

## **PERSISTENT MEDIA BIAS<sup>1</sup>**

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### **I. Introduction**

The news media plays an essential role in society by providing information to the public for both individual and collective choice. The news media, however, is widely viewed as biased. A survey by the American Society of Newspaper Editors (ASNE (1999)) revealed that 78 percent of the public believed that there was bias in news reporting. There, however, was little consensus on the nature and direction of that bias. This paper identifies a demand for news and shows that citizens are skeptical of news reports that might be biased but nevertheless are influenced by those reports. That influence does not manifest itself in beliefs, since citizens rationally take into account any media bias, but instead in what news is reported. That is, in addition to affecting the content of stories, news media bias affects the probability that particular stories are reported. News media bias thus affects not only the content of stories but also what is covered. Citizens pay less for a news service the more skeptical they are, however, which leaves the issue of whether profit-maximizing news organizations would tolerate bias in their news reports.

This paper provides a theory of media bias based on incomplete information and preferences of journalists for influence and their careers. Those preferences lead journalists to work for lower wages when granted discretion in their reporting than if they were tightly controlled. The exercise of that discretion can lead to bias. The paper addresses whether bias would be tolerated by a profit-maximizing news organization, whether bias would persist with competition between news organizations, and whether a media organization that tolerates greater bias earns higher profits than a news organization that tolerates less bias. Another explanation for the tolerance of bias is simply that it is too costly to eliminate it. An internal organization model with this feature is also presented here, but the focus is on an explanation for the existence and persistence of media bias in the absence of such costs.

Media bias has a number of possible explanations on the demand side. Citizens have a demand for news as entertainment and may have a demand for stories that are consistent with their political

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or social views. The latter in particular may provide an incentive for a news organization to bias stories to cater to particular clientele. In addition, a news outlet that relies on advertising revenue may cater to high-income subscribers, as in Stromberg (2002).

Demand-side explanations are based on characteristics of potential subscribers. This paper instead provides a supply-side explanation for the existence and persistence of bias in news stories. On the demand side bias reduces demand because citizens are more skeptical of biased news stories and thus will pay less for them. On the supply side granting discretion to journalists who may then bias stories can allow a news organization to hire at a lower wage than if journalists were tightly monitored by editors. The supply-side explanation is based on the availability of potential journalists who have career concerns and a preference for influence and are willing to work for lower wages in positions in which they can advance their careers or influence the public by exercising the discretion they have been granted. For example, in the model journalists may want citizens to take greater precautions against potential hazards than they would otherwise take. Or, the journalist may have career concerns that can be advanced by having her stories published, and biasing stories could increase the probability they would be published. For example, Stern (1999) found that the wages of scientists who worked for pharmaceutical companies that allowed their scientists to publish their research and attend conventions were lower than the wages paid by pharmaceutical companies that did not provide those opportunities for their scientists.

Even though the public remains skeptical of biased news stories, citizens nevertheless have a demand for news because the news reports provide some information on which they may base individual and collective actions. Skepticism, however, causes the media organization to set a lower price for its news service. A profit-maximizing news organization thus will tolerate bias if it gains more on the supply side than it loses on the demand side. Bias resulting from granting discretion to journalists can be consistent with profit maximization, and it can persist with competition between like-oriented news organizations. If two news organizations compete by choosing the discretion to grant their journalists, both can be sustained in the market. In equilibrium, the news organization with the greater discretion sets a lower price than the other news organization. Citizens sort on the basis of their risk aversion, since in the model more risk averse citizens have a greater tolerance for bias toward greater precautions than do low risk aversion citizens. Bias can also persist with competition between two news organizations with opposing biases; e.g., one biased toward influencing citizens to take more precautions and the other biased toward fewer precautions. An example demonstrates that the news organization with the greater bias can have higher profits.

News media bias can affect both public and private politics. Public politics involves individual and collective action directed at public institutions such as legislatures and bureaucracy. Private politics involves individual and collective action directed at private parties often in the arena of public sentiment.<sup>2</sup> To illustrate the distinction consider the issue of genetically-modified organisms (GMOs) in foods. Private politics could involve action by activists attempting to lead citizens to take precautions against GMO foods and boycott producers and retailers so that others will not have the opportunity to consume such foods. Public politics could be directed at Congress to ban or require labeling of GMO foods or at the Food and Drug Administration to regulate GMO foods. The focus here is on private politics, and to simplify the analysis the emphasis is on precautions taken by individuals. The private politics model can also be interpreted as providing an explanation for why citizens hold certain beliefs and hence political preferences and how the media contributes to those beliefs and preferences. In private politics the model predicts that citizens overreact in response to media bias. Public politics will also be considered in a simple median voter model of regulation, and the expected regulation increases with media bias.

The influence of the news media in private and public politics is through the information contained in its stories, and that influence can be of two types. First, the news media may be responsive to the strategies of its sources, as in Baron (2003b). Second, the news media may shape the stories it reports based on the preferences reflected within the news organization. Those stories can be biased yet convey information to citizens that they can use as a basis for their private actions. A journalist who shapes stories based on her preferences may be thought of as a private politics activist. For example, a journalist may bias a story by exaggerating the risks of GMO foods with the objective of leading citizens to protect themselves as a substitute for government protection through regulation. The focus here is on the second type of influence. Although journalists may prefer to bias a story, a profit-maximizing news organization may be unwilling to tolerate bias. Even if a profit-maximizing news organization were willing to tolerate a degree of bias, competition could prevent the news organization from doing so. The theory presented here provides an explanation for media bias that persists despite profit maximization and competition.

The incentives for citizens to read a newspaper, listen to the news on the radio, or watch a television news program are unlikely to come from public politics. An individual citizen is unlikely to be pivotal in an election or in influencing government in office, so there can be little direct incentive to become politically informed, as Downs (1957) argued. A citizen could have a

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<sup>2</sup> Baron (2003a) provides an introduction to private politics.

demand for the news because of its entertainment value or simply to be better informed. Another explanation, however, can be found in the private decisions of citizens. That is, the news can help citizens make better decisions in their everyday lives. Those decisions could pertain to health, safety, personal finance, product selection, or other issues about which citizens have incentives to make purposive decisions. The perspective here is that the benefit to consumers comes from news they can use.<sup>3</sup>

## II. The Nature of Media Bias

Bias could take a variety of forms. It could be ideological, where owners, editors, or journalists present stories that support particular world views. Bias could also be partisan, where owners, editors, and journalists present stories to support the policies or causes espoused by political parties or interest groups. Bias could also result from information hidden or distorted by sources or because of career concerns of journalists who compete to be published or be on the air. Bias could arise from the personal preferences of journalists and editors who may wish to support particular causes or induce certain behavior among citizens. For example, a journalist may prefer not only that GMO foods be labeled but that citizens take precautions against such foods. Bias could also be measured in a variety of ways. For example, bias could be measured in terms of outcomes that differ from some standard. In this paper, bias is defined relative to the truth.

Bias means many things to many people. The ASNE found:<sup>4</sup>

- 30 percent of adults see bias as “not being open-minded and neutral about the facts.”
- 29 percent say that it’s “having an agenda, and shaping the news report to fit it.”
- 29 percent believe that it’s “favoritism to a particular social or political group.”
- 8 percent say bias in the news media is “all of these.”

The ASNE also wrote, “the research also suggests that much of the public believes there are internal axes that get ground (favorite causes, tenacious beliefs, unshakable convictions of what’s right, etc.) and attitudinal mindsets (self-righteousness, socio economic bigotry, disdain for working-class values, skepticism gone-bad to cynicism, etc.) in newsrooms.”<sup>5</sup> The survey also indicated that, “The public appears to diagnose the root causes of media bias in two forms. First, (and at best), bias is a lack of dispassion and impartiality that colors the decision of whether or not to publish a

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<sup>3</sup> This perspective is also taken by Stromberg (2002).

<sup>4</sup> ASNE, “Perceived Bias,” p. 4, [www.asne.org](http://www.asne.org).

<sup>5</sup> ASNE, “Perceived Bias,” p. 11, [www.asne.org](http://www.asne.org).

story, or the particular facts that are included in a news report and the tone of how those facts are expressed. Second (and at worst), they see bias as an intent to persuade.” The ASNE survey also revealed that those who are more knowledgeable about a story are more critical of media coverage. This suggests that if the public were more knowledgeable about stories in general they would be even more critical of the news media.

Patterson and Donsbach (1996) surveyed journalists in five western democracies and concluded that bias was present in their reporting. They presented the journalists with news situations and asked them to make decisions about story content and headlines. They then correlated the responses with the self-reported political orientations of the journalists. Patterson and Donsbach concluded (p. 466), “When they move from facts to analysis, their decisions are subject to errors of judgment and selectivity of perception. As a result, partisanship can and does intrude on news decisions, even among journalists who are conscientiously committed to a code of strict neutrality. The evidence presented in this article indicates that partisan bias occurs at measurable levels throughout the news systems of Western democracies.” This conclusion is consistent with what Johnstone, Slawski, and Bowman (1976, p. 524) refer to as the “participant” press, “To be newsworthy, information must be reported in context, and it is the journalist’s task to provide the background and interpretation necessary to give events meaning.”

One source of bias may be from self-selection into journalism. Journalists are younger, better-educated, and more liberal than the American public. In the ASNE survey of journalists, “At the bigger papers, 61 percent of newsroom respondents described themselves as Democrats (or leaning toward Democrat) and only 10 percent as Republicans (or leaning toward Republican).”<sup>6</sup> <sup>7</sup> Johnstone, Slawski, and Bowman (p. 532) surveyed American journalists and found that they were better educated than the public in general, and “The most highly trained and perhaps best educated journalistic practitioners thus tend to embrace participant ideologies of the press ...” Zaller (1999, p. 24) wrote, “What elite journalists want is a profession that adds something to the news—a profession that not only reports, but also selects, frames, investigates, interprets, and regulates the flow of political competition. What journalists add should be, in their ideal, as arresting and manifestly important as possible—if possible, the most important part of each news report, so as to call attention to journalists and to the importance of their work.”

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<sup>6</sup> ASNE, Chapter “Characteristics of the Respondents.” [www.asne.org](http://www.asne.org).

<sup>7</sup> Patterson and Donsbach asked journalists to place themselves on a 1-to-7 scale of liberal to conservative and most placed themselves at the middle or slightly to the left of center. Their responses may, however, have been affected by the center serving as a focal point.

The ASNE summarized the public's perception as, "The public suspects that the points of view and biases of journalists influence what stories are covered and how they are covered."<sup>8</sup> Another possible source of bias is journalists' perception of their role to "protect the underdog."<sup>9</sup> This, however, does not explain why a profit-maximizing news organization would tolerate bias nor why they would hire as journalists people who are not more representative of the public. The public also tends to believe that commercial interests are one cause of media bias, but this does not explain why there would be bias other than in favor of advertisers.

In the ASNE survey journalists overwhelmingly rejected the notion that the media is biased. For example, "81 percent say their paper doesn't 'let its editorial page opinions affect coverage on the news pages of the paper.'" Goldberg (2002) argued, however, not only that the news media was biased but that it did not understand that it is biased. Patterson and Donsbach (p.466) concluded from their survey that "Indeed journalists typically deny the existence of this bias, claiming that their decisions are premised solely on professional norms. There is, as a consequence, a perceptual gap between journalists' self-image and their actions, and it leads them to reject any suggestion that they are politically biased."

In the ASNE survey, journalists gave explanations of the public's negative view of the media:

- "Well-known journalists seem to wear their political and social beliefs on their sleeves."
- "We still want to believe we know what's best for them [the public]."
- "Joe Six-Pack thinks we are elitist, liberal socialists with nothing nice to say about anyone. We are part of the problem."

Despite the belief that the news media is biased, the public does not view the bias as a major hindrance. "[T]heir perception of bias in newspapers does not represent a "major obstacle" to being able to trust newspapers as a source of news—perhaps because they believe they've built sufficient filtering mechanisms to identify and neutralize it when they think they see it."<sup>10</sup> In the model this corresponds to the public being skeptical of a news report that might be biased, and rationally adjusting their beliefs to take the possible bias into account.

### **III. Theories of Media Bias**

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<sup>8</sup> The public's view seems to be due in part because of sensationalism. The ASNE wrote, "The public is virtually unanimous in believing that newspapers publish sensational stories to sell papers, not because it's important news."

<sup>9</sup> ASNE, Chapter "Understanding Each Other," p.2.

<sup>10</sup> ASNE, Chapter "Perceived Bias," p.2.

A number of formal theories identify sources of media bias. Stromberg (2002) assumes that citizens have a probability of spotting an article of interest, where that probability is increasing in the space allocated to the subject by a news organization. Due to economies of scale the news media favors large groups by providing more space to issues of interest to those groups. In public politics politicians then provide more projects to groups that are more likely to learn of those projects and hence vote for the politician. Bias is defined as the difference between the politician's allocation of public projects and the allocation a social planner would choose. In contrast to the model presented here, Stromberg's model does not incorporate incomplete information.

Mullainathan and Shleifer (2002) present a theory that incorporates two forms of bias. The first results from the ideological preferences of owners and takes the form of news reports that diverge from the truth. The second is "spin" which results from the incentive to tell an interesting and compelling story. The first form of bias is possible because journalists receive private information and have an opportunity to report as they prefer. This type of bias is present only when the owners of the news organization have an ideological preference and tolerate bias and when competition is not balanced between news organizations with opposing biases. In contrast, bias resulting from spin can exist independently of ideological bias and can persist despite competition and indeed can be reinforced by competition. Spin can have an effect when citizens are categorical thinkers.

Dyck and Zingales (2003) provide an explanation for bias stemming from the relation between a journalist and her sources. To induce a source to reveal information, the journalist provides positive spin to stories to reward the source for providing the information. This positive spin should be greater the higher is the demand for the source's information and the fewer are the alternative sources of that information. Dyck and Zingales test these predictions using stock market returns and company releases of GAAP and pro forma estimates of earnings. Their results provide evidence in favor of both predictions.

Bovitz, Druckman, and Lupia (2002) investigate whether media elites can lead public opinion. They present a model of the internal organization of a news organization including a reporter, editor, and owner, where the public may subscribe to the organization's publication so as to make better decisions. Reporters and editors have career concerns—reporters want to be published—and may also have ideological preferences that differ from those of the public. The media has influence if a report changes the public's action, and the media leads public opinion either because of career concerns of reporters and editors or the ideological preferences of the owner.

Baron (2003b) focuses on the relations among citizens, journalists, and sources of information.

Citizens make both a private and a collective choice based on a news report provided by the media. Private information is held by two sources who have opposing preferences regarding the collective choice as well as the private decisions of citizens. The sources provide information to the media, and they have an incentive to reveal information favorable to their position and conceal unfavorable information. The media can investigate the issue at a cost, and based on the information provided by the sources and possibly its own investigation it provides a report to the citizens. When it has no information, the media biases its report to correct both a market failure and a government failure. In this model the competition is between the sources of information rather than between media organizations.

How is bias created in a news story? One possibility is the fabrication of information as practiced, for example, by Jason Blair. The interpretation preferred here is analogous to the measure used by Groseclose and Milyo (2003). To create bias a journalist can simply include in her story quotations from advocates of particular perspectives. The advocates then can present their perspectives, make assertions and allegations, and argue for particular actions. The favoring of interest groups on one side of an issue is contrary to the journalistic objective of balance, but Groseclose and Milyo show that news outlets are not balanced.

Groseclose and Milyo find “a very significant liberal bias” in the news media.<sup>11</sup> Indeed, all the news outlets studied except Fox News’ Special Report were found to be more liberal than the average member of Congress and “closer to the average Democrat in Congress than to the median member of the House of Representatives.” Their methodology does not require any judgments about which media outlets are liberal or conservative or the degree of bias. They simply count the number of citations a news publication makes to each of 20 think tanks and computes a score by comparing the citations of those think tanks in speeches by members of Congress whose positions on a left-right scale are determined using a statistical procedure standard in political science. That procedure uses rankings of members by interest groups as a basis for the underlying evaluations of Congress members.

## **IV. The Model**

### **A. The Players**

The basic model includes one or more news organizations, citizens who may subscribe to the

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<sup>11</sup> The eight media outlets evaluated were: Fox News’ Special Report, ABC World News Tonight, USA Today, Drudge Report, NBC Nightly News, Los Angeles Times, CBS Evening News, and New York Times.

publication of a news organization and must make a private or collective choice, and journalists who report a story in the publication. A variant of the basic model adds an editor who monitors the journalist for bias in her story.

Citizens are assumed to be rational in three senses. First, they update their beliefs using Bayes' rule. Second, they endogenously become informed by subscribing to a publication or remain uninformed by not subscribing. Third, they act optimally given their beliefs. Those who subscribe act optimally given a news report, and those who do not subscribe base their action on their prior information.

A news organization maximizes its profit with respect to the price of a subscription and the discretion allowed its journalists. Journalists maximize their utility which depends on wages and the opportunity to exercise the discretion allowed by the news organization. The journalist investigates a potential story and obtains private information as a result of her investigation. That private information and the discretion allowed by the news organization provide an opportunity for the journalist to bias her story.

## B. Information Structure

The news story pertains to the issue of a potentially harmful state that at a cost citizens can take precautions against. Let a state be  $\omega \in \Omega = \{b, n\}$ , where  $b$  is a bad state and  $n$  is a neutral state. The prior probability  $Pr(b) = \rho_o < \frac{1}{2}$  of the bad state is assumed to be small. The bad state is assumed to be neither contractable nor insurable, but a citizen can take an *ex ante* action  $a$  to offset the bad state. The bad state could be harm from GMO foods, mold in a house, or a health risk such as obesity or radiation from cell phones. Such issues are subject to both private and public politics. That is, citizens may take precautions on their own such as checking labels, avoiding products, or dieting, and through public politics they may take collective action to impose regulation.

A journalist in the news organization investigates the issue and obtains information about the state. The journalist privately observes a signal  $s \in \{\beta, \phi\}$ , where  $s = \beta$  signals the state  $b$  and  $s = \phi$  signals the state  $n$ . The relation between signals and states is given in the likelihood matrix in Figure 1, where the probability  $Pr(s = \beta | \omega = b) = q \in (\frac{1}{2}, 1)$  may be interpreted as the quality

of the news organization.

Figure 1

Likelihood Matrix

	Signal $s$	
State $\omega$	$\beta$	$\phi$
$b$	$q$	$1 - q$
$n$	$0$	$1$

A strategy of the journalist is what to report conditional on the signal observed. A pure strategy is a soft news report  $r \in \{\beta, \phi\}$ , and a mixed strategy is  $\sigma(s) = Pr(r = \beta | s)$ . A strategy may be interpreted as writing a story that suggests that  $s = \beta$  or  $s = \phi$  has been observed. Assume that  $\sigma(\beta) = 1$ , so the journalist always reports the  $r = \beta$  story when  $s = \beta$  is observed; i.e., the journalist prefers that citizens take precautions. Let  $\sigma(\phi) = \sigma$ , so if the journalist observes  $s = \phi$ , she reports the  $r = \beta$  story with probability  $\sigma$  and the  $r = \phi$  story with probability  $1 - \sigma$ . The choice of  $\sigma$  can be interpreted as the exercise by the journalist of the discretion granted by the news organization. As indicated below, the journalist will choose to exercise fully the discretion granted, in which case the bias in the news report is in effect chosen by the news organization. In this section, bias and discretion will be used synonymous, and in Section V.B the two will be distinguished. The actual bias in a story could be created through the mechanism studied by Groseclose and Milyo (2003); i.e., citing advocates of precautions.

The bias in this model can be given a number of interpretations. First, the journalist may prefer that citizens be alerted to the potential bad state and that they take precautions. After all,  $s = \phi$  could have come from the state  $\omega = \beta$ . This is the principal interpretation used here. Second, the journalist may have a bias in private or public politics in favor of precautions. Third, the journalist may want to be published, and a story based on a report  $r = \beta$  may make the front page, whereas a report  $r = \phi$  may be less newsworthy and relegated to the back pages. The journalist then may have an incentive to present a story  $r = \beta$  when  $s = \phi$ . Fourth, career concerns such as future assignments to important beats, appearances on news broadcasts and talk shows, and speech and book opportunities could motivate a journalist to structure a story that claims more than can be substantiated. The exercise of discretion and the resulting bias are modeled here as conscious choices of journalists, but as indicated above the journalist need not recognize that she is writing biased stories.

A citizen who receives a news report  $r$  has posterior beliefs  $\rho_\beta$  and  $\rho_\phi$  given by

$$\rho_\beta = Pr(b | r = \beta) = \frac{\rho_o(q + (1 - q)\sigma)}{\rho_o q + (1 - \rho_o q)\sigma} \in [\rho_o, 1]. \quad (1)$$

$$\rho_\phi = Pr(b | r = \phi) = \frac{\rho_o(1 - q)}{1 - \rho_o q} < \rho_o. \quad (2)$$

The probability  $\rho_\beta$  is greater than  $\rho_o$  when  $\sigma < 1$ , so the news report is informative even when biased. The probability  $\rho_\beta$  equals 1 for  $\sigma = 0$  and is decreasing in  $\sigma$ , so citizens are more skeptical of a news report  $r = \beta$  the more discretion the news organization grants its journalists. The news report  $r = \phi$  also is informative, but it is constant in  $\sigma$ . A higher quality news organization provides more confidence to citizens; i.e.,  $\rho_\beta$  is increasing in  $q$  and  $\rho_\phi$  is decreasing in  $q$ .

The probability of a news report  $r = \beta$  is  $Pr(r = \beta) = \rho_o q + (1 - \rho_o q)\sigma$ , which is increasing in  $\sigma$ . If news reports  $r = \beta$  are more likely to be published, a journalist with career concerns or who wants to have impact has an incentive to exercise the discretion granted. A news organization that is willing to grant greater discretion to its journalists thus can have a higher probability of publishing a story  $r = \beta$  on the bad state. The higher probability of such a report may be interpreted as agenda setting by the news media.

### C. Citizens and Private Actions

Citizens have a demand for news not because of public politics but instead because of private politics. Citizens are assumed to have a quadratic utility function  $u(x) = x - \alpha x^2$ ,  $x \in \mathfrak{R}$ , where  $\alpha$  reflects risk aversion. A citizen can take precautions  $a$  against the possibility of the bad state, and if he does not take precautions, he incurs a loss  $b$  in the bad state but no loss in the neutral event. The expected utility  $EU(I; \rho_i, \alpha)$  of a citizen with risk aversion  $\alpha$  is

$$EU(I; \rho_i, \alpha) = \rho_i(-b + Ia) - \alpha \rho_i(b - Ia)^2 - cIa,$$

where  $a = b$ ,  $I \in \{0, 1\}$  is an indicator variable,  $i \in \{o, \beta, \phi\}$ , and  $c \in (\rho_o, 1)$  is the cost of acting; i.e., taking precautions.<sup>12</sup> A citizen who takes precautions ( $I = 1$ ) protects against the bad state and thus gains if  $\omega = b$  and loses if  $\omega = \phi$ .

Citizens differ in their risk aversion  $\alpha$ , and let  $F(\alpha)$  denote the distribution function and  $f(\alpha)$  the corresponding density function, where the number of citizens is normalized to 1. Citizens with

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<sup>12</sup> If  $c \geq 1$ , no citizen would act even if the state  $\omega = b$  were certain. If  $\rho_o \geq c$ , every citizen would act based on prior information and in the model the journalist would have no reason to investigate the issue.

high risk aversion ( $\alpha$  high) are more inclined to take precautions, whereas citizens with low risk aversion ( $\alpha$  low) are more inclined to bear the risk. If, for example, the bad state is that GMO foods are harmful, high risk aversion citizens would avoid such foods and low risk aversion citizens would not.

The sequence of actions in the basic game is as follows. Nature draws the state, and the news organization chooses the price for a subscription, the discretion to allow its journalists, and the wage to offer to journalists. The journalists then either accept or reject the employment offer. Citizens then may subscribe to the news organizations' publication, and subscription decisions are based on rational expectations of the discretion granted to journalists. That discretion may be part of the reputation of the news organization. The journalist then observes a signal  $s \in \{\beta, \phi\}$  and chooses her news report  $r \in \{\beta, \phi\}$ . Rather than model how a news report might spill over to non-subscribers, only subscribers are assumed to have access to the news report. Given the report, subscribers act based on their posterior beliefs, and non-subscribers act based on their prior beliefs. None of the players can commit to future actions, and the equilibrium concept is perfect Bayes.

#### D. The Demand for News

Given their prior information some citizens act and others do not. Citizens with  $\alpha$  satisfying  $\rho_o(1 + \alpha b) \geq c$  act, and the citizen  $\alpha^{oo}$  who is indifferent between acting and not acting is defined by

$$\alpha^{oo} = \frac{c - \rho_o}{\rho_o b} > 0. \quad (3)$$

More risk averse citizens act, and less risk averse citizens do not. Fewer citizens act the higher the cost  $c$ , whereas more citizens act the more serious (higher  $b$ ) the bad state.

If a low risk aversion citizen ( $\alpha < \alpha^{oo}$ ) subscribes and receives the report  $r = \beta$ , he prefers to act if  $\rho_\beta(1 + \alpha b) \geq c$ , or if

$$\alpha \geq \alpha_L \equiv \max\left\{0, \frac{c - \rho_\beta}{\rho_\beta b}\right\}, \quad (4)$$

where  $\rho_\beta$  is given in (1). Those citizens with  $\alpha \in [\alpha_L, \alpha^{oo}]$  thus prefer to act based on a report  $r = \beta$ , and if  $\rho_\beta \geq c$ , all low risk-aversion citizens prefer to act. The bound  $\alpha_L$ , when positive, is strictly decreasing in the quality  $q$  of the news service, the seriousness of the bad state, and the prior probability  $\rho_o$  and strictly increasing in the cost  $c$  of acting.

The bound  $\alpha_L$  is strictly increasing in  $\sigma$  when  $\alpha_L > 0$ , so greater bias (discretion) results in skepticism, and hence fewer citizens prefer to take precautions. In the limit as  $\sigma \rightarrow 1$ ,  $\alpha_L \rightarrow \alpha^{oo}$ . When discretion is low,  $\alpha_L = 0$  and all citizens take precautions based on  $r = \beta$ , but for  $\sigma$  higher

some citizens are sufficiently skeptical not to act.<sup>13</sup>

A high risk aversion citizen ( $\alpha > \alpha^{oo}$ ) who receives a report  $r = \phi$  may not take precautions, whereas she would have acted based on prior information. Define the indifferent type  $\alpha_H$  by  $\rho_\phi(1 + \alpha_H b) \equiv c$ , or

$$\alpha_H = \frac{c - \rho_\phi}{\rho_\phi b} > \alpha^{oo}, \quad (5)$$

where  $\rho_\phi$  is given in (2). A type  $\alpha \in (\alpha^{oo}, \alpha_H)$  prefers not to take precautions given  $r = \phi$ , whereas a type  $\alpha > \alpha_H$  prefers to act based on prior information as well as on the report  $r = \phi$ . The bound  $\alpha_H$  is independent of the discretion  $\sigma$ , since discretion is exercised when  $s = \phi$  whether that signal was due to the state  $\omega = b$  or  $\omega = n$ . The bound  $\alpha_H$  is strictly increasing in  $c$  and in the quality  $q$  of the news organization and strictly decreasing in  $b$  and the prior probability  $\rho_o$ .

Figure 2 illustrates responses by citizens to news reports. Citizens with  $\alpha \in (\alpha_L, \alpha_H)$  prefer to change their actions based on one of the news reports and hence benefit from the publication. Those with  $\alpha \in (\alpha_L, \alpha^{oo}]$  prefer to take precautions based on a news report  $r = \beta$ , and those with  $\alpha \in (\alpha^{oo}, \alpha_H)$  prefer not to act based on a report  $r = \phi$ . The potential demand for the publication then is  $F(\alpha_H) - F(\alpha_L)$ , which is increasing in the quality  $q$  of the investigation and decreasing in the bias.

Citizens must subscribe to the publication to receive the news report, and whether a citizen subscribes depends of his *ex ante* expected surplus from actions based on the news reports. The *ex ante* surplus  $S_H(\alpha)$  for an  $\alpha \in [\alpha^{oo}, \alpha_H)$  citizen is

$$\begin{aligned} S_H(\alpha) &= Pr(r = \beta)EU(1; \rho_\beta, \alpha) + Pr(r = \phi)EU(0; \rho_\phi, \alpha) - EU(1; \rho_o, \alpha) \\ &= (1 - \sigma)(1 - \rho_o q)b[c - \rho_\phi(1 + \alpha b)], \end{aligned}$$

which is positive for  $\sigma < 1$ , since  $(1 + \alpha b)\rho_\phi < c$ . The surplus is strictly decreasing in  $\alpha$ , since more risk averse citizens are closer to acting based on  $r = \phi$  and hence have less to gain from the news report. That is, those with a stronger demand for news have risk aversion closer to  $\alpha^{oo}$  and would not take precautions based on a news report that changed their beliefs only slightly. The surplus  $S_H(\alpha)$  is strictly decreasing in  $\sigma$  (i.e.,  $\frac{dS_H(\alpha)}{d\sigma} = -\frac{S_H(\alpha)}{1 - \sigma}$ ), so a biased report is less valuable to the citizen. Since  $\frac{\partial^2 S_H}{\partial \sigma \partial \alpha} > 0$ , more risk averse citizens are more tolerant of bias.

The *ex ante* surplus  $S_L(\alpha)$  for a citizen with  $\alpha \in [\alpha_L, \alpha^{oo}]$  is

$$\begin{aligned} S_L(\alpha) &= Pr(r = \beta)EU(1; \rho_\beta, \alpha) + Pr(r = \phi)EU(0; \rho_\phi, \alpha) - EU(0; \rho_o, \alpha) \\ &= -cb(\rho_o q + (1 - \rho_o q)\sigma) + b(1 + \alpha b)\rho_o(q + \sigma(1 - q)). \end{aligned} \quad (7)$$

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<sup>13</sup> The bound  $\sigma^o$  is given by  $\sigma^o = \frac{\rho_o q(1 - c)}{c - \rho_o + \rho_o q(1 - c)} > 0$ .

This surplus is zero for  $\alpha = \alpha_L$  and is increasing in  $\alpha$ . Moreover,  $\frac{d^2 S_L(\alpha)}{d\alpha d\sigma}$  is positive, so more risk averse citizens are more tolerant of bias. The surplus  $S_L(\alpha)$  is decreasing in  $\sigma$  for  $\alpha \in [\alpha_L, \alpha^{oo}]$ .<sup>14</sup>

The surplus  $S(\alpha)$  of citizens then is

$$S(\alpha) = \begin{cases} S_L(\alpha) & \text{if } \alpha \in [\alpha_L, \alpha^{oo}] \\ S_H(\alpha) & \text{if } \alpha \in (\alpha^{oo}, \alpha_H]. \end{cases}$$

This  $S(\alpha)$  is continuous in  $\alpha$  and is continuously differentiable in  $\sigma$  with

$$\frac{dS(\alpha)}{d\sigma} = -(1 - \rho_o q)(c - (1 + \alpha b)\rho_\phi),$$

which is negative for  $\alpha \in (\alpha_L, \alpha_H)$ . The set of citizens who gain from a subscription thus contracts in  $\sigma$ , since citizens are more skeptical the greater is the bias. Conversely, the higher the quality  $q$  of the news investigation the larger is the set of citizens who gain from subscribing.

## V. A Profit-Maximizing News Organization

### A. Pricing

The revenue of the news organization is assumed to come from subscriptions, for which a price  $p$  is charged. The news organization may also obtain revenue from advertising, where advertising rates correspond to the number of subscribers. The subscription price and the frequency of advertisements reduce the audience, and rather than incorporate both into the model, only the price will be considered.<sup>15</sup> In this section the bias  $\sigma$  is assumed to be fixed, and in the following section it is chosen by the news organization.

If the news organization charges a price  $p$  for a subscription, high risk aversion types with  $\alpha \in (\alpha^{oo}, \hat{\alpha}_H]$  subscribe, where  $\hat{\alpha}_H$  is defined by

$$S_H(\hat{\alpha}_H) - p \equiv 0, \tag{8}$$

for  $p < S_H(\alpha^{oo})$  or

$$\hat{\alpha}_H = \max \left\{ \alpha^{oo}, \frac{(1 - \sigma)b(c(1 - \rho_o q) - \rho_o(1 - q)) - p}{(1 - \sigma)\rho_o(1 - q)b^2} \right\}. \tag{9}$$

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<sup>14</sup> The derivative is

$$\frac{dS_L(\alpha)}{d\sigma} = b(1 - \rho_o q)(-c + \rho_\phi(1 + \alpha b)),$$

which is negative from (5).

<sup>15</sup> In an advertising model if the frequency of advertisements is denoted by  $\tau$  and the citizen's disutility of being confronted with advertisements is  $\xi$ , then in (8) below  $\tau\xi$  replaces  $p$ . Then, if  $\zeta$  is the advertising rate,  $\tau\zeta$  replaces  $p$  in (11) below.

The bound  $\hat{\alpha}_H$  on the set of high risk aversion subscribers is strictly decreasing in  $p$  and in  $\sigma$ . For  $p = 0$ ,  $\hat{\alpha}_H = \alpha_H$ , so when  $p > 0$ , citizens with  $\alpha \in [\alpha^{oo}, \hat{\alpha}_H]$  do not take precautions when  $r = \phi$ .

For low risk aversion citizens let  $\hat{\alpha}_L$  denote the lowest type that subscribes, where

$$\hat{\alpha}_L \equiv \max \left\{ 0, \frac{p - b(\rho_o(q + \sigma(1 - q)) - c(\rho_o q + (1 - \rho_o q)\sigma))}{b^2 \rho_o(q + \sigma(1 - q))} \right\}. \quad (10)$$

This is zero for low  $p$  and low  $\sigma$  and is increasing in  $p$ , so the set  $[\hat{\alpha}_L, \hat{\alpha}_H]$  of subscribers to the publication contracts in  $p$ . If  $\hat{\alpha}_L > 0$ , the derivative  $\frac{\partial \hat{\alpha}_L}{\partial \sigma}$  is positive, so an increase in bias reduces demand among low risk aversion citizens.

The number of subscribers is  $F(\hat{\alpha}_H) - F(\hat{\alpha}_L)$ , and Figure 3 illustrates the set of subscribers at a price  $p$ . The profit  $\pi$  of the news organization is

$$\pi = (p - w)(F(\hat{\alpha}_H) - F(\hat{\alpha}_L)) - K, \quad (11)$$

where  $w$  is the wage rate of journalists, the short-run production function is assumed to be Leontief with one unit of labor required for each subscription, and  $K$  is a fixed cost. This technology is to be interpreted as reflecting the hiring of a number of journalists to write various stories, where to simplify the notation only one story with the information structure in Figure 1 is represented. This technology may be representative of a news organization that writes their own stories (rather than relying on stories from the Associated Press, Reuters, or other news services) as the number of readers increases. An alternative technology is considered in Section V.D. The fixed costs explain why the number of news organizations in a market is small.

The optimal price  $p^*$  satisfies the first-order condition (for  $\hat{\alpha}_L$  and  $\hat{\alpha}_H$  differentiable at  $p^*$ )

$$\frac{d\pi}{dp} \Big|_{p=p^*} = F(\hat{\alpha}_H) - F(\hat{\alpha}_L) + (p^* - w) \left[ f(\hat{\alpha}_H) \frac{d\hat{\alpha}_H}{dp} - f(\hat{\alpha}_L) \frac{d\hat{\alpha}_L}{dp} \right] = 0. \quad (12)$$

The first term in (12) is positive, and the second is negative. For the case of a uniform distribution on  $[0, \bar{\alpha}]$ , where  $\bar{\alpha} > \alpha_H$ , the first-order condition is

$$\hat{\alpha}_H - \hat{\alpha}_L + (p^* - w) \left[ \frac{d\hat{\alpha}_H}{dp} - \frac{d\hat{\alpha}_L}{dp} \right] = 0, \quad (13)$$

and the second-derivative is

$$\frac{d^2\pi}{dp^2} = 2 \left( \frac{d\hat{\alpha}_H}{dp} - \frac{d\hat{\alpha}_L}{dp} \right) < 0.$$

The condition in (13) is linear in  $p$ , and the optimal price  $p^*$ , when  $\hat{\alpha}_L > 0$ , is<sup>16</sup>

$$p^* = \frac{1}{2} (cbq(1 - \rho_o)(1 - \sigma) + w). \quad (14)$$

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<sup>16</sup> If  $\hat{\alpha}_L = 0$  at the optimal price, then  $p^* = \frac{1}{2} (w + (1 - \sigma)b(c(1 - \rho_o q) - \rho_o(1 - q)))$ .

The optimal price is linear and strictly decreasing in  $\sigma$ , so the news organization sets a lower price when it provides more discretion to its journalists. This results because citizens are more skeptical of the news the more discretion is allowed, so the news organization lowers its price to offset some of the decrease in demand. Conversely, the higher the quality  $q$  of the news organization's investigation, the higher is the price, since the signal  $s = \phi$  is less likely. The price is also increasing in  $c$ , since the higher is the cost of taking precautions the greater is the demand for information. Similarly, the more serious (higher  $b$ ) the bad state the greater is the demand for information, allowing the news organization to set a higher price. The price is decreasing in  $\rho_o$  because citizens are more likely to act in the absence of a subscription the higher is  $\rho_o$ .

With a uniform distribution the number  $N$  of subscribers is, when  $\hat{\alpha} > 0$ ,

$$N = \frac{1}{\hat{\alpha}}(\hat{\alpha}_H - \hat{\alpha}_L) = \frac{p^* - w}{\bar{\alpha}b^2\rho_o(1-q)(q + \sigma(1-q))(1-\sigma)}. \quad (15)$$

This is strictly increasing in  $c$  and is increasing in  $b$  if

$$cbq(1 - \rho_o)(1 - \sigma) > w > \frac{1}{2}cbq(1 - \rho_o)(1 - \sigma).$$

Subscriptions are decreasing in  $\rho_o$ , since citizens are more likely to act based on their prior information. Subscriptions are increasing in the quality  $q$  of the news organization, since higher quality news is more valuable. An increase in the discretion  $\sigma$  granted by the news organization decreases subscriptions.<sup>17</sup>

The news organization will operate if its profit is nonnegative, which requires that  $p^* \geq w$  or

$$p^* - w = \frac{1}{2}(cbq(1 - \rho_o)(1 - \sigma) - w) \geq 0. \quad (16)$$

The profit  $\pi^*$  is

$$\pi^* = \frac{(p^* - w)^2}{\bar{\alpha}b^2\rho_o(1-q)(q + \sigma(1-q))(1-\sigma)} - K. \quad (17)$$

This is strictly increasing in  $c$  and  $b$ , since information is more valuable to citizens the more costly are precautions and the more serious is the bad state. Profit is also strictly increasing in the quality  $q$ , since the news report is then more valuable to citizens and the news organization can capture

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<sup>17</sup> The derivative holding  $w$  fixed is

$$\frac{\partial(\hat{\alpha}_H - \hat{\alpha}_L)}{\partial\sigma} = -\frac{cbq(1 - \rho_o)(1 - q)(1 - \sigma)^2 + w(2q + 2\sigma(1 - q) - 1)}{2b^2\rho_o(1 - q)(q + \sigma(1 - q))^2(1 - \sigma)^2} < 0.$$

some of that value. The greater is the prior probability  $\rho_o$ , however, the lower are profits, since citizens are more likely to take precautions in the absence of a news report.

## B. Journalistic Discretion and the Labor Market

To produce news reports, the news organization must hire journalists. The labor market is assumed to have a large supply of people who are both qualified to be journalists and have preferences over wages and influence, where influence will be measured by the probability of causing citizens to change their behavior toward taking precautions.<sup>18,19</sup> That is, journalists prefer to lead citizens to take greater precautions, and the discretion allowed by a news organization provides the opportunity to do so. A journalist thus may play the role of a private politics activist.

An alternative but similar perspective on the preferences of journalists comes from career concerns. To advance and obtain broader opportunities, a journalist must be published.<sup>20</sup> If stories about the bad state are more likely to be published than stories about the neutral state, bias increases the probability of being published. The exercise of discretion could be restrained by professionalism, but to focus on the sources of media bias professionalism will not be included in the model.

The discretion exercised by the journalist is  $\sigma$ , which can be no greater than the discretion  $\bar{\sigma}$  allowed by the news organization. The discretion  $\bar{\sigma}$  is assumed to be known at the time the journalists are hired, and in this section the news organization is assumed to enforce credibly the bound  $\bar{\sigma}$ . In a later section, this assumption is relaxed. The journalist chooses  $\sigma$  after the news organization chooses its price and discretion and after citizens have made their subscription decisions (based on  $\bar{\sigma}$ ), so the only effect of the exercise of discretion by the journalist is on the probabilities of  $r = \beta$  and  $r = \phi$ . The journalist's preferences are a function of the exercise of discretion on those probabilities.

The incremental probability that a report  $r = \beta$  leads to action ( $I = 1$ ) due to the exercise of discretion by the journalist is

$$Pr_{\bar{\sigma}=\sigma}(r = \beta) - Pr_{\bar{\sigma}=0}(r = \beta) = \rho_o q + (1 - \rho_o q)\sigma - \rho_o q = (1 - \rho_o q)\sigma,$$

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<sup>18</sup> Other occupations such as politicians, activists, teachers, clergy, etc. may also attract those who seek influence.

<sup>19</sup> Bovitz, Druckman, and Lupia take a similar perspective on the preferences of journalists.

<sup>20</sup> Zaller (1999, p. 21) wrote, "career success means producing stories that make it onto the front page or get lots of airtime on the evening news, from whence flow fat salaries, peer respect, and sometimes a degree of celebrity status."

where  $Pr_{\bar{\sigma}=j}(r = \beta) = \rho_o q + (1 - \rho_o q)j$ ,  $j \in \{0, \sigma\}$ .<sup>21</sup> The probability  $\eta(\sigma)$  of influence by leading citizens to act through the exercise of journalistic discretion thus is

$$\eta(\sigma) = (1 - \rho_o q)\sigma.$$

Assuming for simplicity a linear utility function, once hired at a wage  $w$  a journalist maximizes her utility  $u$ ,

$$u = w + (1 - \rho_o q)v\sigma,$$

subject to the constraint  $\sigma \leq \bar{\sigma}$ . The journalist thus chooses  $\sigma^* = \bar{\sigma}$  and fully exercises the discretion granted. A potential journalist will accept a position if

$$w + \eta(\bar{\sigma})v \geq w_o,$$

where  $w_o$  is the wage premium above the subsistence wage in the outside labor market for jobs without influence and  $v$  is the marginal rate of substitution between influence and wages.<sup>22</sup> Since the supply of journalists exceeds the demand, the wage  $w(\bar{\sigma})$  offered by the news organization is

$$w(\bar{\sigma}) = w_o - (1 - \rho_o q)v\bar{\sigma}. \quad (18)$$

The news organization thus captures the gain to the journalist from the exercise of discretion. With the career concerns interpretation, the news organization captures only the value of future outside opportunities, such as appearances on news broadcasts and talk shows and speech and book opportunities.

A news organization can attract journalists at lower wages the more discretion it allows them. Conversely, a news organization that provides little discretion to its journalists must pay a higher wage. If discretion is a function of editorial controls, as considered in a following section, a news organization that monitors less frequently can attract journalists at a lower wage.

The news organization chooses its discretion  $\bar{\sigma}$  to maximize its profit  $\pi^*$  in (17) (with  $\bar{\sigma}$  replacing  $\sigma$ ) with the wage  $w = w(\bar{\sigma})$  given in (18). This is subject to the constraint that  $w(\bar{\sigma}) \geq 0$ , which implies an upper bound  $\bar{\sigma}_w$  on the discretion given by

$$\bar{\sigma}_w \equiv \frac{w_o}{(1 - \rho_o q)v}.$$

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<sup>21</sup> That is, the journalist cares not about how many citizens act but instead about how many act as a consequence of her contribution  $\sigma$ .

<sup>22</sup> The subsistence level is set to zero to simplify the notation.

The first-order condition for the maximization of profit  $\pi^*$  yields

$$\begin{aligned}\bar{\sigma}^* &= \frac{-cbq(1 - \rho_o) - w_o(2q - 1) + 2(1 - \rho_oq)vq}{-cbq(1 - \rho_o) + (2q - 1)(1 - \rho_oq)v + 2w_o(1 - q)} \\ &= 1 - \frac{w_o - (1 - \rho_oq)}{-cbq(1 - \rho_o) + (2q - 1)(1 - \rho_oq)v + 2w_o(1 - q)}.\end{aligned}\tag{19}$$

If  $\bar{\sigma}^*$  is an interior optimum, the second-order condition

$$-\frac{1}{2}cbq(1 - \rho_o) + w_o(1 - q) + (q - \frac{1}{2})(1 - \rho_oq)v < 0$$

must be satisfied. The discretion is no greater than one only if  $w(1) = w_o - (1 - \rho_oq)v \geq 0$ , which implies that for  $\bar{\sigma}^* < 1$  the marginal rate of substitution  $v$  must be less than  $\frac{w_o}{(1 - \rho_oq)}$ .<sup>23</sup> Conversely, in this model media bias is present only if  $v$  is large ( $v > \frac{w_o}{1 - \rho_oq}$ ). Moreover,  $\bar{\sigma}^*$  in (19) is non-negative only if  $p^*(0) - w_o < q(w_o - (1 - \rho_oq))$ , which suggests that the price  $p^*(0)$  must be less than the wage premium. This suggests that the equilibrium will likely be  $\bar{\sigma}^* = \bar{\sigma}_w$  or  $\bar{\sigma}^* = 0$ .

A numerical example will be used to illustrate this point. Let the parameter values be:  $c = 0.7, b = 40, q = 0.9, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 10, v = 26, K = 0.01$ . The equilibrium then has  $p^* = 6.547$  and  $\bar{\sigma}^* = \bar{\sigma}_w = 0.423$ . Citizens sort according to the cut points  $\hat{\alpha}_L = 0.107, \hat{\alpha}_H = 0.859$ , where  $\alpha^{oo} = 0.150$ . The wage premium is  $w(\bar{\sigma}^*) = 0$ , and profits are  $\pi^* = 1.221$ . If, however,  $v = 15$ , the optimal discretion is  $\bar{\sigma}^* = 0$ .

### C. Internal Organization

In addition to incentives associated with influence and career concerns, the exercise of discretion by a journalist may depend on factors such as professional standards and personal integrity. It also may depend on the internal organization of the news organization. Suppose the news organization consists of an editor and a journalist, where the editor monitors the news stories of the journalist. Monitoring could be *ex ante* or *ex post*. *Ex ante* monitoring would require the editor to check the content of news reports before publication, but such monitoring would likely be limited by time pressures and deadlines, so the monitoring considered here is *ex post*; i.e., after the story has been published.<sup>24</sup>

The editor monitors only when  $r = \beta$ , since a news report  $r = \phi$  does not involve bias. Consider the case in which at the time the journalist is hired the news organization can commit to monitoring with probability  $h$ . If bias is successfully detected with probability  $k$ , assume that

<sup>23</sup> This condition also implies that  $\bar{\sigma}_w \geq 1$ .

<sup>24</sup> For example, *The New York Times* detected fabrication by Jason Blair only after many of his news reports had been published.

the editor can impose a penalty  $g$ , which could be in terms of future assignments for the journalist or damage to her reputation. After accepting a job at the wage  $w$ , the utility  $u$  of the journalist given the editor's monitoring policy is

$$u = w + (1 - \rho_o q)v\sigma - hkg\sigma,$$

where the journalist chooses  $\sigma$ .<sup>25</sup>

For the purpose of illustration, suppose the utility  $u$  of the journalist is

$$u = w + V((1 - \rho_o q)\sigma) - hkg\sigma,$$

where  $V((1 - \rho_o q)\sigma) = \nu((1 - \rho_o q)\sigma)^{\frac{1}{2}}$  and  $\nu$  is a positive constant. The journalist's response function  $\hat{\sigma}^*$  is

$$\hat{\sigma}^* = (1 - \rho_o q) \left( \frac{\nu}{2hkg} \right)^2,$$

which is decreasing in  $h$ ,  $g$ , and  $k$ . The news organization thus can structure the incentives of the journalist to influence her reporting.

The profit  $\pi^*$  of the news organization is then

$$\pi^* = \frac{(p^* - w(\hat{\sigma}^*))^2}{\bar{\alpha}b^2\rho_o(1 - q)(q + \hat{\sigma}^*(1 - q))(1 - \hat{\sigma}^*)} - K - t(h), \quad (20)$$

where  $t(h)$  is the cost of monitoring. The news organization then chooses  $h$  to maximize  $\pi^*$  in (20).

#### D. An Alternative News Technology

The short-run production technology for news has been assumed to require one unit of labor per unit of demand. An alternative assumption is that a news report requires one journalist regardless of the number of citizens who subscribe to the publication. This reflects the public goods nature of information and increasing return to scale. A news organization with this technology can be thought of as one that does not increase its own reporting as its readership increases.

The profit of the news organization is

$$\pi = (p - \kappa)(F(\hat{\alpha}_H) - F(\hat{\alpha}_L)) - w - K,$$

where  $\kappa$  is the marginal cost of a subscription. The journalist will choose  $\sigma = \bar{\sigma}$ , so the bias is determined by the discretion granted by the news organization. For  $F$  uniform the optimal price

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<sup>25</sup> Citizens are assumed to have rational expectations of the journalist's choice of  $\sigma$ .

is

$$p^* = \frac{1}{2}(cbq(1 - \rho_o)(1 - \bar{\sigma}) + \kappa),$$

and the profit excluding the wage is given in (17) with  $\kappa$  replacing  $w$ . This profit is strictly decreasing in  $\bar{\sigma}$ , so the news organization will grant discretion only if  $w$  is decreasing in  $\bar{\sigma}$ .

The derivative of profit with respect to  $\bar{\sigma}$  is

$$\frac{d\pi^*}{d\bar{\sigma}} = -\frac{(p^* - \kappa)(p^* - \kappa + \kappa(q + \bar{\sigma}(1 - q)))}{\bar{\alpha}b^2\rho_o(1 - q)(q + \bar{\sigma}(1 - q))^2(1 - \bar{\sigma})^2} + (1 - \rho_oq)v.$$

Evaluated at  $\bar{\sigma} = 0$ , the derivative is positive for  $v$  sufficiently large. Bias thus can persist when the journalist is a fixed cost.

### E. Overreaction

Bias in news reports leads to skepticism, which reduces the number of citizens who take precautions, but the likelihood that the news report will be  $r = \beta$  increases because of bias, leading more citizens to act. As shown in the Appendix the exercise of discretion by the journalist increases the number of citizens who act, so the public overreacts as a result of journalist's bias. A journalist who seeks influence thus causes more people to act through the exercise of the discretion granted by the news organization.

Granting discretion, however, is an *ex ante* decision of the news organization, and for  $F$  uniform the expected number of citizens who take precautions as a result of news reporting is  $A = 1 - \hat{\alpha}_L Pr(r = \beta) - \hat{\alpha}_H Pr(r = \phi)$ . The derivative with respect to the discretion  $\bar{\sigma}$  is

$$\frac{dA}{d\bar{\sigma}} = -\frac{d\hat{\alpha}_L}{d\bar{\sigma}} + (\hat{\alpha}_H - \hat{\alpha}_L) - (1 - \rho_oq)(1 - \bar{\sigma})\frac{d(\hat{\alpha}_H - \hat{\alpha}_L)}{d\bar{\sigma}}.$$

The first term is negative and the other two terms are positive. Numerical evaluations suggests that the derivate is positive.

Consequently, from an *ex ante* perspective the grant of discretion by the news organization can increase the expected number of citizens taking precautions. The public thus overreacts as a result of media discretion and bias. The journalist thus expects to lead citizens to take greater precautions when she accepts employment with the news organization.

## VI. The News Media and Public Politics

The model involves private actions by citizens, but it may be possible to substitute public action for private actions. For example, a government could ban foods containing genetically-modified organisms or require labeling. The median voter model will be used to illustrate public

politics. With collective choice only the median voter has an incentive to subscribe to the news organization's publication, so the demand for the publication is problematic. To investigate the role of the news media in public politics, all citizens will be assumed to have access to the publication.

To represent public politics, let  $a \in \mathfrak{R}^+$  denote the level of public regulation to be chosen collectively, where  $c$  is now interpreted as the marginal cost of regulation to each citizen. The collective choice is assumed to be determined by the median citizen, whose ideal regulation  $\hat{a}_m(r = i)$  given a news report  $r = i$  is

$$\hat{a}_m(r = i) = b - \frac{c - \rho_i}{2\alpha_m\rho_i}, \quad i = \beta, \phi,$$

where  $\alpha_m$  is the risk aversion of the median citizen.<sup>26</sup> This is increasing in  $\rho_i$ , and  $\rho_\beta$  is decreasing in  $\bar{\sigma}$ , so discretion and bias result in less stringent regulation when  $r = \beta$ . That regulation, however, occurs with a higher probability of  $\bar{\sigma}(1 - \rho_oq)$  due to bias. When  $r = \phi$ , regulation is unaffected by the bias, but that report occurs with a lower probability  $\bar{\sigma}(1 - \rho_oq)$ . Media bias thus yields (weakly) less stringent regulation, but the more stringent regulation  $\hat{a}_m(r = \beta)$  occurs with higher probability and the less stringent regulation  $\hat{a}_m(r = \phi)$  with lower probability.

The expected regulation is

$$\begin{aligned} E(\hat{a}_m(\cdot)) &= (\rho_oq + (1 - \rho_oq)\bar{\sigma})\hat{a}_m(r = \beta) + (1 - \rho_oq)(1 - \bar{\sigma})\hat{a}_m(r = \phi) \\ &= b + (\rho_oq + (1 - \rho_oq)\bar{\sigma})\frac{\rho_\beta - c}{\alpha_m\rho_\beta} + (1 - \rho_oq)(1 - \bar{\sigma})\frac{\rho_\phi - c}{\alpha_m\rho_\phi}. \end{aligned}$$

This is strictly increasing in  $\bar{\sigma}$ , so the tolerance of media bias by the news organization increases the expected level of regulation.<sup>27</sup> Media bias thus results in more stringent expected regulation.

## VII. Media Bias and Competition

Bias results in skepticism on the part of citizens, and that skepticism reduces the demand for news. Despite the skepticism a profit-maximizing news organization tolerates bias because doing so allows journalists to be hired at a lower wage. Competition, however, could drive out

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<sup>26</sup> Since  $c > \rho_o \geq \rho_\phi$ , higher risk aversion citizens prefer more stringent regulation when  $r = \phi$  (because  $\hat{a}_m < b$ ). The same is true for  $r = \beta$  if  $\rho_\beta < c$ , but if  $\rho_\beta > c$ , higher risk aversion citizens prefer less stringent regulation (because  $\hat{a}_m > b$ ).

<sup>27</sup> The derivative is

$$\frac{dE(\hat{a}_m(\cdot))}{d\bar{\sigma}} = \frac{cq^2(1 - \rho_o)^2}{2\alpha_m\rho_o(1 - q)(q + (1 - q)\bar{\sigma})^2} > 0.$$

bias. This section considers two news organizations with like-oriented biases competing for subscriptions, where citizens choose between publications based on prices and their reputations for bias. The journalists from each news organization conduct independent investigations, and hence obtain independent signals. To simplify the analysis and focus on the exercise of discretion, both investigations are assumed to be of the same quality  $q$ .

To explore the effect of media competition, let one organization have discretion  $\bar{\sigma}_1$  and the other  $\bar{\sigma}_2$ , where  $\bar{\sigma}_1 < \bar{\sigma}_2$ , and assume that a citizen subscribes to only one publication. The difference in the surpluses for the two news organizations for  $\alpha > \alpha^{oo}$  is<sup>28,29</sup>

$$S_H(\alpha; \sigma_1) - S_H(\alpha; \sigma_2) = (\sigma_2 - \sigma_1)(1 - \rho_o q)b [c - \rho_\phi(1 + \alpha b)]. \quad (21)$$

Letting  $p_i, i = 1, 2$ , be the price of a subscription to a publication, the citizen  $\alpha_H^o$  who is indifferent between purchasing from the two news organizations is identified by

$$S_H(\alpha_H^o; \sigma_1) - S_H(\alpha_H^o; \sigma_2) \equiv p_1 - p_2.$$

It is straightforward to show that there is no symmetric equilibrium. Consider a candidate equilibrium with  $\bar{\sigma}_1 = \bar{\sigma}_2$  and  $p_1 = p_2$ , where citizens subscribe randomly to one of the two publications. If news organization 1 lowers its price slightly to  $p'_1 < p_1$ , then

$$S_H(\alpha; \bar{\sigma}_1) - p'_1 > S_H(\alpha; \bar{\sigma}_2) - p_2.$$

News organization 1 thus captures all the demand, and the lower price has only a second-order effect on profit. With  $\bar{\sigma}_1 = \bar{\sigma}_2$  the news organizations thus compete on price until  $p_1 = p_2 = w_1 = w_2$ , but with fixed costs neither news organization is profitable.

With differentiated news  $S_H(\alpha_H^o; \bar{\sigma}_1) - S_H(\alpha_H^o; \bar{\sigma}_2) > 0$ , since  $\bar{\sigma}_2 > \bar{\sigma}_1$ . Consequently, in any equilibrium the price charged by the news organization with the greater bias is lower than the price charged by the news organization with the smaller bias. That is, the greater skepticism of citizens forces news organization 2 to lower its price. Lower quality news commands a lower price.

For a uniform distribution the indifferent citizen  $\alpha_H^o$  is<sup>30</sup>

$$\alpha_H^o = \frac{1}{\rho_\phi b^2} \left[ b(c - \rho_\phi) - \frac{p_1 - p_2}{(\bar{\sigma}_2 - \bar{\sigma}_1)(1 - \rho_o q)} \right].$$

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<sup>28</sup> A similar analysis can be given for  $\alpha < \alpha^{oo}$ . Multiple equilibria may exist.

<sup>29</sup> Note that  $\rho_\phi$  is the same for news reports  $r_i = \phi, i = 1, 2$ , from each news organization.

<sup>30</sup> For  $p_1 \geq p_2$ ,  $\alpha_H^o < \alpha_H$ .

To identify which citizens purchase from which news organizations, recall that  $\frac{\partial S_H}{\partial \bar{\sigma}}$  is increasing in  $\alpha$ . More risk averse citizens thus are more tolerant of bias, so citizens with  $\alpha > (<) \alpha_H^o$  purchase from the high (low) bias news organization. This is illustrated in Figure 4.

The indifferent type  $\alpha_H^o$  is increasing in  $p_2$  and decreasing in  $p_1$  reflecting the usual response of demand to changes in prices. Similarly,  $\alpha_H^o$  is increasing in  $\sigma_2$  and decreasing in  $\sigma_1$ , so the news organization loses subscriptions as it grants discretion.

For the initial technology the profit of each news organizations is strictly concave in its own price, so the prices that satisfy the first-order conditions are a Nash equilibrium, where the fixed costs are covered. The profits are

$$\pi_1 = (p_1 - w_1)(F(\alpha_H^o) - F(\hat{\alpha}_L)) - K$$

$$\pi_2 = (p_2 - w_2)(F(\hat{\alpha}_H) - F(\alpha_H^o)) - K,$$

where  $\hat{\alpha}_L$  is a function of  $(p_1, \bar{\sigma}_1)$  and  $\hat{\alpha}_H$  is a function of  $(p_2, \bar{\sigma}_2)$ .

Initially, let  $\bar{\sigma}_1$  and  $\bar{\sigma}_2$  be fixed. For prices such that  $\hat{\alpha}_L > 0$  the first-order conditions are<sup>31</sup>

$$\frac{\partial \pi_1}{\partial p_1} \Big|_{p_1=p_1^*} = F(\alpha_H^o) - F(\hat{\alpha}_L) + (p_1^* - w_1) \left( f(\alpha_H^o) \frac{\partial \alpha_H^o}{\partial p_1} - f(\hat{\alpha}_L) \frac{\partial \hat{\alpha}_L}{\partial p_1} \right) = 0 \quad (22)$$

$$\frac{\partial \pi_2}{\partial p_2} \Big|_{p_2=p_2^*} = F(\hat{\alpha}_H) - F(\alpha_H^o) + (p_2^* - w_2) \left( f(\hat{\alpha}_H) \frac{\partial \hat{\alpha}_H}{\partial p_2} - f(\alpha_H^o) \frac{\partial \alpha_H^o}{\partial p_2} \right) = 0, \quad (23)$$

where  $p_1^*$  and  $p_2^*$  are the equilibrium prices. The first-order conditions indicate that at an interior equilibrium the prices for both media organizations are greater than the wage, so both news organizations remain in the market provided that the fixed cost is not too high. Bias thus can persist with competition.

For  $F$  uniform the first-order conditions in (22) and (23) are linear in the prices, so it is possible to characterize an interior equilibrium in closed form. The equilibrium prices  $p_1^*$  and  $p_2^*$  are

$$p_1^* = \frac{1}{D} [2(1 - \bar{\sigma}_1)(bcq(1 - \rho_o)(\bar{\sigma}_2 - \bar{\sigma}_1) + w_1(q + \bar{\sigma}_2(1 - q)) + \frac{1}{2}w_2(q + \bar{\sigma}_1(1 - q)))],$$

$$p_2^* = \frac{1}{D} [(1 - \bar{\sigma}_2)(bcq(1 - \rho_o)(\bar{\sigma}_2 - \bar{\sigma}_1) + w_1(q + \bar{\sigma}_2(1 - q)) + 2w_2(1 - \bar{\sigma}_1)(q + \bar{\sigma}_2(1 - q)))],$$

where

$$D = 4(1 - \bar{\sigma}_1)(q + \bar{\sigma}_2(1 - q)) - (1 - \bar{\sigma}_2)(q + \bar{\sigma}_1(1 - q)).$$

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<sup>31</sup> The prices are strategic complements.

The prices are increasing in the wages, the severity  $b$  of the bad state, and the cost  $c$  of taking precautions. The prices are strictly decreasing in the prior probability  $\rho_o$ .

The demand  $Q_1^* = \frac{1}{\bar{\alpha}}(\alpha_H^o - \hat{\alpha}_L)$  for the publication of the low bias news organization is

$$Q_1^* = \frac{(p_1^* - w_1)(q + \bar{\sigma}_2(1 - q))}{\bar{\alpha}\rho_o(1 - q)b^2(q + \bar{\sigma}_1(1 - q))(\bar{\sigma}_2 - \bar{\sigma}_1)}$$

and the demand  $Q_2^* = \frac{1}{\bar{\alpha}}(\hat{\alpha}_H - \alpha_H^o)$  for the high bias organization is

$$Q_2^* = \frac{(p_2^* - w_2)(1 - \bar{\sigma}_1)}{\bar{\alpha}\rho_o(1 - q)b^2(1 - \bar{\sigma}_2)(\bar{\sigma}_2 - \bar{\sigma}_1)}.$$

The profits  $\pi_i^*$ ,  $i = 1, 2$ , of the two news organizations are then

$$\pi_1^* = \frac{(p_1^* - w_1)^2(q + \bar{\sigma}_2(1 - q))}{\bar{\alpha}\rho_o(1 - q)b^2(q + \bar{\sigma}_1(1 - q))(\bar{\sigma}_2 - \bar{\sigma}_1)} - K \quad (24)$$

and

$$\pi_2^* = \frac{(p_2^* - w_2)^2(1 - \bar{\sigma}_1)}{\bar{\alpha}\rho_o(1 - q)b^2(1 - \bar{\sigma}_2)(\bar{\sigma}_2 - \bar{\sigma}_1)} - K. \quad (25)$$

The profits are strictly increasing in the severity of the bad state and the cost of taking precautions, since information is then more valuable to citizens. Profits are decreasing in the outside wage  $w_o$ , since although an increase in  $w_o$  results in higher prices, the margin  $p_i^* - w_i$ ,  $i = 1, 2$ , decreases.<sup>32</sup> The profits of the two news organization cannot be ordered analytically, but an example is presented below that indicates that the organization that grants its journalists greater discretion has greater profits.

Next, suppose that the news organizations can choose the discretion granted to their journalists, where  $w_i = w_o - (1 - \rho_o q)v\sigma_i$ ,  $i = 1, 2$ . The derivative of the profit  $\pi_2^*$  in (25) for the second news organization, for example, is

$$\frac{d\pi_2^*}{d\bar{\sigma}_2} = \frac{(p_2^* - w_2) \left[ 2(1 - \bar{\sigma}_2)(\bar{\sigma}_2 - \bar{\sigma}_1) \left( \frac{dp_2^*}{d\bar{\sigma}_2} - \frac{dw_2}{d\bar{\sigma}_2} \right) - (1 - 2\bar{\sigma}_2 + \bar{\sigma}_1)(p_2^* - w_2) \right] (1 - \bar{\sigma}_1)}{\bar{\alpha}\rho_o(1 - q)b^2(1 - \bar{\sigma}_2)^2(\bar{\sigma}_2 - \bar{\sigma}_1)^2},$$

which is well-behaved suggesting that there could be an interior equilibrium  $\bar{\sigma}_i^*$  for at least one news organization. This is illustrated in the following example.

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<sup>32</sup> To see that  $\pi_2^*$  is decreasing in  $w_o$ , differentiate  $p_2^*$  to obtain

$$\frac{dp_2^*}{dw_o} = \frac{1}{D} [(1 - \bar{\sigma}_2)(q + \bar{\sigma}_2(1 - q)) + 2(1 - \bar{\sigma}_1)(q + \bar{\sigma}_2(1 - q))],$$

which is strictly less than one.

The equilibrium is then characterized by some combination of the first-order conditions and the labor market constraints  $w(\bar{\sigma}_i) \geq 0, i = 1, 2$ . An example will be used to illustrate this. The example also shows that the news organization that grants its journalists the greater discretion can have higher profits. Let the wages be given in (18) and the parameter values be:  $c = 0.7, b = 40, q = 0.9, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 10, v = 26, K = 0.01$ . The equilibrium then has  $p_1^* = 2.135, p_2^* = 1.006, \bar{\sigma}_1^* = 0.353, \bar{\sigma}_2^* = \sigma_w = 0.423$ . The wages are  $w_1 = 1.648$  and  $w_2 = 0$ . Citizens sort according to the cut points  $(\alpha_H^o = 0.554, \hat{\alpha}_L = 0.066, \hat{\alpha}_H = 1.459)$ , where  $\alpha^{oo} = 0.150$ . In this example, the second news organization chooses the maximal discretion and a low price, whereas the first news organization grants less discretion and sets a higher price. The profits are  $\pi_1^* = 0.0494$  and  $\pi_2^* = 0.2174$ , so the news organization with the greater bias has higher profits.<sup>33</sup> Bias thus can persist in competition and be profitable.

To show that greater bias is not always profitable, consider an example with the same parameter values as above with the exception that  $v = 10$ . The equilibrium discretions are  $\bar{\sigma}_1 = 0$  and  $\bar{\sigma}_2 = 0.549$ , and the profits are  $\pi_1^* = 0.530$  and  $\pi_2^* = 0.004$ .

## VIII. Competition with Opposing Biases

### A. Bias Toward Inaction

The above analysis considered news organizations with like-oriented biases and asked whether bias was consistent with profit maximization and could persist with competition. Competition could also come from a news organization with an opposing bias, where one news organization is biased toward greater precautions and the other biased toward fewer precautions. Journalists with orientations toward greater or fewer precautions then would sort between the two news organizations, where the orientations of journalists could be identified through interviews. Or, news organizations could have reputations for orientations in different directions. The assumption thus is that journalists sort consistently with the orientations of the two news organizations.

Let the news organization biased toward greater precautions be denoted by  $\Sigma$  and the other by  $\Gamma$ . Maintaining the same information structure as above, let the latter report  $r_\Gamma = \phi$  with probability one when  $s = \phi$  is observed and report  $r_\Gamma = \beta$  with probability  $\gamma$  when  $s = \beta$  is

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<sup>33</sup> Compared to the example with a single news organization, prices and profits are lower with competition and the average bias is lower.

observed.<sup>34</sup> If a citizen subscribes to news organization  $\Gamma$ , her posterior beliefs  $\rho_{j\Gamma}$ ,  $j = \beta, \phi$ , are

$$\rho_{\beta\Gamma} \equiv Pr(\omega = b \mid r_\Gamma = \beta) = 1$$

$$\rho_{\phi\Gamma} \equiv Pr(\omega = b \mid r_\Gamma = \phi) = \frac{\rho_o(1 - q(1 - \gamma))}{1 - \rho_o q(1 - \gamma)}.$$

The probability  $\rho_{\phi\Gamma}$  is strictly increasing in  $\gamma$ , since subscribers are more skeptical of a report  $r_\Gamma = \phi$  the more likely the journalist in news organization  $\Gamma$  is to bias her story.<sup>35</sup> The probability of a biased report is  $Pr(r_\Gamma = \phi) = 1 - \rho_o q(1 - \gamma)$ , which is increasing in  $\gamma$ , so bias results in fewer citizens acting relative to an unbiased news report.

The news organizations compete in terms of prices and the discretion granted to their journalists. Journalists will fully exercise the discretion granted, so the bias in stories is equal to the discretion. As in Section IV.B that discretion is  $\bar{\sigma}$  for  $\Sigma$ , and let  $\bar{\gamma}$  be the discretion for  $\Gamma$ . The surpluses for subscribers to  $\Gamma$  thus are a function of  $\bar{\gamma}$ .

When  $r_\Gamma = \beta$  is reported, all subscribers act, and if  $r_\Gamma = \phi$  is reported, all subscribers with  $\alpha > \alpha_{H\Gamma} \equiv \frac{c - \rho_{\phi\Gamma}}{\rho_{\phi\Gamma} b}$  act. The surplus  $S_{H\Gamma}(\alpha)$  for a citizen with  $\alpha \in [\alpha^{oo}, \alpha_{H\Gamma})$  is

$$\begin{aligned} S_{H\Gamma}(\alpha) &= (1 - \rho_o q(1 - \bar{\gamma}))b[c - \rho_{\phi\Gamma}(1 + \alpha b)] \\ &= b[c(1 - \rho_o q(1 - \bar{\gamma})) - \rho_o(1 - q(1 - \bar{\gamma}))(1 + \alpha b)], \end{aligned}$$

which is positive and decreasing in  $\alpha$  and  $\bar{\gamma}$ .<sup>36</sup> The surplus  $S_{L\Gamma}(\alpha)$  for a citizen with  $\alpha \in [0, \alpha^{oo}]$  is

$$S_{L\Gamma}(\alpha) = \rho_o q(1 - \bar{\gamma})b[1 + \alpha b - c] \geq 0,$$

which is increasing in  $\alpha$  and decreasing in  $\bar{\gamma}$ . The surplus  $S_\Gamma(\alpha)$  from a subscription is then

$$S_\Gamma(\alpha) = \begin{cases} S_{L\Gamma}(\alpha) & \text{if } \alpha \leq \alpha^{oo} \\ S_{H\Gamma}(\alpha) & \text{if } \alpha > \alpha^{oo}, \end{cases}$$

which is continuous and increasing (decreasing) in  $\alpha$  for  $\alpha < (>) \alpha^{oo}$ .

To determine the relative tolerance of citizens for bias  $\bar{\gamma}$ , note that

$$\frac{\partial^2 S_\Gamma(\alpha)}{\partial \bar{\gamma} \partial \alpha} = -\rho_o q b^2 < 0, \quad \forall \alpha \in [0, \alpha_{H\Gamma}).$$

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<sup>34</sup> Even if a citizen were to subscribe to both publications the information received would not reveal the true state with probability one. That is, if news organization  $\Gamma$  reported  $r_\Gamma = \phi$ , a citizen would not know the state with certainty.

<sup>35</sup> Note that  $\rho_{\phi\Gamma} = \rho_\phi$  if  $\gamma = 0$ .

<sup>36</sup> For  $\bar{\gamma} = 1$ , the set  $[\alpha^{oo}, \alpha_{H\Gamma}]$  is the singleton  $\{\alpha^{oo}\}$  and  $S_{H\Gamma}(\alpha^{oo}) = 0$ .

Less risk-averse citizens thus are more tolerant of bias toward fewer precautions. This indicates that the equilibrium is such that high risk aversion citizens subscribe to the news organization with a bias toward greater precautions and low risk aversion citizens subscribe to the news organization with a bias toward fewer precautions.

## B. Competition

Citizens are assumed to subscribe to only one publication. The differences in the surpluses  $S_{H\Gamma} - S_{H\Sigma}$  and  $S_{L\Gamma} - S_{L\Sigma}$ , where  $S_{H\Sigma}$  and  $S_{L\Sigma}$  are given by (6) and (7), respectively, are given by the same expression

$$S_{L\Gamma} - S_{L\Sigma} = S_{H\Gamma} - S_{H\Sigma} = b[(\bar{\gamma} - \bar{\sigma})\rho_o q(c - (1 + \alpha b)) + \bar{\sigma}(c - \rho_o(1 + \alpha b))].$$

If  $\bar{\gamma} = \bar{\sigma}$ , the difference in the surpluses for high risk aversion citizens is negative (i.e.,  $S_{H\Gamma} - S_{H\Sigma} < 0$ ), and the difference in the surpluses for low risk aversion citizens is positive (i.e.,  $S_{L\Gamma} - S_{L\Sigma} > 0$ ). If  $\bar{\gamma} = 0$ , the difference is positive, and if  $\bar{\sigma} = 0$ , the difference is negative. If  $\bar{\sigma} = \bar{\gamma} = 0$  so the news organizations do not grant discretion, the surpluses are equal. The difference in the surpluses is strictly decreasing in  $\alpha$ .

The equilibrium has high risk-aversion citizens ( $\alpha > \alpha^{oo}$ ) subscribing to the publication of news organization  $\Sigma$  that is biased toward greater precaution and low risk-aversion citizens subscribing to the publication of news organization  $\Gamma$  that is biased toward fewer precautions. Given prices  $p_\Sigma$  and  $p_\Gamma$  for the two news organizations, the indifferent citizen  $\alpha^*$  is identified by

$$\alpha^* = \max\left\{0, \frac{b[(\bar{\sigma} - \bar{\gamma})\rho_o q(1 - c) + \bar{\sigma}(c - \rho_o)] + p_\Sigma - p_\Gamma}{b^2 \rho_o (q\bar{\gamma} + (1 - q)\bar{\sigma})}\right\},$$

which is increasing in  $p_\Sigma$  and decreasing in  $p_\Gamma$ . If the prices  $p_\Gamma$  and  $p_\Sigma$  were equal, then  $\alpha^* = \alpha^{oo}$  when  $\bar{\gamma} = \bar{\sigma}$ , and  $\alpha^* < \alpha^{oo}$  when  $\bar{\sigma} = 0$  and  $\bar{\gamma} > 0$ , and when  $\bar{\gamma} = 0$  and  $\bar{\sigma} > 0$ , then  $\alpha^* > \alpha^{oo}$ .

If the biases are fixed, the equilibrium prices satisfy

$$p_\Gamma^* = \arg \max_{p_\Gamma} (p_\Gamma - w_\Gamma)(F(\alpha^*) - F(\alpha_L^*(p_\Gamma))) - K$$

$$p_\Sigma^* = \arg \max_{p_\Sigma} (p_\Sigma - w_\Sigma)(F(\hat{\alpha}_H(p_\Sigma)) - F(\alpha^*)) - K,$$

where  $w_\Sigma$  and  $w_\Gamma$  are the corresponding wages,  $\hat{\alpha}_H(p_\Sigma)$  is given in (9), and  $\alpha_L^*(p_\Gamma)$  is given by

$$\alpha_L^*(p_\Gamma) = \max\left\{\frac{p_\Gamma - (1 - c)\rho_o q(1 - \bar{\gamma})b}{b^2 \rho_o q(1 - \bar{\gamma})}\right\}.$$

The corresponding first-order conditions are linear in the prices for  $F$  uniform and for  $\alpha_L^*(p_\Gamma) > 0$  yield

$$p_\Sigma^* = \frac{1}{D} [2w_\Sigma(q\bar{\gamma} + 1 - q)(q + (1 - q)\bar{\sigma}) + w_\Gamma(1 - q)(1 - \bar{\sigma})(q + (1 - q)\bar{\sigma}) + (1 - \bar{\sigma})bqc(1 - \rho_o)(2(q + (1 - q)\bar{\sigma})\bar{\gamma} + (1 - q)(1 - \bar{\gamma})\bar{\sigma})]$$

$$p_\Gamma^* = \frac{1}{D} [2w_\Gamma(q\bar{\gamma} + 1 - q)(q + (1 - q)\bar{\sigma}) + w_\Sigma q(1 - \bar{\gamma})(q\bar{\gamma} + 1 - q) + (1 - \bar{\gamma})bqc(1 - \rho_o)(2(q\bar{\gamma} + (1 - q)\bar{\sigma} + q(1 - \bar{\sigma})\bar{\gamma}))],$$

where  $D = 4(\bar{\gamma}q + 1 - q)(q + (1 - q)\bar{\sigma}) - (1 - q)(1 - \bar{\sigma})q(1 - \bar{\gamma})$ . The prices are increasing in the wages, the seriousness  $b$  of the bad state, and the cost  $c$  of taking precautions.

The basic intuition of the equilibrium follows from the observation that low risk aversion citizens are more tolerant of bias toward fewer precautions and high risk aversion citizens are more tolerant of bias toward greater precautions. This sorting seems natural, but the reasons for the sorting are perhaps counterintuitive. High risk aversion citizens take precautions based on prior information and hence they value a more accurate report  $r_\Sigma = \phi$  that would lead them not to act. The more accurate such report is from the news organization biased toward greater precautions. Similarly, low risk aversion citizens value a more accurate report  $r_\Gamma = \beta$  that would lead them to take precautions, and the more accurate report comes from the news organization biased toward fewer precautions. Citizens thus subscribe to the news organization that is biased in the direction of their prior inclination, but they do so only because the signal that would lead them to reverse their decisions is more accurate.

The probability of influence for the journalist at news organization  $\Gamma$  is  $\rho_o q \bar{\gamma}$ , and for  $\Sigma$  the probability is  $(1 - \rho_o q) \bar{\sigma}$ . The wages thus are  $w_\Gamma = w_o - \rho_o q \bar{\gamma}$  and  $w_\Sigma = w_o - (1 - \rho_o q) \bar{\sigma}$ . Since  $\rho_o$  is small, the journalists at news organization  $\Gamma$  have substantially less influence than those at news organization  $\Sigma$ . In this competition, the news organization with the stronger wage incentive to tolerate bias is the one which biases its reports toward the low probability bad state.

The discretion chosen by a news organization maximizes the profit given the equilibrium prices, and a Nash equilibrium is sought. Rather than present the expressions for the equilibrium biases, which are similar to those above, a numerical example of competition with opposing biases is provided. Let  $c = 0.7$ ,  $b = 40$ ,  $q = 0.7$ ,  $\rho_o = 0.1$ ,  $\bar{\alpha} = 4$ ,  $w_o = 10$ ,  $v = 26$ ,  $K = 0.01$ . The equilibrium biases are  $\gamma^* = 0.0$ ,  $\sigma^* = 0.827$ , and the prices are  $p_\Gamma^* = 13.113$ ,  $p_\Sigma^* = 1.133$ . Citizens sort according to the cutpoints  $\alpha_L^* = 0.1096$ ,  $\alpha^* = 0.1808$ ,  $\alpha_H^* = 0.3810$ . The profits are  $\pi_\Gamma^* = 0.0454$ ,  $\pi_\Sigma^* = 0.0467$ . In this example, the news organization that grants journalists greater influence has higher profits.

## VIII. Conclusions

News organizations determine which stories to cover and how those stories are treated. Journalists who have preferences for influence or career concerns that can be furthered by being published may have the opportunity and incentive to add content to their news reports. In the theory presented here, this is in the form of bias, Bias affects both what is covered and treatment. Citizens adjust their beliefs based on the bias they anticipate, and they understand that the probability that a story is covered is also a function of media bias. The latter may be interpreted as an agenda-setting effect of the media. Although journalists may have incentives to bias stories, those incentives can be dampened by factors such as professionalism and by controls implemented by the news organization. A profit-maximizing, however, may have an incentive to tolerate bias if doing so allows journalists to be hired at a lower wage. Moreover, bias may persist in competition.

The following results have been established for the model considered:

1. Bias reduces the demand for news because citizens are more skeptical of news reports from organizations that tolerate bias.
2. Potential journalists with career concerns and a preference for influence, where influence derives from the probability that a news report will lead citizens to act, have an incentive to join a news organization.
3. The explanation for the existence of bias is an ample supply of potential journalists who are willing to work for lower wages in positions of influence.
4. A profit-maximizing news organization tolerates bias if that allows it to hire journalists at a lower wage. This is a necessary condition for the existence of media bias.
5. The tolerance of bias by a news organization reduces demand which induces the news organization to lower its price. Price and bias are thus negatively correlated.
6. Bias can persist with competition between like-oriented news organizations.
7. In an equilibrium with competition between two like-oriented news organizations the one with the greater bias has a lower price but can have higher profits.
8. Bias can be in opposing directions, and a competitive equilibrium sorts citizens based on which news report leads them to change their decisions.
9. Even when bias is persistent, citizens understand it and adjust their beliefs to take it into account. Although citizens fully adjust for bias, they are influenced by the greater likelihood of certain stories. This leads the public to overreact.
10. In public politics the expected stringency of regulation is increasing in media bias. Media bias thus influences public politics as well as private politics.

The orientation of a news organization could be aligned with the orientations of interest groups; e.g., those that want citizens to take greater precautions and those that want citizens to take fewer precautions. For example, the former could be a consumer activist group and the latter the producers of GMO foods. Conversely, interest groups may align themselves with the orientation of news organizations, if doing so is likely to yield coverage that furthers the interests of the group. The interest groups then may view the publication on the other side of the issue to be biased.

The interpretation given to the model has been in terms of private politics, but the interpretation might be extended to a partisan dimension. If greater and fewer precautions are interpreted as liberal and conservative, respectively, then liberal (high risk aversion) citizens subscribe to liberal publications and conservative (low risk aversion) citizens subscribe to conservative publications. Liberals then prefer more precautions, and conservatives prefer fewer precautions. Moreover, they subscribe to the news outlet that is biased in the direction of their preferences.

The impact of the media on political attitudes and behavior has been studied empirically, and rather than develop the implications of the present theory for the studies that have been conducted, only one observation will be made here. Some studies of elections have shown that citizen beliefs are not affected by news reports, and the model has the same feature in the sense that citizens adjust their beliefs anticipating bias. Empirical testing using *ex post* data; i.e., after a story has been published, would show that bias reduces the number of citizens taking precautions, i.e.,  $\hat{\alpha}_L$  is increasing in  $\sigma$ . Moreover, citizens would report that their beliefs were not distorted by bias. The journalist's decision to bias her news report, however, is an *ex ante* decision; i.e., before the news report, and bias results in a higher probability of such a story being covered. Media bias thus would not be found using *ex post* data but could be found using *ex ante* data on the frequency with which particular stories appear.

## Appendix

The exercise of discretion has two effects for the journalist. First, the set of citizens who take precautions is affected, and second, the probabilities of the reports  $r = \beta$  and  $r = \phi$  are affected. That is, given a report  $r = \phi$ , more citizens with  $\alpha \geq \alpha^{oo}$  take precautions when  $\sigma > 0$  than when  $\sigma = 0$ , but the probability of  $r = \phi$  is lower. For citizens with  $\alpha < \alpha^{oo}$  fewer take precautions when  $\sigma > 0$  than when  $\sigma = 0$ , but the probability of  $r = \beta$  is higher. This Appendix considers the case in which journalists have a preference for the number of citizens affected by their strategy.

The journalist decides on her exercise of discretion after citizens have made their subscription decisions and after the signal  $s$  has been observed, so the price and discretion  $\bar{\sigma}$  have already been fixed and only the exercise of discretion affects demand. Recall that  $\bar{\sigma}$  is the choice of the news organization, and assume that citizens have rational expectations or that it is observable as the reputation of the news organization. The expected number  $n(\sigma)$  of citizens acting is

$$\begin{aligned} n(\sigma) &= Pr(r = \beta)(1 - F(\hat{\alpha}_L(\bar{\sigma}))) + Pr(r = \phi)(1 - F(\hat{\alpha}_H(\bar{\sigma}))) \\ &= (\rho_o q + (1 - \rho_o q)\sigma)(1 - F(\hat{\alpha}_L(\bar{\sigma}))) + (1 - \rho_o q)(1 - \sigma)(1 - F(\hat{\alpha}_H(\bar{\sigma}))), \end{aligned}$$

and the derivative with respect to  $\sigma$  is

$$n'(\sigma) = (1 - \rho_o q)(F(\hat{\alpha}_H(\bar{\sigma})) - F(\hat{\alpha}_L(\bar{\sigma}))) > 0.$$

The journalist thus increases the number of citizens taking precautions.

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Figure 2

## Citizen Responses to News Reports

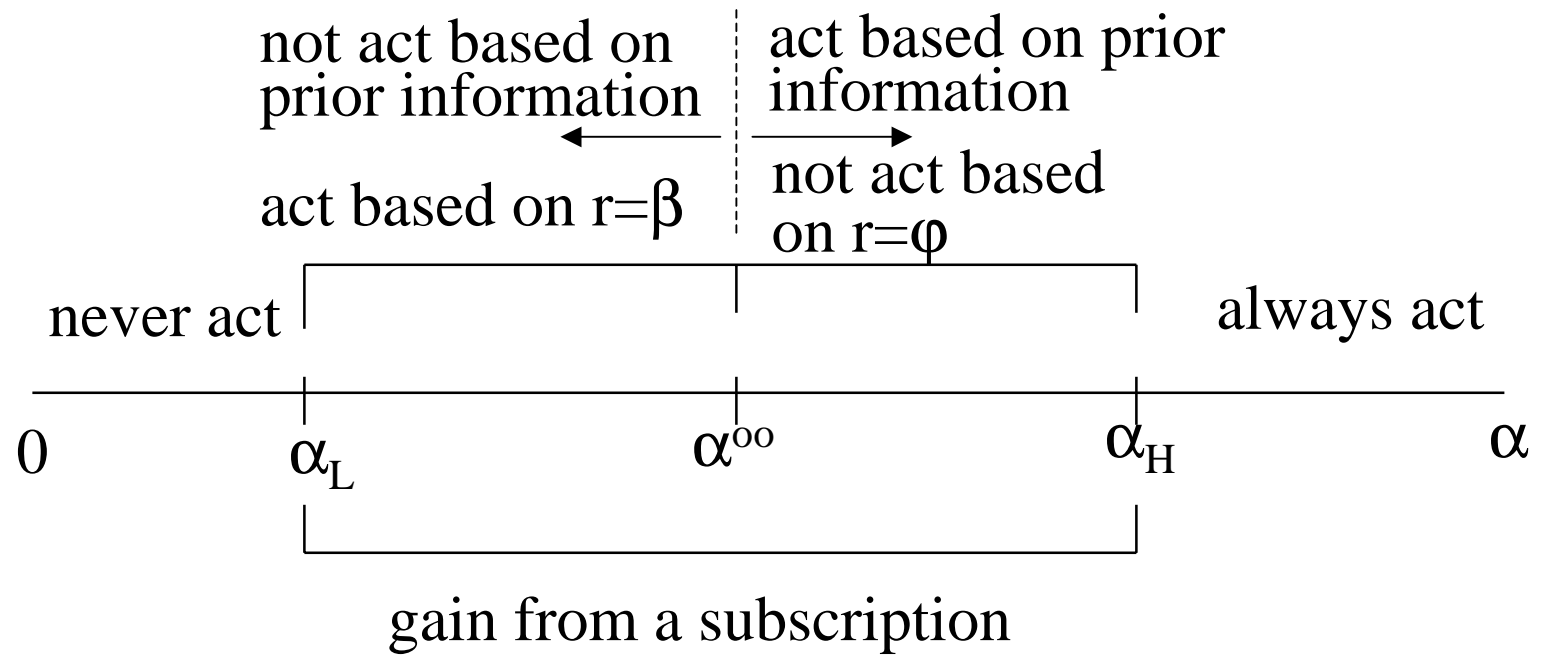


Figure 3

Citizen Responses to News Reports

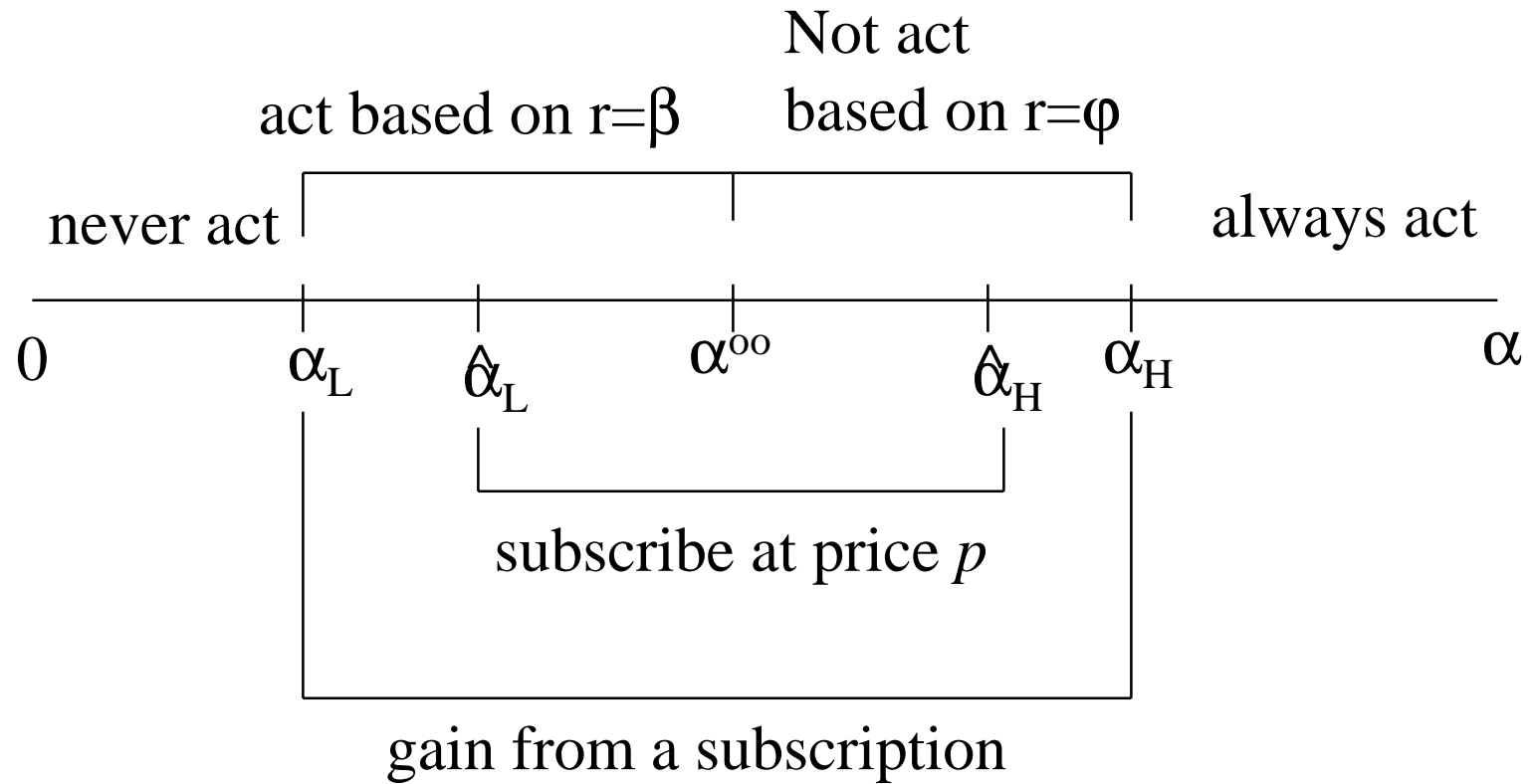


Figure 4

Competition Between News Organizations

