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PERSISTENT MEDIA BIAS

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Abstract

The news media plays an essential role in society, but surveys indicate that the media is widely viewed as biased. This paper presents a theory of media bias that originates with private information obtained by journalists through their investigations and persists despite profit-maximizing news organizations and rivalry from other news organizations. Bias has two effects on the demand for news. First, rational citizens are more skeptical of potentially biased news and thus rely less on it in their individual decision-making. Second, bias makes certain stories more likely than others. This paper presents a supply-side theory in which bias originates with journalists who have a preference for influence and are willing to sacrifice wages to exercise it. News organizations can control the bias by restricting the discretion allowed to journalists, but granting discretion and tolerating bias can increase profits. Citizens have a demand for news they can use in their everyday lives, but their skepticism reduces demand and leads the news organization to set a lower price for its publication the greater is the bias it tolerates. Lower quality news thus commands a lower price. Bias is not driven from the market by competition from a rival news organization nor a news organization with an opposing bias. Moreover, bias can be greater with competition than with a monopoly news organization. If citizens collectively choose regulation in place of their individual decision-making, bias increases the stringency of regulation.

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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 decisions. 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 the perceived bias. This paper identifies a demand for news and a supply of biased news. Media bias has both *ex ante* and *ex post* effects. *Ex post*, when reading news stories citizens take media bias into account and are skeptical of news reports that might be biased. This makes them more cautious in acting based on the news. *Ex ante*, media bias affects the probability that particular stories are reported, which can increase the likelihood that citizens act based on the news. News media bias thus affects both the content of stories and also which stories are reported. Bias and the resulting skepticism reduce the demand for news, which leaves the issue of whether profit-maximizing news organizations would tolerate bias in their news reports and whether bias would persist with competition among news organizations.

Media bias could have a variety of sources. Bias could reflect the preferences or world view of the owner of the news organization. At least in the United States, however, major news organizations are owned by corporations, and the market for control should lead those corporations to maximize profits rather than follow personal views. Media bias could also have demand-side explanations. Citizens have a demand for news as entertainment and may have a demand for stories that are consistent with their political or social views. The latter in particular may provide an incentive for a news organization to bias stories to cater to particular clientele. Similarly, a news outlet that relies on advertising revenue may cater to high-income subscribers.

Demand-side explanations are based on characteristics of potential subscribers. In contrast, this paper provides a supply-side explanation for the existence and persistence of media bias based on incomplete information and the career concerns and preferences of journalists for influence. Granting discretion to journalists allows them to bias stories and also allow a news organization

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to hire at a lower wage than if journalists were tightly monitored. The supply-side explanation is based on the availability of potential journalists who are willing to work for lower wages in positions in which they can advance their careers or influence the public by exercising the discretion granted by a news organization. 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.

As a rough indicator that journalists may accept lower wages, suppose that journalists are also qualified for jobs in advertising and public relations. The Bureau of Labor Statistics, Occupational Employment and Wages 2002 Survey, indicated that the average wages for “News analysts, reporters and correspondents” was \$39,160, \$46,590 for “Public relations specialists,” and \$55,710 for “Advertising and Related Services.” The average 2002 wages for “Newspaper, book, and directory publications” editors was \$46,410 and \$41,270 for “Radio and TV broadcasts” editors. Moreover, many news organizations use interns, some of whom are unpaid. In the model, journalists accept lower wages because they want to have influence; i.e., to lead 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.

In the model even though they remain skeptical of possibly biased news stories, citizens have a demand for news because news reports provide 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, and a profit-maximizing news organization tolerates bias only if it gains more on the supply side than it loses on the demand side. Tolerating bias is shown to be consistent with profit maximization. Competition from a news organization with less bias could, however, force the higher bias organization to reduce the discretion granted to its journalists. Bias, however, is shown to persist with competition between like-oriented news organizations, where citizens choose between competing publications based on their risk aversion. Moreover, the news organization with the greater bias can have higher profits. 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 has a lower price for a subscription but can have higher profits. Moreover, competition can result in more biased news than with a monopoly news

organization.²

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.³ 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 be exposed to 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 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. The probability that an individual is pivotal in an election or in influencing government in office is very small, as Downs (1957) argued. A citizen could have a demand for 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, employment, or other issues about which citizens have incentives to make purposive decisions. The perspective here is that demand comes from news citizens can use.⁴

The principal focus thus is on private rather than public politics, and to simplify the analysis the emphasis is on precautions taken by individuals, as in the case of GMO foods. A journalist who shapes stories based on her preferences may be thought of as a private politics activist. The journalist may bias a story by exaggerating the risks of GMO foods with the objective of leading citizens to take greater precautions in the absence of government regulation. In private politics the model predicts that citizens may overreact as a result of media bias. The model can also be interpreted as explaining why citizens hold certain beliefs relevant to public politics and how the media contributes to those beliefs. Public politics is considered in a simple median voter model of regulation, and the expected stringency of the regulation is shown to be increasing in media bias.

II. The Nature of Media Bias

² Free entry is not considered because news organizations have fixed costs. The number of competing news organizations in a market is typically quite small, and concentration has increased in the media industries. For example, as a result of legislation in 1990s Clear Channel Communication owns 1,200 radio stations in the United States.

³ Baron (2003a) provides an introduction to private politics.

⁴ This perspective is also taken by Stromberg (2002).

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, who 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:⁵

- 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 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.”⁶ 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 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 were more knowledgeable about a story were more critical of media coverage. This suggests that if the public were generally more knowledgeable about stories 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 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

⁵ ASNE, “Perceived Bias,” p. 4, www.asne.org.

⁶ ASNE, “Perceived Bias,” p. 11, www.asne.org.

(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).”⁷ In 1992 89% of the Washington journalists surveyed voted for Bill Clinton and 7% for George Bush. Sixty-one percent of the journalists rated themselves as liberal or liberal to moderate and 9% as conservative or conservative to moderate (Povich (1996), p. 137).⁸ Editors were more evenly balanced in their orientation and political preferences. Johnstone, Slawski, and Bowman (p. 532) surveyed American journalists and concluded that “The most highly trained and perhaps best educated journalistic practitioners thus tend to embrace participant ideologies of the press ...” Another possible source of bias is journalists’ perception of their role to “protect the underdog.”⁹ Zaller (1999, p. 24) provided a different perspective on the journalists’ practice, “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.”

Based on data from three Pew Research Center for the People and the Press surveys in 1999 and 2000, Hamilton (2004, Ch. 3) examined the political bias of news outlets. He found (p. 73), “Of those survey respondents who identified themselves as ‘very liberal,’ only 25.3% perceive a ‘great deal’ of political bias in news coverage. In contrast, among those who say they are ‘very

⁷ ASNE, Chapter “Characteristics of the Respondents.” www.asne.org.

⁸ 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.

⁹ ASNE, Chapter “Understanding Each Other,” p. 2.

conservative,’ 44.5% report there is a great deal of bias.” Similarly, Republicans were much more likely to perceive news coverage as having a Democratic bias than Democrats were to perceive it having a Republican bias. Hamilton developed a measure that identified the ideological location of news outlets based on the political orientation of their audiences. Respondents listing themselves as ‘very conservative’ perceived nightly TV network news and print news magazines as the most biased, and respondents listing themselves as ‘very liberal’ perceived cable political shows and Sunday network talk shows as the most biased.

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.”¹⁰ The journalists surveyed 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 was 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.” The perspective taken here is that bias originates with journalists.

Despite the belief that the news media is biased, the public does not view the bias as a major hindrance to using the news. “[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.”¹¹ 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 bias into account.

III. Theories of Media Bias

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 them. Politicians then provide more projects to groups that are more likely to learn of those projects and hence vote

¹⁰ The public’s view seemed to be due in part to 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.”

¹¹ ASNE, Chapter “Perceived Bias,” p. 2.

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 as a source of bias.

Mullainathan and Shleifer (2003) present a theory of the media based on the distribution of preferences of readers. Newspapers receive an identical signal about the truth and can slant their stories by omitting some of the information. Readers have a disutility for slanted news, and biased readers have a preference for news consistent with their initial beliefs. The presence of biased readers leads a monopolist newspaper to slant the news toward confirming the readers' beliefs. Competition yields the same slant but prices are driven to zero. If readers' beliefs are heterogeneous, duopolist newspapers differentiate themselves by reporting extreme news so that they can charge higher prices. A conscientious reader who reads both newspapers obtains accurate information because he can cross check the stories. Competition thus benefits conscientious readers, but biased readers receive slanted news.

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 private and collective choices based on a news report. 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 Jayson Blair. The interpretation preferred here is analogous to the measure used by Groseclose and Milyo (2003). To create bias a journalist can include in her story quotations from advocates of particular perspectives. The advocates then can present their perspectives, make assertions and allegations, draw conclusions, 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 far from balanced. They find “a very significant liberal bias” in the news media.¹² Seven of the eight news outlets studied 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.”¹³ Their methodology requires no judgments about which media outlets were liberal or conservative or the degree of bias. They simply count the number of citations a news publication made to each of 20 think tanks and compute a score by comparing the citations to those think tanks in speeches by members of Congress. The positions of Congress members on a left-right scale are determined using a statistical procedure standard in political science based on rankings by interest groups.

IV. The Model

A. The Players

The basic model includes one or more news organizations, citizens who may subscribe to the publication of a news organization and must make a private or collective choice, and journalists who report a story. 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 base their actions on a news report, and those who do not subscribe base their action on their

¹² 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 The New York Times.

¹³ The exception was Fox News’ Special Report.

prior information.

News organizations maximize their profit with respect to the price of a subscription and the discretion allowed its journalists. The journalist maximizes her 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 to bias the story.

B. Information Structure

The news story pertains to the issue of a potentially harmful state against which citizens can at a cost take precautions. 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 it. The bad state could be harm from GMO foods, mold in a house, or a health risk such as from obesity or radiation from cell phones. 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 ω	β	ϕ
B	q	$1 - q$
N	0	1

Based on the result s of her investigation, the journalist writes a story, so a strategy of the journalist is a report conditional on the signal observed. A pure strategy is a news report $r \in \{\beta, \phi\}$, and a mixed strategy is $\sigma(s) = Pr(r = \beta | s), s \in \{\beta, \phi\}$. A strategy may be interpreted as writing

a story that suggests that the investigation revealed $s = \beta$ or $s = \phi$. 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 $r = \phi$ story with probability $1 - \sigma$ and with probability σ biases her story by reporting $r = \beta$. The choice of σ can be interpreted as the journalist's exercise 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 take greater precautions. After all, $s = \phi$ could have come from the state $\omega = B$, and the probability $Pr(r = \beta \text{ and } \omega = B) = \rho_o(q + (1 - q)\sigma)$ is increasing in σ . In this interpretation the journalist acts as a private politics activist. This is the principal interpretation used here. Second, 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. Moreover, 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 exercise of discretion and the resulting bias are modeled here as conscious choices of journalists, but as indicated above the journalist may not recognize that she is writing biased stories.

A citizen who receives a news report r has posterior beliefs ρ_β and ρ_ϕ given by

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

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

The probability ρ_β is greater than ρ_o when $\sigma < 1$, so the news report is informative even when biased. The probability ρ_β equals 1 for $\sigma = 0$ and is decreasing in σ , 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 σ . A higher quality news organization provides more confidence to citizens; i.e., ρ_β is increasing in q and ρ_ϕ is decreasing in q .

The probability of a news report $r = \beta$ is $Pr(r = \beta) = \rho_oq + (1 - \rho_oq)\sigma$, which is increasing in σ . If a news report $r = \beta$ is more likely to be published, a journalist with career concerns or who

wants to have an impact has an incentive to exercise the discretion granted. A news organization that grants greater discretion to its journalists thus has a higher probability of publishing a story $r = \beta$. This may be interpreted as agenda setting by the news media.

Bias thus has both *ex ante* and *ex post* effects on citizens. *Ex post*, a citizen's posterior belief ρ_β is decreasing in σ , reflecting skepticism about news reports that may be biased. *Ex ante*, the probability of a news report $r = \beta$ is increasing in σ . As indicated below, bias leads citizens to rely less on the news *ex post*, but the probability that citizens will receive a news report that leads them to act is increasing in bias.

C. Citizens and Private Actions

Citizens have a demand for news not because of public politics but instead because news can improve their personal decisions. Let a citizen have a quadratic utility function $u(x) = x - \alpha x^2$, $x \in \mathfrak{R}$, where α reflects risk aversion. A citizen can take precautions a against the possibility of the bad state, and to simplify the analysis, the precautions allow the citizens to avoid the harm b from the bad state. If a citizen 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 α 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., of taking precautions.¹⁴ A citizen who takes precautions ($I = 1$) protects against the bad state and thus gains if $\omega = B$ and loses if $\omega = N$.

Citizens differ in their risk aversion α , 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 high risk aversion (α high) are more inclined to take precautions, whereas citizens with low risk aversion (α 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. Journalists then either accept or reject the employment offer.

¹⁴ If $c \geq 1$, no citizen would act even if the state $\omega = B$ were certain. If $c \leq \rho_o$, every citizen would act based on prior information, and in the model the journalist would have no reason to investigate the issue.

Citizens then may subscribe to the news organizations' publication, and subscription decisions are based on rational expectations of the discretion granted by the news organization and the reporting strategy of journalists. The 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 take precautions (act) ($I = 1$) and others do not ($I = 0$). Citizens with α satisfying $\rho_o(1+\alpha b) \geq c$ act, and the citizen α^{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 take precautions 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 ρ_β is given in (1). Those citizens with $\alpha \in [0, \alpha_L]$ do not act based on prior information nor on a report $r = \beta$, and if $\rho_\beta \geq c$, all low risk-aversion citizens act. The bound α_L , when positive, is strictly decreasing in the quality q of the news service, the seriousness of the bad state, and the prior probability ρ_o and is strictly increasing in the cost c of acting.

The bound α_L is strictly increasing in σ when $\alpha_L > 0$, so greater bias (discretion) results in skepticism, and hence fewer citizens act. In the limit as $\sigma \rightarrow 1$, $\alpha_L \rightarrow \alpha^{oo}$. When σ is low, $\alpha_L = 0$ and all citizens take precautions based on $r = \beta$, but for σ higher some citizens are sufficiently skeptical not to act.¹⁵

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

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

¹⁵ Some citizens do not act if $\sigma > \sigma^o$, where $\sigma^o \equiv \frac{\rho_o q(1-c)}{c - \rho_o + \rho_o q(1-c)} > 0$.

where ρ_ϕ 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 take precautions based on prior information as well as on the report $r = \phi$. The bound α_H is independent of σ , since discretion is exercised when $s = \phi$ whether that signal was due to the state $\omega = B$ or $\omega = N$. The bound α_H is strictly increasing in c and in the quality q of the news organization and strictly decreasing in b and the prior probability ρ_o .

Figure 2 illustrates the 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 gain from subscribing to 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 σ .

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

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

which is positive for $\sigma < 1$, since $(1 + \alpha b)\rho_\phi < c$. The surplus is zero for $\alpha = \alpha_H$ and is strictly decreasing in α , 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 α^{oo} and would not take precautions even if the news report changed their beliefs only slightly. The surplus $S_H(\alpha; \sigma)$ is strictly decreasing in σ (i.e., $\frac{dS_H(\alpha; \sigma)}{d\sigma} = -\frac{S_H(\alpha; \sigma)}{1 - \sigma}$), so a biased report is less valuable to citizens. Since $\frac{\partial^2 S_H(\alpha; \sigma)}{\partial \sigma \partial \alpha} > 0$, more risk averse citizens are more tolerant of bias.

The expected surplus $S_L(\alpha; \sigma)$ for a citizen with $\alpha \in [\alpha_L, \alpha^{oo}]$ is

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

This surplus is zero for $\alpha = \alpha_L$ and is strictly increasing in α . Moreover, $\frac{d^2 S_L(\alpha; \sigma)}{d\alpha d\sigma}$ is positive, so more risk averse citizens are more tolerant of bias. The expected surplus $S_L(\alpha; \sigma)$ is decreasing in σ for $\alpha \in [\alpha_L, \alpha^{oo})$.

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

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

This is continuous in α and continuously differentiable in σ with

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

which from (5) is negative for $\alpha \in [\alpha_L, \alpha_H)$. The set of citizens who gain from a subscription thus contracts in σ , since *ex post* citizens are more skeptical the greater is the bias and *ex ante* the probability of the news report $r = \beta$ is greater. Conversely, the higher the quality q of the news investigation the larger is the set of citizens who gain from subscribing.

The characteristics of the demand for news are summarized in the following proposition.

Proposition 1: Citizens $\alpha \in (\alpha_L, \alpha_H)$ gain from subscribing to the news, and that set is decreasing in bias σ and increasing in the quality q of the news organization. The gain $S(\alpha; \sigma)$ is increasing (decreasing) in α for $\alpha \in (\alpha_L, \alpha^{oo})$ ($\alpha \in (\alpha^{oo}, \alpha_H)$) and is decreasing in σ and increasing in q .

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 demand, and rather than incorporate both into the model, only the price will be considered.¹⁶ In this section the bias σ is assumed to be fixed, and in the following section it is made endogenous.

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

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

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

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

¹⁶ In an advertising model if the frequency of advertisements is denoted by τ and the citizen's disutility of being confronted with advertisements is ξ , then in (8) $\tau\xi$ replaces p . Then, if ζ is the advertising rate, $\tau\zeta$ replaces p in (11).

The bound $\hat{\alpha}_H$ on the set of high risk aversion subscribers is strictly decreasing in p and in σ . 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, i.e., $S_L(\hat{\alpha}_L; \sigma) - p \leq 0$, 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 σ and is increasing in p , so the set $[\hat{\alpha}_L, \hat{\alpha}_H]$ of subscribers 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 surpluses and the set of subscribers.

To simplify the notation, the costs of the news organization other than producing a news story are initially assumed to be zero. The profit π of the news organization is specified as

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

where w is the wage rate of journalists, the short-run production function for news is assumed to be Leontief, and $K \geq 0$ is a fixed cost. This technology may be representative of a news organization that writes more of its stories (rather than relying on the Associated Press, Reuters, or other news services) as the number of readers increases, where to simplify the notation only one story with the information structure in Figure 1 is represented. An alternative technology is considered in Section V.E. 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 $\hat{\alpha}_L > 0$, is¹⁷

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

¹⁷ 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 p^* is linear and strictly decreasing in σ , 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, and the news organization lowers its price to offset some of the decrease in demand. Conversely, the higher the quality q 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 ρ_o because citizens are more likely to act *a priori* the higher is ρ_o .

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

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

An increase in bias decreases subscriptions, so demand is decreasing in the discretion granted by the news organization.¹⁸ The number of subscribers 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 ρ_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.

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 π^* 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

¹⁸ For $\hat{\alpha}_L > 0$ the derivative holding w fixed is

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

q , since the news report is then more valuable to citizens and the news organization can capture some of that value. The greater is the prior probability ρ_o , however, the lower are profits, since citizens are more likely to take precautions in the absence of a news report.

The characterization of demand and the profit of the news organization is summarized in the following proposition.

Proposition 2: The optimal price p^* in (14) is strictly decreasing in the bias σ and is strictly increasing in the quality q , the cost c of taking precautions, and the seriousness of the bad state. The profit π^* in (17) inherits these properties but may be decreasing in the bias σ . The number Q of subscribers in (15) is strictly decreasing in σ .

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 pertains to leading citizens to change their behavior toward taking precautions.^{19,20} 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.

An alternative perspective on the preferences of journalists comes from career concerns. To advance and obtain broader opportunities, a journalist must be published.²¹ 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. Bias could be restrained by professionalism, but to focus on the persistence of media bias, professionalism will not be included in the model.

The discretion σ exercised by the journalist 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. Discretion may be granted because it allows the news organization to obtain more favorable terms in the labor market.²²

The journalist chooses σ 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

¹⁹ Other occupations such as politician, activist, teacher, clergy, etc. may also attract those who seek influence.

²⁰ Bovitz, Druckman, and Lupia take a similar perspective on the preferences of journalists.

²¹ 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.”

²² Discretion could also be granted for incentive or other purposes.

discretion by the journalist is on the probabilities of news reports $r = \beta$ and $r = \phi$. To simplify the analysis, the journalist's preferences for influence are assumed to be based on the effect of σ on the probability of $r = \beta$. An alternative assumption is that the journalist has preferences for the number of people affected by her story, and as indicated in the Appendix, that number is proportional to the probability of $r = \beta$.

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

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

where $Pr_{\bar{\sigma}=j}(r = \beta) = \rho_o q + (1 - \rho_o q)j$, $j \in \{0, \sigma\}$.²³ 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 ,

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

subject to the constraint $\sigma \leq \bar{\sigma}$, where v is the journalist's marginal rate of substitution between influence and wages. The journalist thus chooses $\sigma^* = \bar{\sigma}$ and fully exercises the discretion granted. A potential journalist then will accept a job offer $(w, \bar{\sigma})$ 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.²⁴ Since the supply of journalists exceeds the demand, the wage $w(\bar{\sigma})$ offered by the news organization is

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

The news organization thus captures the rents to the journalist from the exercise of discretion. With a 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.

²³ That is, the journalist cares not about how citizens respond to $r = \beta$ but instead about how citizens respond to her contribution σ .

²⁴ The subsistence level is set to zero to simplify the notation.

A news organization thus attracts 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 π^* in (17) (with $\bar{\sigma}$ replacing σ) and the wage $w = w(\bar{\sigma})$ given in (18).²⁵ 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

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

This is increasing in w_o , since there are then more rents for the news organization to capture. Conversely, the bound is decreasing in v , since less discretion is required to exhaust the rents.

The first-order condition for the maximization of profit π^* yields

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

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

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

must be satisfied. The discretion in (19) is no greater than one only if $w(1) = w_o - (1 - \rho_o q)v \geq 0$, which implies that for $\bar{\sigma}^* < 1$ the marginal rate of substitution v must be less than $\frac{w_o}{(1 - \rho_o q)}$.²⁶ Conversely, in this model media bias is present only if v is sufficiently large. Moreover, $\bar{\sigma}^*$ in (19) is non-negative only if $p^*(0) - w_o + qw(1) < 0$. Consequently, $\bar{\sigma}^* \in (0, 1)$ only if $w(1) > 0$ and $(q - \frac{1}{2})w(1) + (p^*(0) - w(0)) < 0$, which requires $p^*(0) < w(0)$. In addition, $p^*(\bar{\sigma}^*) - w(\bar{\sigma}^*)$ must be nonnegative. There are few if any economically meaningful parameter values that satisfy these conditions. This suggests that the equilibrium is likely to be $\bar{\sigma}^* = \bar{\sigma}_w$ or $\bar{\sigma}^* = 0$.

A numerical example will be used to illustrate the equilibrium. Let the parameter values be: $c = 0.7, b = 40, q = 0.9, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 10, v = 26, K = 0.001$. The equilibrium then has $p^* = 6.547$ and $\bar{\sigma}^* = \bar{\sigma}_w = 0.423$. Citizens sort according to the cut points $\hat{\alpha}_L = 0.107$ and $\hat{\alpha}_H = 0.859$, where $\alpha^{oo} = 0.150$. The wage premium is $w(\bar{\sigma}^*) = 0$, and profits are $\pi^* = 1.230$. If, however, $v = 10$, the optimal discretion is $\bar{\sigma}^* = 0$.²⁷

²⁵ Citizens' beliefs in (1) and (2) and their subscription decisions are then based on $\bar{\sigma}$.

²⁶ This condition also implies that $\bar{\sigma}_w \geq 1$.

²⁷ If $\bar{\sigma}^* = 1$, the news report $r = \phi$ is off the equilibrium path. In that case, subscribers are assumed to have beliefs $\rho_\phi = 0$.

The following proposition summarizes the labor market outcome and the choice of discretion by the news organization.

Proposition 3: When the supply of potential journalists is large, the wage $w(\bar{\sigma})$ in (18) is decreasing in the discretion $\bar{\sigma}$ and the news organization captures the rents to the exercise of discretion. The optimal discretion is likely to be $\bar{\sigma}^* = \sigma_w$ or $\bar{\sigma}^* = 0$, and if $\bar{\sigma}^* \in (0, \sigma_w)$, the price $p^*(0)$ must be less than the wage $w(0)$ when no discretion is allowed.

C. Welfare and Bias

The portions of aggregate welfare that depend on the bias is the surplus of subscribers, where the price p paid by subscribers to the news organization is a pure transfer, plus the utility gain of the journalists relative to the outside wage as a result of the exercise of discretion allowed by the news organization. The gain to the journalists is, however, captured by the news organization. The aggregate welfare W then is

$$\begin{aligned} W &= \int_{\hat{\alpha}_L}^{\alpha_{oo}} [S_L(\alpha; \bar{\sigma}) - p^*] dF(\alpha) + \int_{\hat{\alpha}_{oo}}^{\hat{\alpha}_H} [S_H(\alpha; \bar{\sigma}) - p^*] dF(\alpha) + \pi^* \\ &= \int_{\hat{\alpha}_L}^{\alpha_{oo}} [S_L(\alpha; \bar{\sigma}) - w(\bar{\sigma})] dF(\alpha) + \int_{\alpha_{oo}}^{\hat{\alpha}_H} [S_H(\alpha; \bar{\sigma}) - w(\bar{\sigma})] dF(\alpha) - K. \end{aligned} \quad (20)$$

The net surplus of citizens given by the two integrals in the first line of (20) is decreasing in $\bar{\sigma}$. The profit π^* , however, can be increasing or decreasing in $\bar{\sigma}$. If $\frac{d\pi^*}{d\bar{\sigma}} \leq 0$, welfare is decreasing in discretion and bias. If, however, the equilibrium discretion $\bar{\sigma}^* = \bar{\sigma}$, then profit is increasing in $\bar{\sigma}$. In the second line of (20), the gross surplus is decreasing in $\bar{\sigma}$, whereas the utility of the journalists is increasing in the bias.

The derivative of the welfare W is

$$\begin{aligned} \frac{dW}{d\bar{\sigma}} &= \int_{\hat{\alpha}_L}^{\alpha_{oo}} \left(\frac{dS_L(\alpha; \bar{\sigma})}{d\bar{\sigma}} - w'(\bar{\sigma}) \right) dF(\alpha) - (S_L(\hat{\alpha}_L; \bar{\sigma}) - w(\bar{\sigma})) \frac{d\hat{\alpha}_L}{d\bar{\sigma}} f(\hat{\alpha}_L) \\ &\quad + \int_{\alpha_{oo}}^{\hat{\alpha}_H} \left(\frac{dS_H(\alpha; \bar{\sigma})}{d\bar{\sigma}} - w'(\bar{\sigma}) \right) dF(\alpha) - (S_H(\hat{\alpha}_H; \bar{\sigma}) - w(\bar{\sigma})) \frac{d\hat{\alpha}_H}{d\bar{\sigma}} f(\hat{\alpha}_H), \end{aligned}$$

where all the derivatives are negative. The social value of the news, including the cost of producing it, is decreasing in the discretion granted by the news organization and hence the bias in the news. The utility of the journalists, however, is increasing in the bias. The net effect on aggregate welfare is ambiguous from this analysis, but if the citizens' demand for news is high (*cb* high), aggregate welfare is decreasing in discretion and bias.

D. Internal Organization

In addition to the incentives associated with influence and career concerns, the exercise of discretion by a journalist 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.²⁸

The editor monitors only when $r = \beta$, since a news report $r = \phi$ is not biased. Consider the case in which at the time the journalist is hired the news organization can commit to monitoring with probability h . This could reflect a standard operating policy of the news organization or its reputation for thoroughness. If bias is successfully detected with probability k , suppose that the editor can impose a penalty g on the journalist, which could be in terms of future assignments or damage to her reputation.

For the purpose of illustration, suppose the utility u of the journalist after accepting a job at the wage w is

$$u = w + V((1 - \rho_o q)\sigma) - h g k (1 - \rho_o q)\sigma,$$

where $V((1 - \rho_o q)\sigma) = \nu((1 - \rho_o q)\sigma)^{\frac{1}{2}}$, ν is a positive constant, and the journalist chooses σ .²⁹ The journalist's response function $\hat{\sigma}^*$ is

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

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 $\hat{\pi}^*$ of the news organization is then

$$\hat{\pi}^* = \frac{(p^* - w(\hat{\sigma}^*))^2}{\bar{\alpha} b^2 \rho_o (1 - q)(q + \hat{\sigma}^*(1 - q))(1 - \hat{\sigma}^*)} - K - t(h), \quad (21)$$

where $t(h)$ is the cost of monitoring. The news organization chooses h to maximize $\hat{\pi}^*$ in (21).

E. An Alternative News Technology

The 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

²⁸ For example, *The New York Times* detected fabrication by Jayson Blair only after many of his news reports had been published.

²⁹ Citizens are assumed to have rational expectations of the journalist's choice of σ .

subscribers. This might reflect the public goods nature of information. 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 then

$$\pi = (p - \kappa)(F(\hat{\alpha}_H) - F(\hat{\alpha}_L)) - w - K, \quad (22)$$

where κ 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 is

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

and the profit excluding the wage is given in (17) with κ 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 in (22) 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.

F. 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 the expected number of citizens who take precautions as a result of news reporting is $A = 1 - \hat{\alpha}_L Pr(r = \beta) - \hat{\alpha}_H Pr(r = \phi)$. For F uniform 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 evaluation suggests that the derivative is positive for some sets of parameter values. For example, for the parameter values

in the above example, the expected number A is increasing in $\bar{\sigma}$ for $v = 10$ and $v = 26$, whereas for $v = 40$ it is decreasing in $\bar{\sigma}$.

Consequently, from an *ex ante* perspective the grant of discretion by the news organization can increase the expected number of citizens taking precautions, in which case the public overreacts as a result of media discretion and bias. The journalist then 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 focuses on private actions by citizens, but it may be possible to substitute public action for private actions. For example, the government could ban foods containing genetically-modified organisms or require labeling. To illustrate this, suppose the government can prescribe precautions and citizens cannot supplement those precautions. 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, the pivotal 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. For example, c could represent the higher cost of food if GMO foods were banned. The collective choice is the ideal regulation $\hat{a}_m(r = i)$ of the median citizen given a news report $r = i$, which is

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

where α_m is the risk aversion of the median citizen.³⁰ This is increasing in ρ_i , and ρ_β is decreasing in $\bar{\sigma}$, so greater discretion and bias result in less stringent regulation when $r = \beta$. That regulation, however, occurs with a higher probability of $(1 - \rho_o q)\bar{\sigma}$ due to bias. When $r = \phi$, regulation is unaffected by the bias, but that report occurs with a lower probability $(1 - \rho_o q)\bar{\sigma}$. 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.

³⁰ 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 $\hat{a}_m > b$).

The expected regulation $E(\hat{a}_m(\cdot))$ is

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

This is strictly increasing in $\bar{\sigma}$, so the tolerance of media bias by the news organization increases the expected level of regulation.³¹ Media bias thus results in more stringent expected regulation.

The public politics results are summarized in the following proposition.

Proposition 4: If the median voter model represents public politics, the levels of regulation conditional on the news reports $r = \beta$ and $r = \phi$ are strictly decreasing in the bias. The expected regulation is strictly more stringent, however, since $\hat{a}(r = \beta) > \hat{a}(r = \phi)$ the likelihood of the report $r = \beta$ is increasing in the bias $\bar{\sigma}$.

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 may tolerate bias when doing so allows journalists to be hired at a lower wage. Competition, however, could drive out bias, since citizens value the news less the more biased it is and can switch to a less-biased publication. 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. Bias thus is a form of product differentiation.³² Competition with like-oriented biases could correspond to the survey results that journalists are predominately to the left politically. In Section VIII competition between news organizations with opposing biases is considered. In both cases, the journalists from each news organization are assumed to conduct independent investigations and hence obtain independent signals. To simplify the analysis, both news organizations are assumed to be of the same quality q .

To explore the effect of media competition, let one news organization have discretion $\bar{\sigma}_1$ and

³¹ The derivative is

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

³² Hamilton (2004) adopts a product differentiation perspective (“[p]olitical bias in media content is similar to product differentiation” (p. 73)) and characterizes news audiences based on survey data from the Pew Center.

the other $\bar{\sigma}_2$, where $\bar{\sigma}_1 < \bar{\sigma}_2$, and assume that a citizen subscribes to only one publication.³³ The difference in the surpluses for the two news organizations is³⁴

$$S_H(\alpha; \bar{\sigma}_1) - S_H(\alpha; \bar{\sigma}_2) = S_L(\alpha; \bar{\sigma}_1) - S_L(\alpha; \bar{\sigma}_2) = (\bar{\sigma}_2 - \bar{\sigma}_1)(1 - \rho_o q)b[c - \rho_\phi(1 + \alpha b)]. \quad (23)$$

Letting $p_i, i = 1, 2$, be the price of a subscription, the citizen α^o who is indifferent between subscribing to the two news organizations is identified by

$$S_H(\alpha^o; \bar{\sigma}_1) - S_H(\alpha^o; \bar{\sigma}_2) \equiv p_1 - p_2.$$

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 lowered its price slightly to $p'_1 < p_1$, then

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

News organization 1 captures additional demand, which has a first-order effect on profit, whereas 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, $S_H(\alpha^o_H; \bar{\sigma}_1) - S_H(\alpha^o_H; \bar{\sigma}_2) > 0$, 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. The greater skepticism of citizens forces news organization 2 to lower its price. Lower quality news thus commands a lower price.

The indifferent citizen α^o is identified by³⁵

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

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

High risk aversion citizens subscribe to the news report with the greater bias, but they are more skeptical of a report $r_2 = \beta$ than are the low risk aversion subscribers who receive a report

³³ In Section VIII citizens are allowed to subscribe to both publications.

³⁴ Note that ρ_ϕ is the same for news reports $r_i = \phi, i = 1, 2$, from each news organization.

³⁵ For $p_1 \geq p_2, \alpha^o < \alpha_H$.

$r_1 = \beta$; i.e., $\rho_{\beta 1} > \rho_{\beta 2}$, where $\rho_{\beta i} = Pr(\omega = B \mid r_i = \beta)$, $i = 1, 2$. Although high risk aversion subscribers are more skeptical, they receive the report $r_2 = \beta$ with higher probability than low risk aversion citizens receive $r_1 = \beta$. The beliefs of all subscribers are the same when they receive news report $r_i = \phi$.

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

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

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

where $\hat{\alpha}_L$ is a function of $(p_1, \bar{\sigma}_1)$ and $\hat{\alpha}_H$ is a function of $(p_2, \bar{\sigma}_2)$. The indifferent type α° is increasing in p_2 and decreasing in p_1 reflecting the usual response of demand to changes in prices. Similarly, α° is increasing in $\bar{\sigma}_2$ and decreasing in $\bar{\sigma}_1$, so a news organization loses subscriptions as it grants more discretion.

Initially, let $\bar{\sigma}_1$ and $\bar{\sigma}_2$ be fixed. For prices such that $\hat{\alpha}_L > 0$ the first-order conditions are³⁶

$$\frac{\partial \pi_1}{\partial p_1} \Big|_{p_1=p_1^*} = F(\alpha^\circ) - F(\hat{\alpha}_L) + (p_1^* - w_1) \left(f(\alpha^\circ) \frac{\partial \alpha^\circ}{\partial p_1} - f(\hat{\alpha}_L) \frac{\partial \hat{\alpha}_L}{\partial p_1} \right) = 0 \quad (24)$$

$$\frac{\partial \pi_2}{\partial p_2} \Big|_{p_2=p_2^*} = F(\hat{\alpha}_H) - F(\alpha^\circ) + (p_2^* - w_2) \left(f(\hat{\alpha}_H) \frac{\partial \hat{\alpha}_H}{\partial p_2} - f(\alpha^\circ) \frac{\partial \alpha^\circ}{\partial p_2} \right) = 0, \quad (25)$$

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 wages, 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 (24) and (25) 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

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

³⁶ 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 ρ_o .

The number $Q_1^* = \frac{1}{\bar{\alpha}}(\alpha^o - \hat{\alpha}_L)$ of subscribers 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 number $Q_2^* = \frac{1}{\bar{\alpha}}(\hat{\alpha}_H - \alpha^o)$ of subscribers 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

$$\pi_1^* = \frac{(p_1^* - w_1)^2(q + \bar{\sigma}_2(1 - q))}{\bar{\alpha}\rho_o(1 - q)b^2(q + \bar{\sigma}_1(1 - q))(\bar{\sigma}_2 - \bar{\sigma}_1)} - K \quad (26)$$

and

$$\pi_2^* = \frac{(p_2^* - w_2)^2(1 - \bar{\sigma}_1)}{\bar{\alpha}\rho_o(1 - q)b^2(1 - \bar{\sigma}_2)(\bar{\sigma}_2 - \bar{\sigma}_1)} - K. \quad (27)$$

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 premium w_o , since although an increase in w_o results in higher prices, the margin $p_i^* - w_i, i = 1, 2$, decreases.³⁷ 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 can have greater profits.³⁸

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 π_2^* in (27) for the second news organization is, for example,³⁹

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

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.

³⁷ To see that π_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.

³⁸ A sufficient condition for $\pi_2^* > \pi_1^*$ is $p_1^* - W_1 \leq p_2^* - w_2$.

³⁹ The expression for $\bar{\sigma}_1$ is similar.

The equilibrium is characterized by some combination of the first-order conditions for $\bar{\sigma}_1$ and $\bar{\sigma}_2$ and the labor market constraints $w(\bar{\sigma}_i) \geq 0, i = 1, 2$. An example will be used to illustrate an equilibrium and show 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: $c = 0.7, b = 40, q = 0.9, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 10, v = 26, K = 0.001$. 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 ($\hat{\alpha}_L = 0.066, \alpha^o = 0.554, \hat{\alpha}_H = 1.459$). 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 $\pi_1^* = 0.0584$ and $\pi_2^* = 0.2264$, so the news organization with the greater bias has higher profits. Bias thus can persist in competition and be profitable.

Compared to the example in Section V.B, competition between two like-oriented news organizations results in lower average bias in the news reports, lower prices, and lower profits. Both the lower bias and the lower prices, however, result in more subscriptions, so more citizens are exposed to biased news reports.

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 $\bar{\sigma}_2 = 0.549 < \bar{\sigma}_w$, and the profits are $\pi_1^* = 0.539$ and $\pi_2^* = 0.013$. In this example, the average bias is greater than with a single news organization, and because of lower prices more citizens subscribe, so more citizens are exposed to biased reports. Competition thus can result in greater bias than with a monopolist news organization.

The results of this section are summarized in the following proposition.

Proposition 5: In competition between two like-oriented news organizations the one with the greater bias has a lower price in any equilibrium. Depending on the parameter values the news organization with the greater bias can have greater profits.

VIII. Competition between News Organizations with Opposing Biases

A. Bias Toward Inaction

The above analysis has 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. The orientations of the two news organizations, for example, could be determined by the orientations of their

owners. Journalists with orientations toward greater or fewer precautions then would self-select 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 Σ and the other by Γ . 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 γ when $s = \beta$ is observed.⁴⁰ Bias toward inaction may be thought of as quoting advocates of GMO foods, citing previous investigations that found no evidence of harm, or emphasizing the potential benefits to developing countries.

If a citizen subscribes to news organization Γ , 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 γ , since subscribers are more skeptical of a report $r_\Gamma = \phi$ the more likely the journalist in news organization Γ is to bias her story.⁴¹ The probability of a biased report is $Pr(r_\Gamma = \phi) = 1 - \rho_o q(1 - \gamma)$, which is increasing in γ , 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 V.B that discretion is $\bar{\sigma}$ for Σ , and let $\bar{\gamma}$ be the discretion for Γ .

When $r_\Gamma = \beta$ is reported, all subscribers to Γ 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 $S_{H\Gamma}(\alpha; \bar{\gamma})$ for a citizen with $\alpha \in [\alpha^{oo}, \alpha_{H\Gamma})$ is

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

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

which is positive and decreasing in α and $\bar{\gamma}$.⁴² The surplus $S_{L\Gamma}(\alpha; \bar{\gamma})$ for a citizen with $\alpha \in [0, \alpha^{oo}]$

⁴⁰ 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 Γ reported $r_\Gamma = \phi$, a citizen would not know the state with certainty.

⁴¹ Note that $\rho_{\phi\Gamma} = \rho_\phi$ if $\gamma = 0$.

⁴² For $\bar{\gamma} = 1$, the set $[\alpha^{oo}, \alpha_{H\Gamma}]$ is the singleton $\{\alpha^{oo}\}$ and $S_{H\Gamma}(\alpha^{oo}; \bar{\gamma}) = 0$.

is

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

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

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

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

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

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

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 news organization Σ with a bias toward greater precautions and low risk aversion citizens subscribe to news organization Γ with a bias toward fewer precautions.

B. Competition

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

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

This is strictly decreasing in α unless $\bar{\gamma} = \bar{\sigma} = 0$ and is strictly decreasing in $\bar{\gamma}$ and $\bar{\sigma}$.

The citizen α^* who is indifferent between subscribing to either publication is defined by

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

where p_{Σ} and p_{Γ} are the subscription prices. If $\bar{\gamma} \leq (<) \bar{\sigma}$, the difference in the surpluses is nonnegative, and hence $p_{\Gamma} \geq (>) p_{\Sigma}$, so greater bias by Σ must be compensated for by a lower price. If $\bar{\gamma} > \bar{\sigma}$, however, the difference can be positive or negative. Consequently, except for the case in which $\bar{\gamma}$ is sufficiently greater than $\bar{\sigma}$ that the difference $S_{H\Gamma}(\alpha; \bar{\gamma}) - S_{H\Sigma}(\alpha; \bar{\sigma})$ is negative, greater bias leads to a lower price.

The equilibrium has high risk aversion citizens ($\alpha > \alpha^{oo}$) subscribing to the publication of news organization Σ that is biased toward greater precautions and low risk-aversion citizens subscribing

to the publication of news organization Γ that is biased toward fewer precautions. The indifferent citizen α^* 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_Σ and decreasing in p_Γ . If the prices p_Γ and p_Σ were equal, then $\alpha^* = \alpha^{oo}$ when $\bar{\gamma} = \bar{\sigma}$, $\alpha^* < \alpha^{oo}$ when $\bar{\sigma} = 0$ and $\bar{\gamma} > 0$, and $\alpha^* > \alpha^{oo}$ when $\bar{\gamma} = 0$ and $\bar{\sigma} > 0$.

Letting the biases be 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_Σ and w_Γ are the corresponding wages, $\hat{\alpha}_H(p_\Sigma)$ is given in (9), and $\alpha_L^*(p_\Gamma)$ is given by

$$\alpha_L^*(p_\Gamma) = \max\left\{0, \frac{p_\Gamma - (1 - c)\rho_o q(1 - \bar{\gamma})b}{b^2 \rho_o q(1 - \bar{\gamma})}\right\}.$$

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

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

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

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 self-selection seems natural, but the reasons for it are perhaps counterintuitive. High risk aversion citizens take precautions based on prior information and hence they value a more accurate report $r_i = \phi$ 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 $r_i = \beta$ 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 because the signal that would lead them to reverse their prior decisions is more accurate.

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

The discretion chosen by a news organization maximizes its profit given the equilibrium prices, and a Nash equilibrium is sought. Rather than present the necessary conditions for the equilibrium biases, which are similar to that in (19), a numerical example is provided. Let $c = 0.7, b = 40, q = 0.7, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 10, v = 26, K = 0.001$. The equilibrium biases are $\bar{\gamma}^* = 0.0, \bar{\sigma}^* = 0.423$, the prices are $p_\Gamma^* = 11.701, p_\Sigma^* = 3.372$, and the wages are $w_\Gamma = 10, w_\Sigma = 0$. Citizens self-select according to the cutpoints $\alpha_L^* = 0.0738, \alpha^* = 0.2018, \hat{\alpha}_H = 1.2023$. The profits are $\pi_\Gamma^* = 0.0858$ and $\pi_\Sigma^* = 0.8453$. In this example, the news organization that grants journalists greater discretion has higher profits.

As another example with the same parameter values with the exception that $\rho_o = 0.2$, the equilibrium is $\bar{\gamma}^* = 0.1093, \bar{\sigma}^* = 0.469, p_\Gamma^* = 11.065, p_\Sigma^* = 4.432$, and $S_{\Gamma\Sigma} = 1.513$. The profits are $\pi_\Gamma^* = 0.0157$ and $\pi_\Sigma^* = 0.4303$, and the cutpoints are $\alpha_L^* = 0.0356, \alpha^* = 0.0423, \alpha_H^* = 0.4317$. In this example, both news organizations bias their news reports, both are profitable, and the one with the greater bias has higher profits.

The results of this section are summarized in the following proposition.

Proposition 6: In competition between two news organizations with opposing biases, if the one oriented toward greater precautions has the greater bias, it has a lower price. The equilibrium prices are increasing in the wage, the seriousness of the bad state, and the cost of precautions. The news organization that grants greater discretion to its journalists can have the greater profits.

C. Extensions

A citizen could subscribe to both publications Γ and Σ , since the additional news report is valuable despite the bias. Consider a subscriber to Γ who is considering subscribing also to Σ . If he subscribes to both, let $\rho^{ij}, i, j \in \{\beta, \phi\}$, denote the posterior beliefs that $\omega = B$ after seeing reports $r_\Gamma = i$ and $r_\Sigma = j$. It is straightforward to show that

$$1 = \rho_{\beta\Gamma} = \rho^{\beta\beta} = \rho^{\beta\phi} > \rho^{\phi\beta} > \rho_o > \rho_{\phi\Gamma} > \rho^{\phi\phi}.$$

Those with the most to gain from subscribing to Σ are those with high α , and if $\alpha^* > \alpha^{oo}$, those are the subscribers with $\alpha \in [\alpha^{oo}, \alpha_H^*]$. Those subscribers will act in response to both news reports

unless $r_\Gamma = r_\Sigma = \phi$. The additional surplus $S_{\Gamma\Sigma}$ is then

$$S_{\Gamma\Sigma} = \rho_o q(1 - q(1 - \bar{\gamma}^*))(1 - \bar{\sigma}^*)b(-c + 1 + \alpha b),$$

which is positive for $\bar{\sigma}^* < 1$. The subscriber to Γ thus will not subscribe to Σ if $S_{\Gamma\Sigma} \leq p_\Sigma^*$. For the above example, $S_{\Gamma\Sigma} = 1.739$, so citizens subscribe to at most one publication. Numerical evaluations, however, indicate that for some parameter values some citizens can have an incentive to subscribe to both publications.

The model assumes that both news organizations are in the market, but it can be reformulated to consider a market with an incumbent Σ and a potential entrant Γ . An entry model is not formalized here, but it is straightforward to show that Γ has an incentive to enter the market. Consider a two-period model with a different and independent news issue to be investigated in each period, and let Σ be the only news organization in the first period. At the end of the first period, Γ can enter or not. Since information is complete at the time of the entry decision and period two is the last period, Σ has no credible threat against Γ . Consequently, Γ will enter if it would have positive profits in the subsequent equilibrium, as in the examples.

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 interpretation and content to their news reports. In the theory presented here, this takes the form of bias. Bias affects both coverage and treatment. That is, it affects coverage in the sense that the probability that a news story with new information on the harm from GMO foods will be published. Treatment pertains to citizens' beliefs after seeing a news report. Citizens understand that the probability that a particular story is reported is a function of media bias, and in addition they adjust their beliefs based on the bias they anticipate. 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 news organization, however, may have an incentive to tolerate bias if by granting discretion journalists can be hired at a lower wage. Moreover, bias may persist with competition between news organizations.

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 news organizations that tolerate bias.

2. A profit-maximizing news organization tolerates bias only if that allows it to hire journalists at a lower wage. This is a necessary condition for the existence of media bias.

3. When it tolerates bias, a news organization lowers its subscription price. Price and bias are negatively correlated.

4. With competition between like-oriented news organizations citizens self-select with the more risk averse subscribing to the publication with the greater bias.

5. With competition between two like-oriented news organizations the one with the greater bias has a lower price but can have higher profits. Moreover, aggregate bias can be greater with competition than with a monopoly news organization. Lower quality (more biased) news commands a lower price, but low quality news can be more profitable than high quality news.

6. With news organizations with opposing biases citizens sort based on which news report leads them to change their prior decisions. High risk aversion citizens subscribe to the publication biased toward greater precautions, and low risk aversion citizens subscribe to the publication biased toward fewer precautions. The news organization with the greater bias can have higher profits.

7. Although citizens fully adjust for bias, they are influenced by the greater likelihood of certain stories. This can lead the public to overreact in private politics.

8. In public politics the expected stringency of regulation is increasing in media bias toward greater precautions. That is, media bias results in less stringent regulation given a news report, but the news report leading to the more stringent regulation is more likely.

The orientation of a news organization could be aligned with the orientation of interest groups; e.g., those that want citizens to take greater precautions and those that want citizens to take fewer precautions. 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 attract coverage that furthers their interests. The interest groups 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 it could be extended to a partisan dimension. If greater and fewer precautions against GMO foods are interpreted as liberal and conservative, respectively, then high risk aversion citizens subscribe to liberal publications and low risk aversion citizens subscribe to conservative publications. Citizens subscribing to the liberal publication are more skeptical of a news report β , but they see those reports with higher probability. From an *ex ante* perspective they take greater precautions than do the subscribers to the conservative publication.

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 those studies only one observation will be made. Some studies of elections have shown that citizen beliefs are not affected by news reports, and the model has this 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 σ . Moreover, citizens would report that they took bias into account and adjusted their beliefs appropriately. The journalist's decision to bias her news report, however, is an *ex ante* decision; i.e., when preparing the news report, and bias results in a higher probability of a biased story being reported. 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

This Appendix considers the case in which journalists have a preference for the number of citizens affected by their strategy. 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.

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 p^* and the discretion $\bar{\sigma}$ have already been fixed and only the exercise (σ) of discretion affects citizens. 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

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

where $\hat{\alpha}_H(\bar{\sigma})$ and $\hat{\alpha}_L(\bar{\sigma})$ are given in (9) and (10), respectively. The derivative with respect to σ 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, and the increase is proportional to $(1 - \rho_o q)$.

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Figure 2

Citizen Responses to News Reports

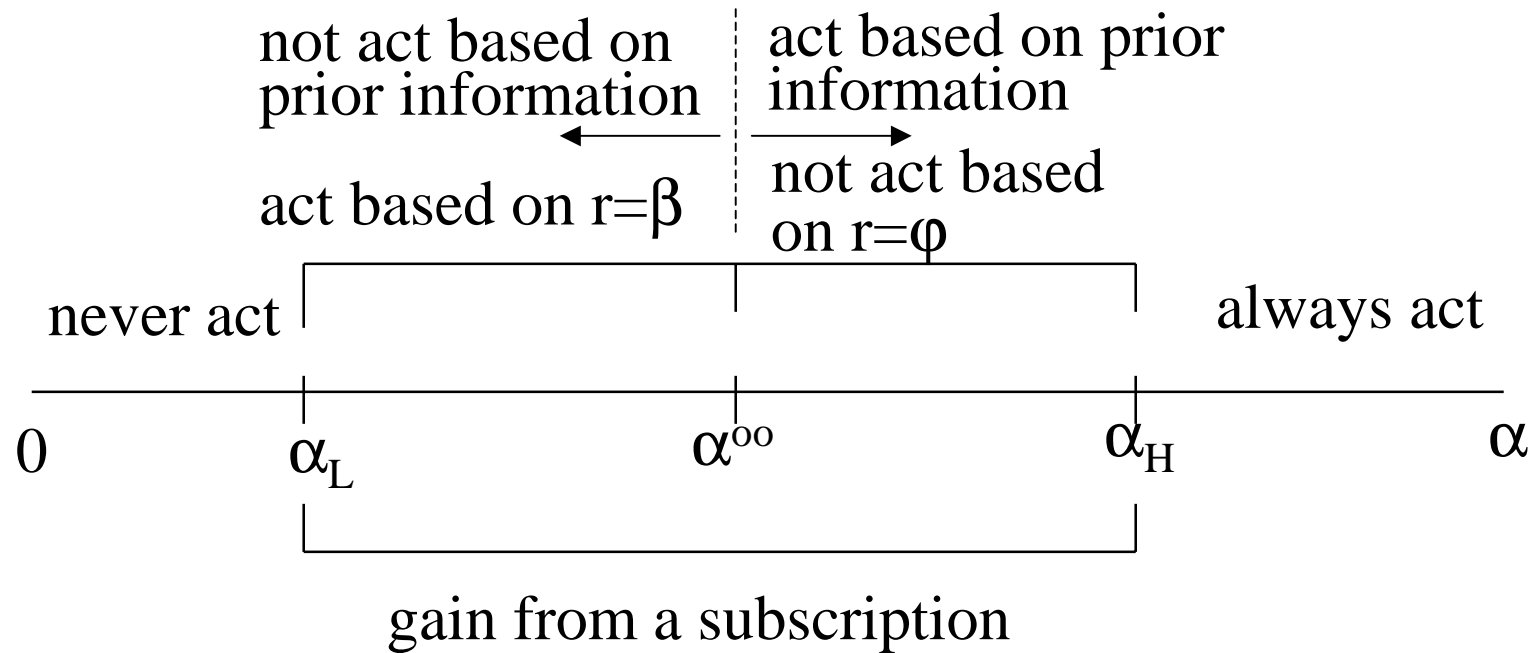


Figure 3

Citizen Responses to News Reports

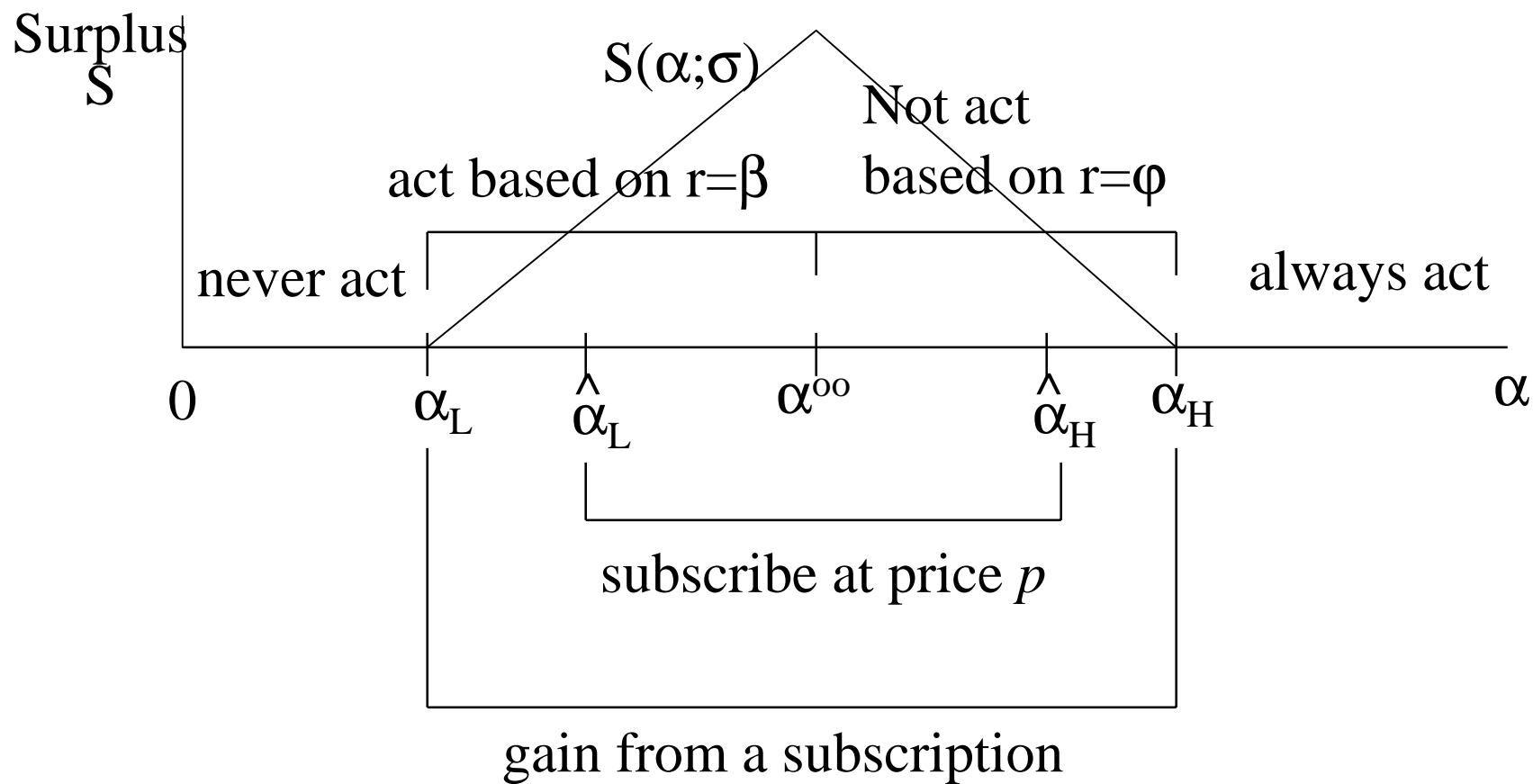


Figure 4

Competition Between News Organizations

