cheap-talk model à la Crawford and Sobel [3], Sobel [13] studies how reputation concerns of a potentially biased sender affect the communication between the sender and the receiver in a repeated setting. In Sobel's model, the sender has private information about the state of the world and his own bias. There are two opposite states. The receiver wants to take an action that matches the true state of the world. There are also two types of senders: a friend of the receiver, who wants the same action taken as the receiver, or an enemy of the receiver, who wants the opposite action taken. The importance of the issue in consideration varies from period to period.

Sobel shows that the enemy of the sender sometimes chooses to report truthfully if the issue is not very important, so as to maintain his reputation, in order to influence the receiver's decision in the future. A feature of Sobel's model is that the receiver is better off from finding out the bias of the sender, because by so doing, he can both obtain full information from his friend and avoid manipulation by his enemy. In a

repeated setting, the potential welfare gain for the receiver is even more pronounced.[14]

In contrast, in our model the newspaper is either honest or opportunistic. The latter is not intrinsically biased, but is driven by the profit maximization motive. The newspaper's revenue comes from favors received from interest groups and subscription fees from the reader. Our model is not a purely cheap-talk one (more on this later), in that the newspaper has to conduct a costly investigation in order to make a report on its own. Furthermore, both sources of revenue are forthcoming only if the newspaper maintains its influence to the reader. It may well be that obtaining revenue from interest groups is more important, and maintaining its reputation is just an instrument to achieve that goal.

To compare the welfare implications of our model to those of Sobel's, we modify our model such that the importance of the issue varies across periods. We analyze a two-period model. The details of the analysis are in the appendix. We find that in our model, it is possible for the reader to prefer that the newspaper's type or source of news remain undisclosed because the reader may benefit from the newspaper's investigation efforts in the current period.

If the newspaper is forced to disclose the source of its news, then the interest group's propaganda will never affect the decision of the reader. Therefore, a strategic newspaper chooses to investigate and report truthfully only if the cost of investigation is lower than the reader's willingness to pay. Let us assume that that is not the case. Now, suppose the newspaper is not required to disclose the source of its news. If the interest group's stake is high relative to that of the reader and if the issue in the current period is not quite important, then the interest group would like to investigate in the current period so as to maintain its reputation and receive higher revenue in the next period. If in addition, the current period is not too unimportant, then the reader's gain from the current period is large enough to offset loss in the next period.

The intuition of the result is as follows. Consider the second period. The strategic newspaper will not investigate at all, so the reader will make a mistake if he follows the strategic newspaper's report when it reports 1 in state 0 or if he fails to follow the honest newspaper's report when it reports 1 in state 1. But the first kind of mistake happens only if in the first period the strategic newspaper had investigated *and* the true state of the world was 0. The second kind of mistake happens if in the first period the true state of the world was 1, or if in the first period the strategic

[14]However, this result is not robust to variations of the distribution of the sender's bias. For a demonstration in the static setting that the receiver may benefit from *not* learning the sender's type, see Li and Madarasz [6].

newspaper had chosen investigation with a high frequency and the true state of the world was 0 (the high frequency of investigation by the strategic newspaper prevents its reputation from rising sufficiently to make the reader follow its propaganda). The newspaper makes its choice between investigation and propaganda before the state is realized, thus its positive impact on the first-period payoff is independent of the realization of the state. But, the negative impact on the reader's payoff in the second period is contingent on the realization of the state. This contributes to the result that investigation leads to welfare improvement for the reader.

We conjecture that if we allow the stake of the interest group relative to that of the reader to also vary across periods, then the strategic newspaper tends to investigate matters for which the interest group's stake is relatively low so as to maintain reputation and receive higher payments from the interest groups in the future. The reader may benefit more from keeping the source of news undisclosed.

5.2 High and low cost

The model in our paper relies on the existence of a *non-strategic* type that always acquires information, regardless of the amount of subscription and access fees, and never attempts to separate itself from the other type.In the introduction and in the description of the model we state that this type is a convenient modeling shortcut for a strategic type who either has a lower cost of investigation or experiences a positive utility from reporting truthfully to the reader. Here, we make this argument precise and consider a model in which there are two types of newspaper that have different costs of investigation, $\underline{c} < \overline{c}$ and $\overline{c} > 0$. Again, the reader is uncertain about the type of the newspaper. The rest of the model is identical to the one considered in the previous sections. We will demonstrate that it is indeed an equilibrium for the low-cost type to always investigate and report truthfully and the high-cost type to behave as prescribed in our previous sections. The equilibrium in the model with truthful type can now be replicated if we assign (out-of-equilibrium) beliefs to the reader that the newspaper has high cost whenever the subscription fee is different from the subscription fee prescribed in the original game.

5.2.1 Two periods

We start our analysis with the two-period model. First, we remark that it is impossible to replicate the equilibrium in Section 3 in the new model if $\underline{c} \geq 0$. In the second period, the newspaper with high cost will always choose propaganda. Furthermore,

the newspaper with low (non-negative) cost will also choose propaganda whenever its report is followed with positive probability: the subscription fee is sunk at the moment of the newspaper's decision and the benefit of investigation is zero. On the other hand, the newspaper can obtain a positive access fee by choosing to deliver the report prepared by the special interest group.

To demonstrate our point that the honest type can be replaced with a strategic type with different cost than the opportunistic type, assume $\underline{c} < -\lambda(1-q)$. In this setting, the low-cost newspaper experiences a positive utility from acquiring and reporting information truthfully to the reader, regardless of whether the reader can take advantage of this information. In this situation, the access fee from propaganda is always lower than the benefit from investigation for the newspaper with low cost and therefore this newspaper will never choose propaganda.

5.2.2 Infinitely many periods

We now turn to the model with infinitely many periods. Let us assume that

$$\underline{c} \leq c_*, \tag{4}$$

where c_* is defined in (2). In particular, observe that c_* is positive if λ is relatively small.

For low values of reputation, in the original model the newspaper with high cost is indifferent between propaganda and costly investigation. Hence, in the new model, the newspaper with low cost strictly prefers investigation. It remains to check that for $p_t \geq p^*$, the low cost newspaper prefers to investigate, that is,

$$\underline{c} + \alpha(p_t) \leq \delta(1-q)\underline{V}(1), \tag{5}$$

where

$$\underline{V}(1) = \frac{-\underline{c}+q}{1-\delta}$$

is the value of reputation one for the newspaper with low cost.[15]

A sufficient condition for (5) to hold for any $p_t \geq p^*$ is that this inequality holds for the highest possible access fee, $\alpha(p_t) = \lambda(1-q)$, that is,

$$\underline{c} + \lambda(1-q) \leq \delta(1-q)\frac{-\underline{c}+q}{1-\delta},$$

which is equivalent to (4).

[15]Note that the high-cost type never investigates when $p_t \geq p^*$ and hence the newspaper's reputation becomes one after investigation in low state, $p_{t+1}^{s_0} = 1$.

5.3 Role of assumptions on preferences

In our model, the reader's loss function is linear. Though this assumption simplifies the mathematic expressions, it also causes a discontinuity in the reader's best response (it is an upper hemicontinuous correspondence). There exists a threshold of reputation and a threshold of probability of investigation at which the newspaper's report goes from being ignored to being followed. As a result, the access fee the interest group is willing to pay jumps from zero to a positive constant. Fortunately, in our model, the reader can mix between the two actions at the right probability when he is indifferent, which ensures the existence of equilibria. This in some sense eliminates the effect of such discontinuity. In addition, the reputation-updating rule is independent of the reader's preferences. However, the discontinuity mentioned above does cause a key difference between linear loss functions and other preferences. For example, if the reader's utility function is quadratic, then the value of the newspaper's report is continuous in its reputation and probability of investigation. Furthermore, next period's access fee is strictly increasing in the newspaper's reputation next period (as opposed to the step function in the linear case). This has the potential of providing further incentive for the newspaper to choose investigative journalism so as to enhance its reputation.

Now, we discuss our assumption that the interest group always prefers the action 1 taken regardless of the true state of the world. The qualitative result will not be affected if we allow the interest group to have other types of preferences. For example, the interest group may prefer each action some of the time, as long as its preferences are not perfectly aligned with those of the reader. Furthermore, the interest group's preferences do not have to be persistent across periods. Our analysis will not be affected if the interest group's favorite action is determined by a random draw from the same distribution each period. As long as the reader can verify after each period whether the newspaper's report has matched the true state of the world, the tradeoff faced by the newspaper is the same, namely, that between maintaining reputation through costly investigation and taking an access fee from the interest group in the current period.

5.4 Shut-down and cheap-talk

Here, we consider a version of the two-period model in which the strategic newspaper can choose to shut down after obtaining the subscription fee from the reader and a version of the two-period model in which the strategic newspaper can make up

any report at zero cost (cheap-talk). We demonstrate that the possibility of either shut-down or cheap-talk allows the newspaper to obtain a higher access fee in the second period, but otherwise keeps the incentives of the newspaper unchanged. In equilibrium, a higher access fee increases the payoff of the newspaper in the second period and may increase the probability of investigation in the first period and the reputation in the second period.

5.4.1 Shut-down

Consider the model in which the strategic newspaper can shut down and report nothing after the reader has subscribed. Furthermore, there is no cost of shutting down. (We assume that the truthful newspaper never shuts down.)

In equilibrium in which the strategic newspaper does not shut down, the threat of shut-down allows it to collect a larger access fee in the second period: If the access fee is not paid, it is now optimal for the newspaper to shut down. In this case, the reader will implement action 0 in all states. If the access fee is paid, the reader will implement action given by $y_1(p_2)$. Hence, the access fee is increased in case the reader follows high report by the probability of high state:

$$\alpha(p_2) = \begin{cases} 0, & \text{if } p_2 < p^*; \\ \tilde{z}\lambda, & \text{if } p_2 = p^*; \\ \lambda, & \text{if } p_2 > p^*; \end{cases}$$

where $\tilde{z}$ is the probability that the reader takes action 1 after report 1 when $p_2 = p^*$.

Thus, the payoff of the strategic newspaper in the second period whose reputation is p_2 equals

$$V(p_2) = \begin{cases} 0, & \text{if } p_2 < p^*; \\ \tilde{z}\lambda, & \text{if } p_2 = p^*; \\ q + \lambda - (1 - p_2)(1 - q), & \text{otherwise.} \end{cases}$$

Let us now turn to the first period. If the newspaper shuts down in the first period, it will reveal its type and obtain zero payoff. This is weakly dominated by the choice of propaganda, in which case the newspaper collects a non-negative access fee in the first period. We now focus on equilibria in which the newspaper never shuts down in the first period.

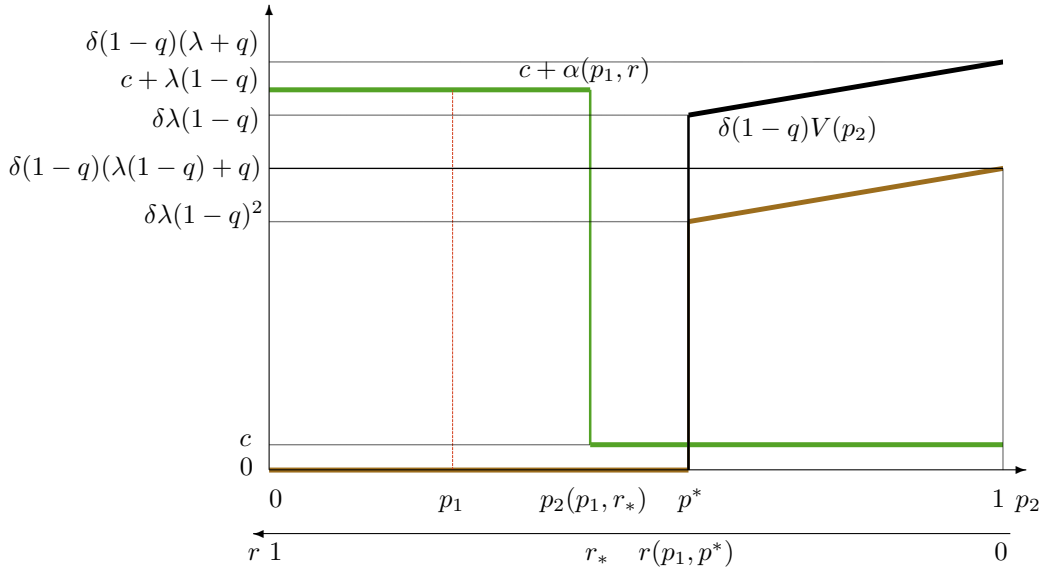

Figure 7: The cost and the benefit of investigative reporting with zero subscription fees when $p_1 < (p^*)^2$. The upper horizontal axis represents p_2. The lower horizontal axis represents r. The black line represents the value of reputation in the second period when shut down is possible. The parameters are: $\delta = 1$, $\lambda = 2$, $p_1 = 1/4$, $c = 1/10$, $q = 3/10$.

Figure 7 describes the discounted value of the reputation in the second period and the opportunity cost of investigation in the first period.[16] One can see that if in the equilibrium in the original model without shut down the newspaper is indifferent between costly investigation and propaganda, it will also be indifferent between these two actions in the new model. It may happen, however, that to be indifferent in the new model the newspaper has to choose investigation with a larger probability. This occurs if and only if in the original equilibrium the newspaper chooses investigation with probability $r < r(p_1, p^*)$.

In addition, in the situation when the cost of investigation is so high that there is no investigation in the original model, the increases value of the reputation in the second period in the model with shut down may induce the newspaper to investigate with some probability in the first period.

[16]The possibility of shut-down does not help the newspaper to collect a higher access fee in the first period. Consider an equilibrium in which the newspaper investigates with positive probability in the first period. In this equilibrium, the payoff from investigation in the first period is non-negative. At the same time, the payoff from shut-down is zero. In order for the threat of shut-down to be credible, the payoff from investigative reporting should be non-positive. Hence, it must be zero. In turn, this implies that the payoff from propaganda, the access fee, is also zero.

5.4.2 Cheap-talk

Let us now consider a version of the model in which the reports of the newspaper are cheap talk: we assume that the newspaper can always send, at zero cost, any of the two reports, regardless of whether it obtains any report from investigation or special interest group and regardless what this report might be. The effect of this possibility is identical to the possibility of shut down: In the second period, the threat to send a low cheap talk message allows the newspaper to obtain a higher access fee. In the first period, however, the threat to send a cheap talk message does not affect the access fee in equilibrium.

For a detailed analysis of the effect of cheap-talk, first observe that cheap-talk with message "1" is dominated by propaganda with message "1," as the newspaper receives a positive access fee in the latter option. In addition, shutdown is dominated by propaganda as by shutting down the newspaper loses reputation for sure without receiving any access fee, while by choosing propaganda the newspaper can at least recuperate an access fee.[17] As shown before, the payoff of the strategic newspaper in the second period whose reputation is p_2 equals

$$V(p_2) = \begin{cases} 0, & \text{if } p_2 < p^*; \\ \tilde{z}\lambda, & \text{if } p_2 = p^*; \\ q + \lambda - (1 - p_2)(1 - q), & \text{otherwise.} \end{cases}$$

In the first period, the newspaper's payoffs from choosing investigation, propaganda, and cheap-talk are respectively

$$\begin{aligned} -c + \delta q V(p_1) + \delta(1 - q)V(p_2^{s_0}), \\ \alpha + \delta q V(p_1), \\ \text{and } \delta(1 - q)V(p_2^{s_0}). \end{aligned}$$

Comparing these expressions, we conclude that investigation can be weakly better than cheap talk (using message "0") only if the reputation of the newspaper, p_1, is high enough. Note that by choosing message "0," the newspaper loses reputation only when the state of the world was 1 in the first period. But, when the newspaper successfully reports message "1" in state 1, its reputation will remain p_1. In the second period, a reputation of $p_2 = p_1$ can be of value only if it is greater than p^*,

[17] To be sure, this reasoning works due to the simple nature of our model. In reality, the fact that a newspaper fails to cover a particular issue does not automatically harm the reputation of a newspaper, as it might have been caused by the focus of the newspaper.

the minimum reputation level that ensures the newspaper's report be followed by the reader even though the strategic newspaper never chooses costly investigation. Hence, the willingness to pay by the interest group in the first period is at least $\lambda(1-q)$. This turns out to imply that the newspaper finds propaganda preferable to costly investigation, as long as $\delta \leq 1$. Note that

$$V(p_1^{s_0}) \leq V(1) = (2q-1) + (1-q) + \lambda = q + \lambda.$$

Thus, the difference between the payoffs associated with investigation and propaganda can be written

$$\delta(1-q)V(p_2^{s_0}) - c - \alpha,$$

which is less than or equal to

$$\delta(1-q)(q+\lambda) - c - \lambda(1-q) \quad = \quad (\delta-1)\lambda(1-q) + \delta q(1-q) - c.$$

But, the last expression can be nonnegative only if $\delta > 1$ as we have assumed $c > q$.

Timing. In our analysis above, we have assumed the cheap-talk option is available only to the newspaper when the newspaper approaches an interest group but is rejected. However, if we allow the newspaper to choose cheap-talk before approaching the interest group, and if the newspaper's threat of cheap-talk is credible, it would never choose investigation unless it is indifferent between the two options, which only happens for a particular value of p_1.

6 Conclusions

In this paper, we present a dynamic model of news reporting by a profit-maximizing media outlet whose credibility is uncertain to the public. In each period, the media outlet chooses its source of news: a costly independent investigation or, possibly, a free report prepared by an interest group. The revenue of the media outlet consists of the subscription fees for the public and the access fees for interest groups. We characterize the equilibrium structure of information transmission with and without disclosure of the source of the media report. In particular, we demonstrate that absence of disclosure may create incentives for the strategic media outlet to choose costly investigation in the hope of improving its reputation. Nevertheless, the public cannot benefit from more informative reports as they serve the goal of confusing the public and making the reports by the interest group more effective.

There are a number of ways in which our model can be extended. We assume the newspaper's investigation technology is perfect, and the reader learns the true state of the world with certainty after each period. As a result, once a strategic newspaper's report fails to match the true state of the world, it is fully exposed and deprived of any reputation. This is an assumption that greatly simplifies the analysis. Though in this paper we do not explore the relaxation of these assumptions, we believe allowing imperfect investigation by the newspaper and imperfect verification by the reader may generate interesting results that might otherwise not be possible. However, we believe the underlying tradeoff remains the same.

In our model, there is a single newspaper and only one interest group in each period. It is interesting to consider competition between newspapers and interest groups. We may use competition between interest groups to justify the newspaper being able to extract all the potential surplus from the interest group. On the other hand, competition between newspapers for readers may force newspaper to charge very low subscription fees, thus increasing the weight of access fees in newspapers' choices.

A Equilibrium in the infinitely repeated model

In this section, we characterize equilibria in the infinitely repeated version of the model for all costs of investigation. In order to do so, we start with some preliminary observations.

First, note that in equilibrium, the newspaper reports 1 either when it has chosen costly investigation and the state is high or when it has chosen propaganda. Thus, when the reader receives report 1, he infers that it reflects θ with probability $p_t + (1 - p_t)r_t$ and has no valuable information with probability $(1 - p_t)(1 - r_t)$. As a result, conditional on report 1, the reader believes that θ equals 1 with probability

$$q(p_t, r_t) = \frac{q}{1 - (1 - q)(p_t + (1 - p_t)r_t)}.$$

We can now describe the subscription fee collected in equilibrium.

Lemma 1. *In any equilibrium, the subscription fee is equal to*

$$\phi(p_t, r_t) \quad = \quad \begin{cases} 0, & \text{if } q(p_t, r_t) \leq \frac{1}{2}; \\ 2q - 1 + (p_t + (1 - p_t)r_t)(1 - q), & \text{otherwise.} \end{cases}$$

Proof. In equilibrium, the newspaper charges a subscription fee equal to the reader's willingness to pay, which is equal to the utility difference between making his decision based on the newspaper's report and doing so solely based on the prior.

In our model, the newspaper reports 0 only if it has chosen costly investigation. Hence, if the reader receives report 0, he infers that it reflects θ with probability one. By contrast, the readers believes that report 1 reflects the truth with probability $q(p_t, r_t)$.

Therefore, if $q(p_t, r_t) < 1/2$, the reader takes decision 0 regardless of the newspaper's report and hence his willingness to pay for subscribing to the newspaper is zero. Furthermore, if $q(p_t, r_t) = 1/2$, the reader is indifferent about which action to choose after report 1 and hence his willingness to pay for the reports is also zero. On the other hand, if $q(p_t, r_t) > 1/2$, the newspaper's report is valuable to the reader, who will take action 1 after report 1. The value of subscription, however, depends on the reader's prior beliefs. The best action for the reader in the absence of the newspaper's report is 0, in which case his payoff is equal to $1 - q$. If he subscribes to the newspaper, his expected payoff is $1 - (1 - p_t)(1 - r_t)(1 - q)$. As a result, he is willing to pay for the subscription to the reports up to to $2q - 1 + (p_t + (1 - p_t)r_t)(1 - q)$. □

Similarly, we can determine the access fee collected in equilibrium.

Lemma 2. *In any equilibrium, the access fee is equal to*

$$\alpha(p_t, r_t) = \begin{cases} 0, & \text{if } q(p_t, r_t) < \frac{1}{2}; \\ \tilde{z}\lambda(1-q), & \text{if } q(p_t, r_t) = \frac{1}{2}; \\ \lambda(1-q), & \text{if } q(p_t, r_t) > \frac{1}{2}; \end{cases}$$

where $\tilde{z}$ is the probability that the reader takes action 1 after report 1 if $q(p_t, r_t) = \frac{1}{2}$.

Proof. For the interest group the newspaper can be valuable if and only if the newspaper's report of 1 affects the reader's decision, that is, if and only if $q(p_t, r_t) \geq \frac{1}{2}$. First, consider the case in which $q(p_t, r_t) > \frac{1}{2}$. If the interest group does not buy access, then the newspaper has to conduct an investigation and reports 1 with probability q and 0 with probability $1 - q$, which gives the interest group the payoff of λq. If the interest group does buy access, then it ensures that the newspaper publishes its favorite report, 1, which gives the payoff of λ. Hence, the interest group is willing to pay up to $\lambda(1 - q)$ in the access fee.

Now, assume that $q(p_t, r_t) = \frac{1}{2}$. In this case, the reader is indifferent about which action to take after high report. Let $\tilde{z} \in [0, 1]$ be the probability that the reader chooses action 1. Then, the interest group will get the payoff $\lambda\tilde{z}q$, if it does not buy access, and the payoff $\lambda\tilde{z}$, if it does. □

Our next result describes the value of reputation $p_t = 1$.[18]

Lemma 3. *In any equilibrium, the expected payoff of the strategic newspaper with reputation one, $p_t = 1$, is equal to*

$$V(1) = \begin{cases} \frac{-c+q}{1-\delta}, & c \leq c_*; \\ \frac{\lambda(1-q)+q}{1-\delta q}, & \text{otherwise.} \end{cases}$$

Proof. Lemma 1 and Lemma 2 imply that the fees collected by the newspaper with reputation are

$$\begin{aligned} \phi(1, r_t) &= q; \\ \alpha(1, r_t) &= \lambda(1-q). \end{aligned}$$

[18]The newspaper can never achieve reputation one on the equilibrium path. Nevertheless, this can happen off the equilibrium path: if the reader expects the newspaper to choose propaganda with probability one learns that the newspaper has reported θ truthfully.

If the newspaper chooses investigation, its reputation will remain one and, therefore, its expected payoff is equal to

$$v' = -c + q + \delta V(1).$$

If, on the other hand, the newspaper chooses propaganda, it will lose its reputation whenever the state is zero, which happens with probability q.[19] In this case, its expected payoff is

$$v'' = \lambda(1-q) + q + \delta(1-q)V(1).$$

Then, the value of reputation one is given by

$$\begin{aligned} V(1) &= \max\{v', v''\} \\ &= \max\left\{\frac{-c+q}{1-\delta}, \frac{\lambda(1-q)+q}{1-\delta q}\right\}, \end{aligned}$$

which implies the result. □

A.1 Low cost of investigation

We start our analysis of equilibria with the low costs of investigation, $c \leq c_*$. In this case, the costs are small enough to permit the equilibrium in which the newspaper chooses investigative journalism with probability one.

Proposition 3. *If $c \leq c_*$, there exists an equilibrium in which the newspaper investigates and reports the state with probability one as long as $p_t > 0$. Furthermore, this equilibrium is unique if $c < c_*$.*

Proof. Equilibrium. The one-shot deviation principle implies that we only need to look at deviations in one period. Hence, imagine that the newspaper with reputation $p_t > 0$ investigates with probability one in each period and the reader expects it to do so. Then, $V(p_t) = \frac{-c+q}{1-\delta}$. It follows now from the assumption on the cost of investigation that the net benefit of the journalism, $\mathcal{L}(p_t, 1) \geq 0$ for all $p_t > 0$. Hence, it is optimal for the newspaper to choose investigation in the current period.

[19] Recall that we restrict attention to equilibria in which the reputation of newspaper drops to zero, on or off the equilibrium path, if the reader learns that it chose propaganda.

Uniqueness. We first show that in any equilibrium the newspaper with $p_t > 0$ chooses investigation with positive probability. Assume the opposite. Then, $r_t = 0$ and the net benefit of investigation is equal to

$$\begin{aligned}\mathcal{L}(p_t, 0) &= -c - \alpha(p_t, 0) + \delta(1-q)V(1) \\ &\geq -c - \lambda(1-q) + \delta(1-q)V(1) > 0,\end{aligned}$$

implying that the newspaper would prefer to deviate to costly investigation.

Thus, in equilibrium for any $p_t > 0$ the newspaper weakly prefers to investigate. Therefore, the expected payoff of the newspaper can be obtained by adding the stage payoffs along the history in which the newspaper chooses to investigate,

$$V(p_t) = -\frac{c}{1-\delta} + \sum_{T=t}^{\infty} \delta^{T-t} \phi(p_T, r_t), \tag{6}$$

where

$$p_{T+1} \geq p_T \tag{7}$$

as the newspaper never chooses propaganda.

Now, let $\epsilon = \mathcal{L}(1, 1)$. By the assumption $c < c_*$, we have $\epsilon > 0$. Define

$$h = \max\left\{p^*, 1 - \frac{1-\delta}{\delta(1-q)^2} \cdot \epsilon\right\}.$$

As the next step, we demonstrate that in equilibrium for any $p_t > h$ the newspaper chooses investigation with probability one. By (7), the subscription fee for the newspaper is bounded from below by $\phi(p_t, 0)$. Hence, from (6) the payoff of the newspaper is bounded from below by

$$\underline{V}(p_t) = -\frac{c}{1-\delta} + \frac{\phi(p_t, 0)}{1-\delta}.$$

Using Lemma 1 to express the subscription fee in the above, we obtain a lower bound on the difference between the payoffs of the newspaper with reputation one and the newspaper with reputation p_t,

$$V(1) - V(p_t) \leq \frac{(1-q)(1-p_t)}{1-\delta}.$$

Therefore, for any $r_t \in [0, 1]$, we have

$$\begin{aligned}\mathcal{L}(p_t, r_t) &= -c - \alpha(p_t, r_t) + \delta(1-q)V(p_{t+1}^{s_0}) \\ &\overset{\text{Lemma 2, (7)}}{\geq} -c - \lambda(1-q) + \delta(1-q)\left(V(1) - \frac{(1-q)(1-p_t)}{1-\delta}\right) \\ &= \epsilon - \delta\frac{(1-q)^2(1-p_t)}{1-\delta} > 0,\end{aligned}$$

where the last inequality follows from the definition of h. This shows that in equilibrium the newspaper with reputation $p_t > h$ cannot be indifferent about its actions and hence chooses investigation with probability one.

The rest of the proof is by induction. We show that if the newspaper chooses investigation with probability one for any reputation $p_t > h_i$, then it is also chooses investigation with probability one for any reputation $p_t > h_{i+1}$, where

$$h_i = h^i, \qquad (i \in \mathbb{N}).$$

By the assumption, we have

$$V(p_t) = V(1), \qquad (p_t > h_i).$$

Let

$$\underline{r}(p_t, h_i) = \frac{p_t}{1-p_t}\frac{1-h_i}{h_i}.$$

For any $r_t < \underline{r}(p_t, h_i)$, the next period reputation after a success in zero state

$$p_{t+1}^{s_0} = \frac{p_t}{p_t + (1-p_t)r_t} > h_i.$$

Nevertheless, if this is the case, we have

$$\begin{aligned} \mathcal{L}(p_t, r_t) &= -c - \alpha(p_t, r_t) + \delta(1-q)V(p_{t+1}^{s_0}) \\ &\geq -c + \lambda(1-q) + \delta(1-q)V(1) > 0, \end{aligned}$$

implying the newspaper strictly prefers investigation. Hence, if there is mixing in equilibrium, $\underline{r}(p_t, h_i)$ provides a lower bound on the probability of investigation.

Thus, in equilibrium the subscription fee is bounded from below by $\phi(p_t, \underline{r}(p_t, h_i))$. Using $p_t > h_{i+1}$ in Lemma 1, we get

$$\phi(p_t, \underline{r}(p_t, h_i)) = 2q - 1 + (1-q)\frac{p_t}{h_i} > 0.$$

Hence, from (6), the payoff of the newspaper is bounded from below by

$$\underline{V}(p_t, h) = -\frac{c}{1-\delta} + \frac{2q - 1 + (1-q)p_t/h_i}{1-\delta},$$

implying a lower bound

$$V(1) - V(p_t) \leq \frac{(1-q)(1-p_t/h_i)}{1-\delta}.$$

Furthermore, Lemma 2 and $p_t > h_{i+1}$ imply that

$$\alpha(p_t, \underline{r}(p_t, h_i)) \quad = \quad \lambda(1-q).$$

Therefore, for any $r_t \in [\underline{r}(p_t, h_i), 1]$, we have

$$\mathcal{L}(p_t, r_t) \quad \geq \epsilon - \delta(1-q)\frac{(1-q)(1-p_t/h_i)}{1-\delta} > 0,$$

where the last inequality follows from the definition of h_i.

The value of h_i converges to zero as i converges to infinity, which completes the proof. □

A.2 High cost of investigation

We now turn to the situation in which the cost of investigation is high, $c \geq c^*$.

Proposition 4. *If $c > c^*$ or $\lambda > 0$ and $c = c^*$, in any equilibrium the newspaper with reputation $p_t < 1$ investigates with probability zero.*

Proof. Equilibrium. Imagine that the newspaper with reputation $p_t < 1$ investigates with probability zero in each period and the reader expects it to do so. Then, the net benefit of investigative journalism equals

$$\mathcal{L}(p_t, 0) \quad = \quad -c - \alpha(p_t, 0) + \delta(1-q)V(1) < 0,$$

where the inequality follows from Lemma 3 and the assumption about the cost. Hence, it is optimal for the newspaper to choose propaganda.

Uniqueness. There is no equilibrium in which the newspaper investigates with probability one. Assume the opposite. Then, the expected payoff of the newspaper on the equilibrium path is equal to

$$\begin{aligned} V(p_t) &= -c + q + \delta V(p_t) \\ &= \frac{-c+q}{1-\delta}. \end{aligned}$$

Nevertheless, the assumption on the cost of investigation and Lemma 3 imply that the net benefit of costly investigation is negative,

$$\mathcal{L}(p_t, 1) \quad = \quad -c - \lambda(1-q) + \delta(1-q)V(p_t) < 0, \qquad (p_t < 1).$$

Hence, in any equilibrium the newspaper weakly prefers to choose propaganda. Therefore, the expected payoff of the newspaper can be obtained by adding the stage payoffs along the history in which the newspaper chooses propaganda,

$$\begin{aligned} V(p_t) &= \sum_{T=t}^{\infty} (\delta q)^{T-t} [\phi(p_t, r_t) + \alpha(p_t, r_t)] \\ &= \frac{\phi(p_t, r_t) + \alpha(p_t, r_t)}{1 - \delta q}. \end{aligned}$$

Thus, the net benefit of investigation is equal to

$$\mathcal{L}(p_t, r_t) = -c - \alpha(p_t, r_t) + \delta(1-q) \frac{\phi(p_{t+1}^{s_0}, r_t(p_{t+1}^{s_0})) + \alpha(p_{t+1}^{s_0}, r_t(p_{t+1}^{s_0}))}{1 - \delta q},$$

Furthermore, the access fee is bounded from below by 0 and from above by $\lambda(1-q)$, while the subscription fee is bounded from above by q. Note that if $p_t < 1$ and $r_t < 1$, then the subscription and collection fees are less than their respective bounds. It follows that the net benefit of investigation is bounded from above,

$$\mathcal{L}(p_t, r_t) < -c + \delta(1-q) \frac{q + \lambda(1-q)}{1 - \delta q} \leq 0, \qquad (p_t < 1, r_t < 1).$$

□

If $c = c^*$ and $\lambda = 0$, we have $c = c_* = c^*$. In this case, by Proposition 3 there is an equilibrium in which the newspaper investigates with probability one.

A.3 Medium cost of investigation

We now turn to the case in which $c_* < c < c^*$. Proposition 5 below shows that there exists an equilibrium. Furthermore, this equilibrium is essentially unique in the following sense: there might be multiple equilibria, but they differ only in the behavior on a finite set of reputations.

The equilibrium is constructed by induction. First, we determine the behavior of the newspaper with reputation $p_t \in (p^*, 1]$. This, in turn, allows us to determine the behavior of the newspaper with reputation $p_t \in ((p^*)^2, p^*]$, and so on. Therefore, let us partition the set of reputations as follows:

$$(0, 1] = \bigcup_{n=1}^{\infty} [h_{n+1}, h_n) \cup [h_1, 1],$$

where

$$h_n \equiv \left(\frac{1 - 2q}{1 - q} \right)^n = (p^*)^n.$$

Note that $h_0 = 1$ and $h_1 = p^*$.

Now, let

$$w = \frac{\delta(1-q)}{1-\delta q}.$$

The following function will describe the expected payoff of the newspaper in the equilibrium for the reputations inside different intervals of the partition:

$$\begin{aligned} g(p,n) &= -\frac{c}{1-\delta q}\frac{1-w^n}{1-w} + w^n \frac{\left(\frac{p}{(p^*)^n} + \lambda - 1\right)(1-q)+q}{1-\delta q},\ n \in \{1,2,\dots\}, \\ g(p,0) &= \frac{(p+\lambda-1)(1-q)+q}{1-\delta q}, \end{aligned}$$

where $p \in (0,1]$ represents the reputation of the newspaper and n represents the index of the interval of the partition corresponding to the value of reputation, that is, $p \in (h_{n+1}, h_n)$.

The expected payoff of the newspaper with a reputation on the boundary of the intervals of the partition will be described by the following function:

$$\begin{aligned} f(\tilde{z},n) &= -\frac{c}{1-\delta q}\frac{1-w^n}{1-w} + w^n \frac{\tilde{z}\lambda(1-q)}{1-\delta q},\quad n \in \{1,2,\dots\}, \\ f(\tilde{z},0) &= \frac{\tilde{z}\lambda(1-q)}{1-\delta q}, \end{aligned}$$

where $\tilde{z} \in [0,1]$, describes the probability that the reader follows high report in equilibrium if the newspaper's reputation is $p_t = h_n$ and n represents the index of the interval of the partition.

In some cases, there could be multiple equilibria that allow for different behavior on the boundaries of the partition intervals. This happens if the following condition is satisfied:

there exists $n' \in \{1,\dots\}$ such that
$g(h_{n'}, n') > \frac{c}{\delta(1-q)}$ and $g(h_{n'+1}, n') < \frac{c}{\delta(1-q)}$. (condition (*))

If condition (*) holds, then there exists $p' \in (h_{n'+1}, h_{n'})$ such that

$$g(p', n') = \frac{c}{\delta(1-q)}. \tag{8}$$

If condition (*) is not satisfied, then there exists $n' \in \{1,2,\dots\}$ such that

$$g(h_{n'}, n'-1) \geq \frac{c}{\delta(1-q)} \text{ and } g(h_{n'}, n') \leq \frac{c}{\delta(1-q)},$$

in which case we define $p' = h_{n'}$.

We are now ready to describe the probability of investigation in the equilibrium. It is the same in any equilibrium and is given by

$$r_t(p_t) \;=\; \begin{cases} 0, & \text{if } p_t \geq p^*; \\ r_*(p_t), & \text{if } p'p^* \leq p_t < p^*; \\ \frac{p_t}{1-p_t}\frac{1-p'}{p'}, & \text{otherwise;} \end{cases} \tag{9}$$

There are three regions: high, medium, and low value of reputation. If the newspaper has high reputation, $p_t \geq p^*$, it chooses propaganda with probability one. If the newspaper has medium reputation, $p'p^* \leq p_t < p^*$, then it mixes between investigation and propaganda in the manner that makes the reader indifferent about whether to follow high report. Finally, if the newspaper's reputation is low, it also mixes between investigation and propaganda. The manner of randomization is, however, different: the newspaper's reputation after success in the low state becomes equal to p'. In order to achieve this, the newspaper chooses costly investigation very infrequently; in this case, the newspaper's reports are not valuable for the reader.

The expected payoff of the newspaper in the equilibrium is given by

$$V(p_t) \;=\; \begin{cases} g(p_t, n), & \text{if } p_t \in (h_{n+1}, h_n), p_t \geq p'p^*; \\ f(\tilde{z}, n), & \text{if } p_t = h_n, p_t \geq p'p^*; \\ 0, & \text{otherwise.} \end{cases} \tag{10}$$

where $\tilde{z}$ is the probability that the reader follows high report if $p_t = h_n$.

If condition (*) holds, there are multiple equilibria that differ in the value $\tilde{z}$. If this condition does not hold, then the equilibrium is unique:

$$\begin{array}{ll} \tilde{z} \in [z^*, 1], & \text{if condition (*) holds;} \\ f(\tilde{z}, n') = \frac{c}{\delta(1-q)}, & \text{otherwise;} \end{array} \tag{11}$$

where

$$z^* \;=\; \frac{\delta(1-q)}{1-\delta q} + \frac{\delta q}{\lambda(1-\delta q)} - \frac{c}{\lambda(1-q)}.$$

Proposition 5. *There exists an equilibrium. In any equilibrium, (9)–(11) hold. Furthermore, for any $\tilde{z}$ that satisfies (11), there exists an equilibrium in which (9) and (10) hold.*

Proof. Let us consider a newspaper with reputation $p_t \in [h_1, 1)$. Because $c > c_*$, the newspaper with reputation one will choose propaganda and we have $\mathcal{L}(1,0) < 0$. Furthermore, observe that $\mathcal{L}(p_t, 0) = \mathcal{L}(1,0)$ for all $p_t > p^*$. Thus, the newspaper with reputation $p_t > p^*$ will choose propaganda.

If $p_t = p^*$, then $\mathcal{L}(p_t, r) < 0$ for all $r \neq 0$ and hence the newspaper with this reputation will never choose costly investigation. For $r = 0$ to be optimal, we need to have $\tilde{z}$ such that $\mathcal{L}(p_t, 0) \leq 0$, or equivalently, $\tilde{z} \geq z^*$.

It follows that for $p_t \in [h_1, 1]$ the value of reputation is given by $g(p_t, 0)$ if $p_t > h_1$ and $f(\tilde{z}, 0)$ if $p_t = h_1$.

We now construct by induction the probability of investigation and the value of reputation in equilibrium for $p_t < p^*$. Assume that the probability of investigation and the value of reputation are given by (9) and (10) for $p_t \in [h_n, 1]$. We will determine the probability of investigation and the value of reputation for $p_t \in [h_{n+1}, h_n)$, $n = 1, \ldots$.

First, observe that $\mathcal{L}(p_t, 0) > 0$ by $c < c^*$. On the other hand, for all $r_t > r_*(p_t)$, we have $\mathcal{L}(p_t, r_t) = \mathcal{L}(p_t, 1) = \mathcal{L}(1,1) = \mathcal{L}(1,0) < 0$. Hence, in equilibrium the newspaper with reputation $p_t < p^*$ randomizes between investigative journalism and propaganda with probability $r_t \in (0, r_*(p_t)]$.

Now, consider $p_t \in (h_{n+1}, h_n)$ such that $p_t \geq p' p^*$. Note that

$$p_{t+1}^{s_0}(p_t, r_*(p_t)) = \frac{p_t}{p^*} \in (h_n, h_{n-1}).$$

We now show that $\mathcal{L}(p_t, r_*(p_t)) = 0$, or equivalently that there exists $z \in [0,1]$ such that

$$c + z\lambda(1-q) = \delta(1-q) g\left(\frac{p_t}{p^*}, n-1\right).$$

This follows from the fact that

$$\begin{aligned} c + \lambda(1-q) &> \delta(1-q) g\,(1,0) \\ &\geq \delta(1-q) g\left(\frac{p_t}{p^*}, n-1\right). \end{aligned}$$

and that

$$c \leq \delta(1-q) g\left(\frac{p_t}{p^*}, n-1\right)$$

because $p_t \geq p' p^*$.

Furthermore, $\mathcal{L}(p_t, r)$ is decreasing on $(0, r_*(p_t)]$ and hence $r_*(p_t)$ is the unique solution of $\mathcal{L}(p_t, r) = 0$ on this interval. Hence, the probability of investigation satisfies (9).

We now calculate the value of reputation. Because the newspaper is indifferent about its action, its payoff can be expressed as

$$\begin{aligned} V(p_t) &= -c + \delta q V(p_t) + \delta(1-q)V\left(\frac{p_t}{p^*}\right) \\ &= -c + \delta q V(p_t) + \delta(1-q)g\left(\frac{p_t}{p^*}, n-1\right) \end{aligned}$$

implying

$$V(p_t) = -\frac{c}{1-\delta q} + wg\left(\frac{p_t}{p^*}, n-1\right) = g(p_t, n).$$

The argument for $p_t = h_n, p_t \geq p'$ is analogous.

Let now $p_t < p'p^*$ (note that $p' > 0$ by construction). Observe that in this case, $\mathcal{L}(p_t, r_*(p_t)) < 0$ and therefore $r_t(p_t) < r_*(p_t)$. The probability of investigation is determined by $\mathcal{L}(p_t, r(p_t)) = 0$, which is equivalent to

$$-c = \delta(1-q)V(p_{t+1}^{s_0}(p_t, r)). \tag{12}$$

The value $V(p_{t+1}^{s_0}(p_t, r))$ is decreasing in r on $(0, r_*(p_t)]$. Therefore, (12) has at most one solution. By construction of p', $r = r(p_t)$ is a solution. This proves that the probability of investigation satisfies (9). The newspaper's payoff is

$$V(p_t) = \frac{-c + \delta(1-q)V(p')}{1-\delta q},$$

and equals zero by the definition of p'.

Finally, to see that $\tilde{z}$ must satisfy (11), observe that if condition (*) does not hold and (11) is violated, then (12) does not have a solution. □

B Welfare analysis in which importance of issues varies across periods

We now turn to a version of the model where the importance of issues may vary across periods. In particular, we introduce an i.i.d. random variable, A_t (following Sobel [13]) , so that both the reader and the interest group's utility in period t is weighted by A_t. Without loss of generality, we assume its expected value, $E(A_t)$, is one. At the beginning of each period, all the parties learn about the value of A_t.

First, we consider the two-period version of the model. Recall that $r_*(p_1)$ is the probability with which the newspaper has to investigate in order for the newspaper's

report to be believed and that $r(p_1, p^*)$ is the probability in order for the newspaper's reputation to be equal to p^* next period in the case of a success in state 0. As we have calculated before, for $p_1 \leq p^*$,

$$\begin{aligned} r_*(p_1) &= \frac{p^* - p_1}{1 - p_1}; \\ r(p_1, p^*) &= \frac{p_1(1 - p^*)}{p^*(1 - p_1)}. \end{aligned}$$

Note that $r_*(p_1) > r(p_1, p^*)$ if and only if $p_1 < (p^*)^2$. Thus, in the case $p_1 < (p^*)^2$, the newspaper's report does not affect the reader's decision in the first period. This decides welfare comparison in disclosure's favor. The reason is as follows. Since the strategic newspaper never investigates in the second period, disclosure is definitely better in the second period. Therefore, nondisclosure could dominate disclosure only if the strategic newspaper's investigation in the first period makes up for the welfare loss in the second period. But, in the case $p_1 < (p^*)^2$, the newspaper's report in the first period is not useful to the reader. This implies that disclosure must be better.

In the discussion below, we want to focus our attention on the case $p_1 \in [(p^*)^2, p^*]$. In this case, $r_*(p_1) \leq r(p_1, p^*)$. Thus, the newspaper's probability of investigation is determined by the equation

$$c + \alpha(p_1, r) = (1 - q)E(A_2)V(p_2^{s_0}(p_1, r)).$$

As calculated before, $V(p_2) = \begin{cases} 0, & p_2 < p^*, \\ \tilde{z}\lambda(1 - q), & p_2 = p^*, \\ q + (\lambda + p_2 - 1)(1 - q), & p_2 > p^*. \end{cases}$

In order to make sure that in equilibrium the newspaper's report is useful in the first period, we assume

$$c + A_1\lambda(1 - q) < (1 - q)E(A_2)V\left(p_2^{s_0}\left(p_1, r_*(p_1)\right)\right).$$

Substituting in the expression of $r_*(p_1)$ and simplifying the result, we rewrite the above condition as

$$c + A_1\lambda(1 - q) < (1 - q)E(A_2)\left[q\frac{p_1 - (p^*)^2}{p^* - (p^*)^2} + \lambda(1 - q)\right].$$

Given this condition, we have two cases to consider:

Case 1. The newspaper investigates with probability $r(p_1, p^*)$.

Case 2. The newspaper investigates with probability r between $r_*(p_1)$ and $r(p_1, p^*)$.

We compare welfare under disclosure and nondisclosure *after* A_1 is realized.

In our model, the reader's expected payoff is equal to the probability he makes a "correct" decision, namely, one that matches the true state of the world. Under disclosure, the reader receives perfect information from an honest newspaper, but no useful information from a strategic one. Thus, the reader's payoff is

$$A_1[1-(1-p_1)q]+E(A_2)[1-(1-p_1)q].$$

Let us consider case 1, in which the newspaper's reputation in the second period becomes p^* after a success in state 0. In order for this to be an equilibrium, according to Figure **??** the following inequality must hold:

$$c+A_1\lambda(1-q) \;\leq\; (1-q)E(A_2)V(p^*)=(1-q)^2\lambda E(A_2).$$

The last equality sign comes from straightforward calculation. Rewriting the above inequality gives

$$A_1 \;\leq\; (1-q)E(A_2)-\frac{c}{\lambda(1-q)}.$$

In this case, the reader does not find it beneficial to follow the newspaper's report in the second period and simply takes the ex ante more likely action 0 regardless of the newspaper's report. Hence, the reader's total payoff is

$$A_1[1-(1-p_1)(1-r(p_1,p^*))(1-q)]+E(A_2)(1-q).$$

Thus, the difference in the reader's welfare between nondisclosure and disclosure is

$$\begin{aligned}
& A_1(1-p_1)[q-(1-r(p_1,p^*))(1-q)]+E(A_2)[-p_1q] \\
= \;& A_1(1-p_1)q\left[1-\tfrac{1-r(p_1,p^*)}{1-p^*}\right]-E(A_2)p_1q \qquad \text{using } (1-p^*)(1-q)=q \\
= \;& \left[A_1\tfrac{p_1(1-p^*+(p^*)^2)-(p^*)^2}{p^*-(p^*)^2}-E(A_2)p_1\right]q.
\end{aligned}$$

The above expression is nonnegative if and only if

$$A_1 \;\geq\; E(A_2)p_1\Big/\frac{p_1(1-p^*+(p^*)^2)-(p^*)^2}{p^*-(p^*)^2} \text{ and } p_1(1-p^*+(p^*)^2)-(p^*)^2>0.$$

Thus, in order for there to be a welfare improvement from disclosure to nondisclosure, the following conditions are necessary and sufficient:

$$p_1(1-p^*+(p^*)^2)-(p^*)^2 \;>\; 0, \tag{13}$$

$$L\equiv\frac{p_1\left(p^*-(p^*)^2\right)}{p_1\left(1-p^*+(p^*)^2\right)-(p^*)^2} \;<A_1<\; (1-q)-\frac{c}{\lambda(1-q)}\equiv R. \tag{14}$$

The second inequality is possible if and only if $L < R$. Note that L is decreasing in p_1 given (13) and R is increasing in λ. Setting p_1 to p^* and letting λ go to infinity, the inequality $L < R$ becomes

$$\frac{p^*}{1-p^*} \quad < \quad 1-q.$$

Using the fact $p^* = (1-2q)/(1-q)$, the above inequality is equivalent to

$$q \quad > \quad \frac{3-\sqrt{5}}{2}.$$

This leads us to the following conclusion: given $q > \frac{3-\sqrt{5}}{2}$, if λ is large enough and p_1 is close enough to p^*, then there exist values of A_1 such that nondisclosure leads to higher utility for the reader.

We now turn our attention to case 2. In this case, we have

$$c + A_1\lambda(1-q) \quad = \quad (1-q)E(A_2)V\left(p_2^{s_0}\left(p_1, r^*\right)\right), \tag{15}$$

where $r^* \in (r_*, r(p_1, p^*))$. As we have shown before, $p_2(p_1, r_*) = p_1/p^*$. Thus, in order for this to be an equilibrium, we need

$$\begin{aligned} c + A_1\lambda(1-q) \quad &> \quad (1-q)V(p^*) = \lambda(1-q)^2, \\ c + A_1\lambda(1-q) \quad &< \quad (1-q)V(p_2(p_1, r_*)) = \left(\lambda + \frac{p_1}{p^*} - p^*\right)(1-q)^2. \end{aligned}$$

Let $\pi = (1-q)\left[p_1 + (1-p_1)r^*\right]$ be the probability of success in state 0. In this case, the reader's expected payoff under nondisclosure is

$$A_1\left[1-(1-p_1)(1-r^*)(1-q)\right] + E(A_2)\left[(1-q)p_1 \cdot 1 + (1-q)(1-p_1)r^* \cdot q + (1-\pi)(1-q)\right].$$

Hence, the difference in the reader's welfare between nondisclosure and disclosure is

$$\begin{aligned} & A_1(1-p_1)(r^*-p^*)(1-q) + E(A_2)\left[(\pi-p_1)q - (1-p_1)r^*(1-q)^2\right] \\ = \quad & A_1(1-p_1)(r^*-p^*)(1-q) + E(A_2)\left[-p_1q^2 - (1-p_1)r^*(1-q)(1-2q)\right], \end{aligned}$$

where we have used the facts $(1-p^*)(1-q) = q$ and $\pi = (1-q)\left[p_1 + (1-p_1r^*)\right]$. Since $E(A_2) = 1$ and $q < 1/2$, in order for nondisclosure to dominate disclosure, it is necessary and sufficient to have

$$r^* \quad > \quad p^*, \tag{16}$$

$$A_1(1-p_1)(r^*-p^*)(1-q) \quad \geq \quad p_1q^2 + (1-p_1)r^*(1-q)(1-2q). \tag{17}$$

Note

$$p_2^{s_0}(p_1, r^*) = \frac{p_1}{p_1 + (1-p_1)r^*},$$

using which in (15) gives

$$r^* = \left[\frac{(1-q)^2}{c + A_1\lambda(1-q) - \lambda(1-q)^2 + (1-q)(1-2q)} - 1\right] \cdot \frac{p_1}{1-p_1}. \quad (18)$$

Note that r^* is decreasing in A_1. First, let us look for restrictions on parameters values to satisfy (17) and verify that (16) is also satisfied. Applying (18) in (17) yields

$$[A_1 - (1-2q)]\left[\frac{(1-q)^2}{c + A_1\lambda(1-q) - \lambda(1-q)^2 + (1-q)(1-2q)} - 1\right] \geq \frac{q^2}{1-q} + A_1 p^* \frac{1-p_1}{p_1}.$$

We need $A_1 > 1-2q$ in order for the above inequality to hold. Consider $A_1 = (1-q) - \frac{c}{\lambda(1-q)}$, then the above inequality can be rewritten

$$\left[1 - \frac{1}{\lambda(1-q)}\right]\frac{q^2}{1-2q} \geq \frac{q^2}{1-q} + (1-2q)\left[1 - \frac{c}{\lambda(1-q)^2}\right]\frac{1-p_1}{p_1},$$

which as λ becomes arbitrarily large becomes

$$\frac{q^2}{1-2q} \geq \frac{q^2}{1-q} + (1-2q)\frac{1-p_1}{p_1},$$

It is most easily satisfied when $p_1 = p^*$ since $p_1 \in [(p^*)^2, p^*]$:

$$\frac{q^2}{1-2q} \geq \frac{q^2}{1-q} + q,$$

solving which gives us

$$q \geq \frac{3-\sqrt{5}}{2}.$$

Since all the expressions involved above are continuous functions of the variables and parameters, if q is above $\frac{3-\sqrt{5}}{2}$, as long as λ is large enough, p_1 is sufficiently close to p^*, and A_1 sufficiently close to $1-q$, condition (17) is satisfied.

Note that when $p_1 = p^*$ and λ becomes arbitrarily large, r^* approaches 1, which is clearly higher than p^*, and hence satisfies condition (16).

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