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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 public views the media 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 individuals are more skeptical of potentially biased news and thus rely less on it in their 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 career interests and are willing to sacrifice current wages for future opportunities. News organizations can control bias by restricting the discretion allowed to journalists, but granting discretion and tolerating bias can increase profits. The skepticism of individuals 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 a rival news organization nor by a news organization with an opposing bias. Moreover, bias can be greater with competition than with a monopoly news organization. If individuals collectively choose regulation in place of their individual decision-making, bias increases the expected 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 individuals 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 individuals 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. Individuals have a demand for news as entertainment and may have a demand for stories that are consistent with their political or social viewpoints. This 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.

In contrast to demand-side explanations based on characteristics of potential subscribers, this paper considers a supply-side explanation for the existence and persistence of media bias based on incomplete information and the career interests of journalists. Biasing stories may increase the probability that a journalist's story is published or may promote the world view of the journalist.

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Granting discretion to journalists provides the opportunity to bias stories and also allows a news organization to hire at a lower wage than if journalists were tightly controlled. 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 demonstrate influence 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.

Data on the compensation of journalists compared to compensation in other occupations with equivalent skill requirements are not available, but suppose that journalists were 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." Moreover, many news organizations use interns, some of whom are unpaid. In the model, journalists accept lower wages because their career interests can be advanced by having her stories published, and biasing stories can increase the probability of publication.

Even though they remain skeptical of possibly biased news stories, individuals have a demand for news because news reports provide information on which they may base individual and collective actions. Skepticism, however, about possible media bias 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 can be consistent with profit maximization. Competition from a news organization with less bias, however, could force a higher bias news organization to reduce the discretion granted to its journalists. Bias, however, is shown to persist with competition between like-oriented news organizations, where individuals choose between competing publications based on their preferences for stories with different possible biases. Although the news organization with the greater bias has a lower price for a subscription, it can have higher profits. Bias can also persist with competition between two news organizations with opposing biases. Moreover, competition can result in more biased news than with a monopoly news organization.[2]

[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.

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 bureaucracies. 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 individuals 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.

Public politics is unlikely to provide the incentives for individuals to read a newspaper, listen to the news on the radio, or watch a television news program. The probability that an individual is pivotal in an election or in influencing government in office is very small, as Downs (1957) argued. An individual 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 individuals. That is, the news can help individuals make better decisions in their everyday lives. Those decisions could pertain to health, safety, personal finance, product selection, the environment, employment, or other issues about which individuals make purposive decisions. The perspective here is that demand comes from news individuals can use.[4]

The principal focus of this paper thus is on private rather than public politics and hence not on partisan bias but instead on biased or unbalanced reporting on social issues such as the environment, health, safety, workers' rights, abortion, gun control, and so on. A journalist may, for example, bias a story by exaggerating the risks of GMO foods with the objective of leading individuals to take greater precautions in the absence of government regulation. The model also explains how the media contributes to individuals holding certain beliefs relevant to public politics. Public politics is considered in a simple median voter model of regulation, and the expected stringency of regulation is shown to be increasing in media bias.

II. The Nature of Media Bias

Bias takes a variety of forms.[5] Bias could result from an absence of balance resulting in one side of a story receiving unwarranted attention. It could be idealogical, where owners, editors, or journalists present stories that support particular world views. Bias could also be partisan,

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

[4] This perspective is also taken by Stromberg (2004).

[5] Daily commentary on the news media including discussions of bias, corrections of misreporting, and evaluations of articles can be found on Romenesko at www.poynter.org/column.asp?id=45.

where owners, editors, and journalists present stories to support the policies or causes espoused by political parties or interest groups. Bias could also be due to the fabrication of information, from information hidden or distorted by sources, or from 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 also that individuals 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:[6]

- 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, unstaunchable 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."[7] 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 (p. 466), "When they move from facts to analysis, their decisions are subject to errors of judgment

[6] ASNE, "Perceived Bias," p. 4, www.asne.org.
[7] ASNE, "Perceived Bias," p. 11, www.asne.org.

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." 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 ..."

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)."[8] 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)). Editors were more evenly balanced in their orientation and political preferences. 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 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

[8] ASNE, Chapter "Characteristics of the Respondents." www.asne.org.
[9] ASNE, Chapter "Understanding Each Other," p. 2.

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." 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.

In the wake of the firing of Jayson Blair for the fabrication of stories The New York Times created the position of public editor devoted "to receiving, investigating, and answering outsiders' concerns about our coverage." In July 2004 the public editor Daniel Okrent described his conclusions about liberal bias on social issues. "And if you think The Times plays it down the middle on any of [the social issues], you've been reading the paper with your eyes closed. ... [It is] quite another thing to tell only the side of the story your co-religionists wish to hear. I don't think it's intentional when The Times does this. But negligence doesn't have to be intentional." His example was same-sex marriage, and he described The Times' coverage as, "But for those who also believe the news pages cannot retain their credibility unless all aspects of an issue are subject to robust examination, it's disappointing to see The Times present the social and cultural aspects of same-sex marriage in a tone that approaches cheerleading. ... Every one of these articles was perfectly legitimate. Cumulatively, though, they would make a very effective ad campaign for the gay marriage campaign. ... [The] potentially nettlesome effects of gay marriage have been virtually absent from The Times ... Times editors have failed to provide the three-dimensional perspective balanced journalism requires."[10,11] The absence of balance, emphasis on one side of a story, or support for a particular world view is consistent with the bias considered in this paper.

Despite the belief that the news media is biased, the public does not view that bias as a

[10] *The New York Times*, July 25, 2004.

[11] Goldberg characterized CBS's reporting of the homeless in much the same way that Okrent characterized The Times' reporting.

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."[12] In the model this corresponds to individuals being skeptical of a news report that might be biased and rationally adjusting their beliefs to take the possible bias into account.

III. Theories and Measurement of Media Bias

A number of formal theories identify sources of media bias. Stromberg (2004) assumes that individuals 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 for the politicians. Bias is defined as the difference between the politicians' 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, but 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 does not affect the 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. Here, competition results in different biases and prices.

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.

[12] ASNE, Chapter "Perceived Bias," p. 2.

Baron (2005) focuses on the relations among individuals, journalists, and sources of information. Individuals 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 individuals. The sources have incentives to reveal information favorable to their position and conceal unfavorable information.[13] The media can investigate the issue at a cost, and based on the information provided by the sources and possibly its our investigation, it provides a report to the individuals. When it has no information, the media may bias its report to correct both a market failure and a government failure. The competition is between the sources of information rather than media organizations as in the model considered here.

Bovitz, Druckman, and Lupia (2002) investigate whether media elites can lead public opinion. They present a model of the internal organization of a single news organization including a reporter, editor, and owner, where readers subscribe to the organization's publication so as to make better decisions. Reporters and editors have career concerns–reporters want to be published–and along with the owner of the news organization 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.

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. Favoring of 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.[14] 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."[15] Their methodology requires no judgments about which media outlets were liberal or conservative or the degree of bias. They

[13] Puglisi (2004a) presents a model in which two candidates for public office can give spin to stories to make them more attractive to a news organization.

[14] 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.

[15] The exception was Fox News' Special Report.

simply counted the number of citations a news publication made to each of 20 think tanks and computed a score by comparing those citations to citations of those think tanks in speeches by members of Congress. The positions of Congress members on a left-right scale were determined using a statistical procedure standard in political science based on rankings by interest groups.

Unbalanced reporting or coverage emphasizing issues on which a party is viewed as strong by the electorate can constitute partisan bias. Puglisi (2004b) studied New York Times news articles for the period 1946 to 1994 and found that when the incumbent president was a Republican more emphasis was given to issues on which Democrats were traditionally "stronger." Similarly, when the incumbent was a Democrat, during the campaign greater coverage was provided on issues on which Democrats were strong. Puglisi concluded that the evidence is consistent with the hypothesis that The Times has a Democratic partisanship. Groseclose and Milyo also found that The Times was far to the left. Lott and Hassett (2004) studied the reporting of data on four measures of economic activity by a cross-section of 100 newspapers for the period January 1991 to April 2004. They found that headlines were more positive relative to the actual data during the Clinton administration than during either Bush administration. The results were stronger for the top 10 newspapers, although the results were not conclusive for some of the individual measures. The model presented here yields overemphasis on certain stories, and as a systematic phenomenon, this could be viewed as favoring a political party. The interpretation emphasized here, however, focuses on the issues themselves.

Another form of bias is simply overemphasis of extreme events. Ansolabehere, Snowberg, and Snyder (2004) studied the reporting of campaign contributions in the United States and found that the contributions reported by the press was several times greater than the average contributions in congressional elections. The press also overreported PAC contributions relative to contributions by individuals. Individual contributions represent over two-thirds of total contributions, whereas press reports suggested that approximately two-thirds of the contributions came from PACs. Surveys have indicated that the public's beliefs are consistent with the press reports.

IV. The Model

A. The Players

The basic model includes one or more news organizations, individuals who may subscribe to the publication of a news organization and may take an action, and journalists who report a story. A variant of the basic model adds an editor who monitors the journalist for bias in her story.

Individuals 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 act based on their prior information.

News organizations maximize their profits with respect to the price of a subscription and the discretion allowed their journalists. A journalist maximizes her utility which depends on wages and career interests that can be advanced by the exercise of 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 an issue on which individuals can at a cost take an action. 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 neither contractable nor insurable, but an individual can take an *ex ante* action 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. Individuals 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 $Pr(s = \beta \mid \omega = B) = q \in (\frac{1}{2}, 1)$ 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 is a report conditional on the signal observed. A pure strategy is a news report $r \in \{\beta, \phi\}$, and a

mixed strategy is $\sigma(s) = Pr(r = \beta \mid s), s \in \{\beta, \phi\}$. 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 to warn individuals. 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 story 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, i.e., citing advocates of precautions, by overemphasis of the bad event as illustrated by Ansolabehere, Snowberg, and Snyder, or by fabrication. Cumulatively over a series of stories, bias is consistent with unbalanced coverage of an issue and overemphasis.

The incentive for bias in this model can be given a number of interpretations. First, career interests such as future assignments to important beats, appearances on news broadcasts and talk shows, and speech and book opportunities could motivate a journalist to write an unbalanced story. That is, a report $r = \beta$ on the risks of GMO foods may make the front page, whereas a report $r = \phi$ may be less newsworthy and relegated to the back pages. A model of career interests and wages is presented in Section V.B. Second, the journalist may prefer that individuals 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 $Pr(r = \beta \; and \; \omega = B) = \rho_o(q + (1 - q)\sigma)$ is increasing in σ. In this interpretation the journalist acts as a private politics activist. 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.

An individual who receives a news report r has posterior beliefs ρ_β and ρ_ϕ given by

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

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

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 individuals 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 individuals; i.e., ρ_β is increasing in q and ρ_ϕ is decreasing in q.

The probability of a news report $r = \beta$ is

$$Pr(r = \beta) = \rho_o q + (1 - \rho_o q)\sigma, \tag{3}$$

which is increasing in σ. If a news report $r = \beta$ is more likely to be published, a journalist with career interests 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 $r = \beta$. The result may be unbalanced reporting as described by The Times' public editor.

Bias thus has both *ex ante* and *ex post* effects. *Ex post*, an individual'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 individuals to rely less on the news *ex post*, but the probability that individuals receive a news report that leads them to act is increasing in bias.

C. Individuals and Private Actions

Individuals have a demand for news that can improve their personal decisions.[16] Let an individual have a quadratic utility function $u(x) = x - \alpha x^2, x \in \Re$, where $\alpha \in [0, \bar{\alpha}]$ reflects risk aversion. An individual can take precautions against the risks associated with GMO foods, and to simplify the analysis, the precautions are assumed to allow the individuals to avoid completely the harm from the bad state. If an individual does not take precautions, he incurs a loss b in the bad state but no loss in the neutral state. The expected utility $EU(a; \rho_i, \alpha)$ of an individual with risk aversion α is

$$EU(a; \rho_i, \alpha) = \rho_i b(a - 1) - \alpha\rho_i(b(a - 1))^2 - cab,$$

where $a \in \{0, 1\}$ is the action, $i \in \{o, \beta, \phi\}$, and $c \in (\rho_\phi, 1 + \bar{\alpha}b)$ is the marginal cost of acting; i.e., of taking precautions.[17] An individual who takes precautions ($a = 1$) protects against the bad state and thus gains if $\omega = B$ and loses if $\omega = N$.

Individuals differ in their risk aversion α, and let the distribution function of α be uniform on $[0, \bar{\alpha}]$ with the number of individuals normalized to 1. Individuals with high risk aversion (α high)

[16] The news could also have entertainment value that is not included in the model.

[17] If $c \geq 1 + \bar{\alpha}b$, no individual would act even if the state $\omega = B$ were certain. If $c \leq \rho_\phi$, every individual would act based on either report, in which case there is no demand for news.

are more inclined to take precautions, whereas individuals 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 individuals would avoid such foods and low risk aversion individuals would not.

The model of individuals' preferences could be given a number of interpretations. In addition to the GMO foods issue, individuals could be concerned about the relation between obesity and health, and the action could be avoiding fast food. The parameter α also could be interpreted as an aversion to guilt or criticism for one's views or inaction. For example, the issue could be workers' rights in overseas factories producing footwear and apparel, assistance to the homeless, attitudes toward same-sex marriage, or environmental concerns about global climate change. In the case of global climate change, the bad state could be that global climate change is a serious risk, the action $a = 1$ is not buying an SUV, and α represents an aversion to inaction or to criticism for driving an SUV. In the case of the issue of the homeless, the bad state could be that the homeless are victims of bad fortune and with assistance $a = 1$ can resume normal lives, so α represents an aversion to inaction.

The sequence of actions in the basic game is as follows. Nature draws the state, and the news organization chooses the discretion to allow its journalists, which may be part of the reputation of the news organization, and the wage to offer to journalists. The journalists then accept or reject the employment offer. The news organization then chooses the price for a subscription, and individuals make their subscription decisions based on rational expectations of the discretion granted by the news organization and the reporting strategy of journalists. 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

Based on their prior information, some individuals act (take precautions) ($a = 1$) and others do not ($a = 0$). Individuals with α satisfying $\rho_o(1 + \alpha b) \geq c$ act, and the individual α^{oo} who is indifferent between acting and not acting is defined by

$$\alpha^{oo} \equiv \max\left\{\frac{c - \rho_o}{\rho_o b}\right\} > 0. \tag{4}$$

More risk averse individuals act, and less risk averse individuals do not. Fewer individuals act

the higher the cost c, whereas more individuals act the more likely (higher ρ_o) and more serious (higher b) the bad state.

The demand for news is characterized in the Appendix, and only the qualitative characteristics are described here. Individuals with $\alpha \in (\alpha_L, \alpha_H)$, defined in the Appendix, change their actions based on one of the news reports and hence gain from subscribing to the publication. Those with $\alpha \in (\alpha_L, \alpha^{oo}]$ act based on a news report $r = \beta$, and those with $\alpha \in (\alpha^{oo}, \alpha_H)$ do not act given a report $r = \phi$. Figure 2 illustrates the responses by individuals to news reports for $\alpha^{oo}>0$. The bound α_H is independent of σ, since the journalist exercises discretion when $s = \phi$ whether that signal was due to the state $\omega = B$ or $\omega = N$.

Individuals must subscribe to the publication to receive the news report, and whether an individual subscribes depends on his expected surplus $S(\alpha;\sigma)$ from actions conditional on the news reports. The expected surplus is

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

where $S_L(\alpha;\sigma)$ is the expected surplus of low risk aversion individuals and $S_H(\alpha;\sigma)$ is the corresponding expression for high risk aversion individuals. The expected surplus is increasing (decreasing) in α for $\alpha \in [\alpha_L, \alpha^{oo})(\in [\alpha^{oo}, \alpha_H])$, so individuals with the greatest gain from a subscription are those closest to α^{oo}. The potential demand for the publication is $\alpha_H - \alpha_L$, which is increasing in the quality q of the investigation and decreasing in the bias σ. Greater bias (discretion) results in skepticism, and hence fewer individuals gain from the news. The cross-partial derivative of $S(\alpha;\sigma)$ is positive, so more risk averse individuals are more tolerant of bias.

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

Proposition 1: Individuals $\alpha \in (\alpha_L, \alpha_H)$ 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 surplus $S(\alpha;\sigma)$ is increasing (decreasing) in α for $\alpha \in [\alpha_L, \alpha^{oo})$ $(\alpha \in [\alpha^{oo}, \alpha_H])$, decreasing in σ, increasing in q, and more risk averse individuals are more tolerant of bias.

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.[18] In this section the bias σ is assumed to be fixed, and in the following section it is made endogenous.

Individuals in (α_L, α_H) with a surplus at least as great as the price p subscribe to the publication, and denote the set of subscribers by $[\hat{\alpha}_L, \hat{\alpha}_H]$. This set is characterized in the Appendix. The bound $\hat{\alpha}_L$ is increasing and $\hat{\alpha}_H$ is decreasing in p, so a higher price causes both low and high risk-aversion individuals not to subscribe. The set of subscribers is decreasing in bias, since individuals are more skeptical and gain less from a subscription. Figure 3 illustrates the surplus and the set of subscribers.

The technology of producing the news publication involves assigning journalists to stories, and two polar cases are considered. In the first journalists are a variable cost, and in the second they are a fixed cost. Pricing is the same in both cases, and the variable cost assumption will be used in the exposition. The fixed cost case is considered in Section V.E.

The profit π of the news organization is

$$\pi = (p - w)\Big(\frac{\hat{\alpha}_H - \hat{\alpha}_L}{\bar{\alpha}}\Big) - K, \tag{5}$$

where w is the wage rate of journalists and $K \geq 0$ is a fixed cost. This technology may be representative of a news organization that covers more stories (rather than relying on the Associated Press, Reuters, or other news services) as the number of readers increases. The other variable costs of operating the news organization are assumed to be zero. The fixed costs explain why the number of news organizations in a market is small.

The optimal price $p^*(\sigma)$, when $\hat{\alpha}_L > 0$, is[19,20]

$$p^*(\sigma) = \frac{1}{2}\big(cbq(1 - \rho_o)(1 - \sigma) + w\big). \tag{6}$$

The optimal price p^* is linear and strictly decreasing in σ, so the news organization sets a lower price when it allows its journalists more discretion. This results because individuals 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 of the journalist's investigation the higher is the price, since the signal $s = \phi$ is then less likely. The price is also

[18] In an advertising model if the frequency of advertisements is denoted by τ and the individual's disutility of being confronted with advertisements is ξ, then $\tau\xi$ replaces p in the demand for news in equation $(A6)$ in the Appendix. Then, if ζ is the advertising rate, $\tau\zeta$ replaces p in (5).

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

[20] The optimal price and the number of subscriptions are characterized in the Appendix.

increasing in the individuals' cost c of acting, 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 more individuals act *a priori* the greater is ρ_o.

The news organization will operate if its profit is nonnegative, which requires that

$$p^* - w = \frac{1}{2}(cbq(1-\rho_o)(1-\sigma) - w) \geq 0. \tag{7}$$

The profit π^* then is

$$\pi^* = \frac{(p^* - w)^2}{\bar{\alpha}b^2\rho_o(1-q)(q+\sigma(1-q))(1-\sigma)} - K, \tag{8}$$

which is strictly increasing in c and b, since information is more valuable to individuals the more costly are precautions and the more serious is the bad state. Profit is also strictly increasing in the quality q, since the news report is then more valuable to individuals and the news organization can capture some of that value. The greater is the prior probability ρ_o, however, the lower are profits, since individuals are more likely to take precautions in the absence of a news report.

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

Proposition 2: The optimal price p^* in (6) is strictly decreasing in the bias σ and the prior probability ρ_o 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 (8) inherits these properties for w fixed.

Although the price and the number of subscribers are strictly decreasing in σ, allowing discretion may have advantages in the market for journalists.

B. Journalistic Discretion and the Labor Market

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 careers with opportunities for prominence and influence.[21] Prominence results from the opportunity to write books, given speeches, receive prizes, give interviews on talk shows, obtain a regular position on a TV news program, etc. These opportunities are largely outside the news organization and thus provide little benefit or cost to it. To obtain opportunities for prominence, the journalist's work must be noticed, and notice depends on being published. 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." If stories about the bad state

[21] Bovitz, Druckman, and Lupia take a similar perspective on the preferences of journalists.

are more likely to be published than stories about the neutral state, bias increases the probability of being published. For example, stories about the bad state may be more newsworthy because they matter to more individuals; i.e., more people act in response to such a story. The public seems more interested in warnings about possible hazards, such as associated with GMO food, than with stories ($r = \phi$) that no information about risks was found.

Bias could be restrained by professionalism, but to focus on the persistence of media bias, professionalism will not be included in the model. Instead, the discretion σ exercised by the journalist is assumed to be bounded by 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.

The journalist writes the story after the news organization chooses its price and discretion allowed and after individuals have made their subscription decisions (based on $\bar{\sigma}$), so the only effect of the exercise of discretion by the journalist is on the likelihood of the news reports $r = \beta$ and $r = \phi$. To simplify the analysis, the chances of succeeding to a career of influence are assumed to be an increasing function of the probability $\eta(\sigma) = \rho_o q + (1 - \rho_o q)\sigma$ in (3) of a report $r = \beta$.

The preferences of journalists are assumed to depend on their wage w and their expected future opportunities for influence. These future opportunities will be represented by $\eta(\sigma)R$, where R is the expected reward to the journalist from career opportunities for prominence and incorporates the probability of success conditional on being published. The reward R is assumed to be primarily outside the news organization, so R is not included in the news organization's profit in (5). Assuming for simplicity a linear utility function, once hired at a wage w a journalist maximizes her utility u,

$$u = w + \eta(\sigma)R,$$

subject to the constraint $\sigma \leq \bar{\sigma}$. The journalist thus chooses $\sigma^* = \bar{\sigma}$ and fully exercises the discretion granted. A journalist then will accept a job offer $(w, \bar{\sigma})$ if

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

where w_o is the wage premium above the subsistence wage in the outside labor market for jobs without career opportunities for prominence.[22] Since the supply of journalists exceeds the demand,

[22] The subsistence level is set to zero to simplify the notation.

the wage $w(\bar{\sigma})$ offered by the news organization is

$$w(\bar{\sigma}) = w_o - \eta(\bar{\sigma})R. \tag{9}$$

The news organization thus captures the value of future outside career opportunities, so a news organization 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 Section V.D, a news organization that monitors less frequently can attract journalists at a lower wage.

The news organization chooses its discretion, or reputation, $\bar{\sigma}$ to maximize its profit π^* in (8) (with $\bar{\sigma}$ replacing σ and the wage $w = w(\bar{\sigma})$ given in (9)).[23] 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

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

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

$$\bar{\sigma}^* = \frac{cbq(1-\rho_o) + (w_o - \rho_o q R)(2q-1) - 2(1-\rho_o q)qR}{cbq(1-\rho_o) - (2q-1)(1-\rho_o q)R - 2(1-q)(w_o - \rho_o q R)}. \tag{10}$$

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

$$cbq(1-\rho_o) - (2q-1)(1-\rho_o q)R - 2(1-q)(w_o - \rho_o q R) < 0$$

must be satisfied. The discretion in (10) is no greater than one only if $w(1) = w_o - \eta(1)R \geq 0$, which implies that for $\bar{\sigma}^* < 1$ the expected reward R must be less than $\frac{w_o - \rho_o q}{(1-\rho_o q)}$. Conversely, in this model media bias is present only if R is sufficiently large. Moreover, $\bar{\sigma}^*$ in (10) is non-negative only if $p^*(0) - w(0) + qw(1) < 0$. Consequently, $\bar{\sigma}^* \in (0,1)$ only if $w(1) > 0$ and $p^*(0) - w(0) + qw(1) < 0$, which requires $p^*(0) < w(0)$. In addition, $p^*(\bar{\sigma}^*) - w(\bar{\sigma}^*) \geq 0$ is required for profit to 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: $c = 0.7, b = 40, q = 0.9, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 12, R = 26, K = 0.01$. The equilibrium then has $p^* = 6.710$ and $\bar{\sigma}^* = \bar{\sigma}_w = 0.408$. Individuals sort according to the cut points $\hat{\alpha}_L = 0.105$ and

[23] Individuals' beliefs in (1) and (2) and their subscription decisions are then based on $\bar{\sigma}$.

$\hat{\alpha}_H = 0.859$, where $\alpha^{oo} = 0.150$. The wage premium is $w(\bar{\sigma}^*) = 0$, and profits are $\pi^* = 1.254$. If, however, $R = 10$, the optimal discretion is $\bar{\sigma}^* = 0$.[24]

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 (9) is decreasing in the discretion $\bar{\sigma}$ allowed by the news organization, which captures the rents to the exercise of discretion. The optimal discretion is $\bar{\sigma}^* = \sigma_w$ if R is large or $\bar{\sigma}^* = 0$ if R is small, and if $\bar{\sigma}^* \in (0, \bar{\sigma}_w)$, the price $p^*(0)$ must be less than the wage $w(0)$.

C. Welfare and Bias

The portions of aggregate welfare that depend on the bias are 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 thus is

$$\begin{aligned} W &= \int_{\hat{\alpha}_L}^{\alpha_{oo}} \Big[S_L(\alpha;\bar{\sigma}) - p^*)\Big]\frac{d\alpha}{\bar{\alpha}} + \int_{\hat{\alpha}_{oo}}^{\hat{\alpha}_H} \Big[S_H(\alpha;\bar{\sigma}) - p^*\Big]\frac{d\alpha}{\bar{\alpha}} + \pi^* \\ &= \int_{\hat{\alpha}_L}^{\alpha^{oo}} \Big[S_L(\alpha;\bar{\sigma}) - w(\bar{\sigma})\Big]\frac{d\alpha}{\bar{\alpha}} + \int_{\alpha^{oo}}^{\hat{\alpha}_H} \Big[S_H(\alpha;\bar{\sigma}) - w(\bar{\sigma})\Big]\frac{d\alpha}{\bar{\alpha}} - K. \end{aligned} \tag{11}$$

The net surplus of individuals given by the two integrals in the first line of (11) 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 $\bar{\sigma}^* = \bar{\sigma}_w$, then profit is increasing in $\bar{\sigma}$. In the second line of (11), 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

$$\begin{aligned} \frac{dW}{d\bar{\sigma}} = &\int_{\hat{\alpha}_L}^{\alpha^{oo}} \Big(\frac{dS_L(\alpha;\bar{\sigma})}{d\bar{\sigma}} - w'(\bar{\sigma})\Big)\frac{d\alpha}{\bar{\alpha}} - \Big(S_L(\hat{\alpha}_L;\bar{\sigma}) - w(\bar{\sigma})\Big)\frac{1}{\bar{\alpha}}\frac{d\hat{\alpha}_L}{d\bar{\sigma}} \\ &+ \int_{\alpha^{oo}}^{\hat{\alpha}_H} \Big(\frac{dS_H(\alpha;\bar{\sigma})}{d\bar{\sigma}} - w'(\bar{\sigma})\Big)\frac{d\alpha}{\bar{\alpha}} - \Big(S_H(\hat{\alpha}_H;\bar{\sigma}) - w(\bar{\sigma})\Big)\frac{1}{\bar{\alpha}}\frac{d\hat{\alpha}_H}{d\bar{\sigma}}, \end{aligned}$$

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.

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

The wage savings $-w'(\bar{\sigma})$, however, are positive. The net effect on aggregate welfare is ambiguous from this analysis, but if the individuals' 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 outside career opportunities, the exercise of discretion by a journalist may depend on the internal organization of the news organization. As an illustration 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, deadlines, and cost, so the monitoring considered here is *ex post*; i.e., after the story has been published.[25]

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 found, 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, let the utility u of the journalist after accepting a job at the wage w is

$$u = w + \nu((1 - \rho_o q)\sigma)^{\frac{1}{2}} - hg(1 - \rho_o q)\sigma,$$

where ν is a positive constant. The journalist's response function $\hat{\sigma}^*$ is[26]

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

which is decreasing in hg. 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

$$\hat{\pi}^* = \frac{(p^* - \hat{w}(\hat{\sigma}^*))^2}{\bar{\alpha}b^2\rho_o(1-q)(q + \hat{\sigma}^*(1-q))(1-\hat{\sigma}^*)} - K - t(h), \tag{12}$$

where $t(h)$ is the cost of monitoring and $\hat{w}(\hat{\sigma}^*) = w_o - \left(\rho_o q + \left(\frac{\nu^2}{2hg}\right)^2\right)$. The news organization chooses h to maximize $\hat{\pi}^*$ in (12).

[25] For example, *The New York Times* detected fabrication by Jayson Blair only after many of his news reports had been published. Bovitz, Druckman and Lupia consider *ex ante* monitoring by an editor who observes the same signal as does the journalist.

[26] Individuals are assumed to have rational expectations of the journalist's choice of $\hat{\sigma}^*$.

E. An Alternative News Technology

The technology for news production has represented journalists as a variable cost. An alternative assumption is that a news report requires a fixed number of journalists regardless of the number of 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 cover more stories as its readership increases.

The profit of the news organization is then

$$\pi = (p - \kappa)\Big(\frac{\hat{\alpha}_H - \hat{\alpha}_L}{\bar{\alpha}}\Big) - nw - K, \tag{13}$$

where κ is the marginal cost of a subscription and n is the number of journalists required. The journalist will choose $\sigma = \bar{\sigma}$, so the bias is determined by the discretion granted by the news organization. The optimal price p_f^* is

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

and the profit excluding the wage is given in (8) with κ replacing w.[27] 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 with respect to $\bar{\sigma}$ of profit in (13) evaluated at p_f^* is

$$\frac{d\pi^*}{d\bar{\sigma}} = -\frac{(p_f^* - \kappa)(p_f^* - \kappa + \kappa(q + \bar{\sigma}(1-q)))}{\bar{\alpha}b^2\rho_o(1-q)(q+\bar{\sigma}(1-q))^2(1-\bar{\sigma})^2} + n(1-\rho_o q)R. \tag{14}$$

Evaluated at $\bar{\sigma} = 0$, the derivative is positive for R sufficiently large. Bias thus can exist when journalists are a fixed cost.

VI. The News Media and Public Politics

The model focuses on private actions by individuals, but it may be possible to substitute public action for private actions. For example, the government could require labeling or ban foods containing genetically-modified organisms. To illustrate this, suppose the government can prescribe precautions and individuals 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 individuals will be assumed to have access to the publication.

[27] The cost κ must satisfy $cbq(1-\rho_o)(1-\bar{\sigma}) > \kappa$ for the news organization to operate.

To represent public politics, let $a \in \Re^+$ denote the stringency of public regulation to be chosen collectively, where c is now interpreted as the marginal cost of regulation to each individual. 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 individual given a news report $r=i$, which is

$$\hat{a}_m(r=i) = 1 - \frac{c-\rho_i}{2\alpha_m \rho_i b},\ i=\beta,\phi,$$

where α_m is the risk aversion of the median individual. This is increasing in ρ_i, and ρ_β is decreasing in $\bar{\sigma}$, since the median voter is then more skeptical of the news report. Greater discretion and bias thus result in less stringent regulation conditional on $r=\beta$. 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 *ex post*, but the more stringent regulation $\hat{a}_m(r=\beta)$ occurs with higher probability and the less stringent regulation $\hat{a}_m(r=\phi)$ with lower probability.

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

$$\begin{aligned} E(\hat{a}_m(\cdot)) &= (\rho_o q + (1-\rho_o q)\bar{\sigma})\hat{a}_m(r=\beta) + (1-\rho_o q)(1-\bar{\sigma})\hat{a}_m(r=\phi) \\ &= 1 - (\rho_o q + (1-\rho_o q)\bar{\sigma})\frac{c-\rho_\beta}{2\alpha_m \rho_\beta b} - (1-\rho_o q)(1-\bar{\sigma})\frac{c-\rho_\phi}{2\alpha_m \rho_\phi b}. \end{aligned}$$

This is strictly increasing in $\bar{\sigma}$, so media bias resulting from the discretion granted to journalists by the news organization increases the expected stringency of regulation.[28] 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 stringency of regulation conditional on the news reports $r=\beta$ and $r=\phi$ is strictly decreasing and constant, respectively, in the bias. The expected regulation is strictly more stringent, however, since $\hat{a}(r=\beta) > \hat{a}(r=\phi)$ and the probability of the report $r=\beta$ is increasing in the bias $\bar{\sigma}$.

VII. Media Bias and Competition

[28] The derivative is

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

Bias results in skepticism on the part of individuals, and 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 individuals 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 individuals choose between publications based on prices and their reputations for bias. Bias thus is a form of product differentiation.[29] Competition with like-oriented biases could correspond to the survey results that journalists are predominately to the left politically or to the empirical findings of Groseclose and Milyo. 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 have the same quality q.

Let one news organization have discretion $\bar{\sigma}_1$ and the other $\bar{\sigma}_2$, where $\bar{\sigma}_1 < \bar{\sigma}_2$, and assume that an individual subscribes to only one publication.[30] The difference in the surpluses for the two news organizations is[31]

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

Letting $p_i, i = 1,2$, be the price of a subscription to publication i, the individual 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 individuals 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

[29] 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.

[30] In Section VIII.C individuals are allowed to subscribe to both publications.

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

compete on price until $p_1 = p_2 = w_1 = w_2$, where $w_i = w(\bar{\sigma}_i)$, but with fixed costs neither news organization is profitable.

With differentiated news with $\bar{\sigma}_2 > \bar{\sigma}_1$, $S_H(\alpha^o; \bar{\sigma}_1) - S_H(\alpha^o; \bar{\sigma}_2) > 0$, so $p_1 > p_2$. In any equilibrium the skepticism of individuals requires that the price charged by the news organization with the greater bias thus is lower than the price charged by the news organization with the smaller bias. Lower quality news thus commands a lower price.

The indifferent individual α^o is identified by

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

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

High risk aversion individuals 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 $r_1 = \beta$; 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 individuals receive $r_1 = \beta$. The beliefs of all subscribers are the same given $r_i = \phi$.

The profit of each news organization 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

$$\pi_1 = (p_1 - w_1)\Big(\frac{\alpha^o - \hat{\alpha}_L}{\bar{\alpha}}\Big) - K$$

$$\pi_2 = (p_2 - w_2)\Big(\frac{\hat{\alpha}_H - \alpha^o}{\bar{\alpha}}\Big) - K,$$

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 individual α^o is increasing in p_2 and decreasing in p_1 reflecting the usual response of demand to changes in prices. Similarly, α^o is increasing in $\bar{\sigma}_2$ and decreasing in $\bar{\sigma}_1$, so a news organization loses subscriptions as it allows its journalists more discretion to pursue career interests.

Initially, let $\bar{\sigma}_1$ and $\bar{\sigma}_2$ be fixed. 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.[32] Bias thus can persist with competition. The equilibrium prices p_1^* and p_2^* for $\hat{\alpha}_L > 0$ are

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

[32] See the Appendix.

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

where

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

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

$$\pi_1^* = \frac{(p_1^* - w_1)^2(q+\bar{\sigma}_2(1-q))}{\bar{\alpha}\rho_o(1-q)b^2(q+\bar{\sigma}_1(1-q))(\bar{\sigma}_2-\bar{\sigma}_1)} - K \tag{15}$$

and

$$\pi_2^* = \frac{(p_2^* - w_2)^2(1-\bar{\sigma}_1)}{\bar{\alpha}\rho_o(1-q)b^2(1-\bar{\sigma}_2)(\bar{\sigma}_2-\bar{\sigma}_1)} - K. \tag{16}$$

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 individuals. Profits are decreasing in the wage premium w_o, since although an increase in w_o results in higher prices, the margins $p_i^* - w_i, i = 1, 2$, decrease.[33]

Unambiguous comparisons of the news organizations' strategies are limited, and those results that are available are stated in the following proposition, which is proven in the Appendix.

Proposition 5: Given $\bar{\sigma}_2 > \bar{\sigma}_1$,

(a) $p_2^* - w_2 \geq p_1^* - w_1 \;\Rightarrow\; \pi_2^* > \pi_1^* \;\Rightarrow\; \hat{\alpha}_H - \alpha^o > \alpha^o - \hat{\alpha}_L$.

(b) $\alpha^o - \hat{\alpha}_L \geq \hat{\alpha}_H - \alpha^o \leq \;\Rightarrow\; \pi_1^* < \pi_2^* \;\Rightarrow\; p_1^* - w_1 > p_2^* - w_2$.

A higher margin for the news organization with the greater bias implies a higher profit and more subscribers than for the lower bias news organization. If the news organization with the lower bias has more subscribers, it has higher profit and a higher margin than the news organization with greater bias.

Next, consider the news organizations' choices of the discretion to grant to their journalists. The derivative of the profit π_2^* in (16) for news organization 2 is, for example,[34]

$$\frac{d\pi_2^*}{d\bar{\sigma}_2} = \frac{(p_2^* - w_2)\Big[2(1-\bar{\sigma}_2)(\bar{\sigma}_2-\bar{\sigma}_1)(\frac{dp_2^*}{d\bar{\sigma}_2} - \frac{dw_2}{d\bar{\sigma}_2}) - (1-2\bar{\sigma}_2+\bar{\sigma}_1)(p_2^*-w_2)\Big](1-\bar{\sigma}_1)}{\bar{\alpha}\rho_o(1-q)b^2(1-\bar{\sigma}_2)^2(\bar{\sigma}_2-\bar{\sigma}_1)^2}, \tag{17}$$

[33] To see that π_2^* is decreasing in w_o, differentiate p_2^* to obtain

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

which is strictly less than one.

[34] The expression for news organization 1 is similar.

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. The equilibrium is characterized by a 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 show that the news organization that grants its journalists the greater discretion can have higher profits. Let the parameter values be: $c = 0.7, b = 40, q = 0.7, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 12, R = 26, K = 0.01$. The equilibrium then has $p_1^* = 5.244, p_2^* = 2.077, \bar{\sigma}_1^* = 0.232, \bar{\sigma}_2^* = \sigma_w = 0.421$. The wages are $w_1 = 4.594$ and $w_2 = 0$. individuals sort according to the cut points ($\hat{\alpha}_L = 0.082, \alpha^o = 0.170, \hat{\alpha}_H = 0.443$). In this example, news organization 2 chooses the maximal discretion and a low price, whereas news organization 1 grants less discretion and sets a higher price. The profits are $\pi_1^* = 0.0043$ and $\pi_2^* = 0.1315$, so the news organization with the greater bias has higher profits. Bias thus can persist with competition and be profitable.

To show that greater bias is not always profitable, consider an example with the same parameter values as above with the exception that $q = 0.9$ and $R = 12$. The equilibrium discretions are $\bar{\sigma}_1^* = 0$ and $\bar{\sigma}_2^* = 0.634 < \bar{\sigma}_w = 1$, and the profits are $\pi_1^* = 0.471$ and $\pi_2^* = 0.0167$. In this example, the average bias is greater than with a single news organization, and because of lower prices more individuals subscribe, so more individuals are exposed to biased reports. Competition thus can result in greater bias than with a single news organization.

VIII. Competition between News Organizations with Opposing Biases

A. Opposing Biases

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 on the issue of GMO foods one news organization is biased toward greater precautions and the other biased toward fewer precautions. Similarly, referring to the commentary by The Times' public editor, one news organization could provide unbalanced reporting supporting one world view, and the other could provide unbalanced reporting supporting an opposing world view. The orientations of the two news organizations could, for example, be determined by the orientations of their owners. Journalists would then self-select between the two news organizations based on their own world views, where the orientations of journalists could be identified through interviews. Or, news organizations could have reputations for particular world views that allow sorting. Career interests then could be

pursued through opportunities within each world view.

Let the news organization biased toward greater precautions be denoted by Σ and the other by Γ. Maintaining the same information structure in Figure 1, let the latter report $r_\Gamma = \phi$ with probability one when $s = \phi$ is observed and report $r_\Gamma = \phi$ with probability γ when $s = \beta$ is observed.[35] Bias may be thought of as quoting advocates of GMO foods, citing previous investigations that found no evidence of harm, or emphasizing the potential benefits.

If an individual 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.[36] 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 a higher probability of a story reporting $r_\Gamma = \phi$.

B. Demand and Competition

The news organizations compete in terms of prices and the discretion granted to their journalists. Journalists will fully exercise the discretion, so the bias in stories is equal to the discretion granted. As in Section V.B that discretion is $\bar{\sigma}$ for Σ, and let $\bar{\gamma}$ be the discretion for Γ.

The surplus $S_\Gamma(\alpha; \bar{\gamma})$ for an individual α who subscribes to publication Γ is characterized in the Appendix. The surplus is decreasing in $\bar{\gamma}$ and increasing (decreasing) in α for $\alpha \in [0, \alpha^{oo})(\in [\alpha^{oo}, \alpha_{\Gamma H}])$, where $\alpha_{\Gamma H}$ is the highest α that gains from a subscription. The cross-partial derivative of $S_\Gamma(\alpha; \bar{\gamma})$ is negative, so less risk-averse individuals are more tolerant of bias toward the neutral state. The equilibrium has high risk aversion individuals subscribing to the publication of news organization Σ and low risk-aversion individuals subscribing to the publication of news organization Γ. Letting the respective subscription prices be denoted by p_Σ and p_Γ, the indifferent individual α^* is identified by

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

[35] Even if an individual 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 $r_\Gamma = \phi$ and Σ reported $r_\Sigma = \beta$, an individual would not know the state with certainty if reports were biased.

[36] Note that $\rho_{\phi\Gamma} = \rho_\phi$ if $\gamma = 0$.

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

$$p_\Gamma^* = \arg\max_{p_\Gamma} \, (p_\Gamma - w_\Gamma)\Big(\frac{\alpha^* - \alpha_L^*(p_\Gamma)}{\bar{\alpha}}\Big) - K$$

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

where $w_\Sigma = w_o - (\rho_o q + (1 - \rho_o q)\bar{\sigma})R_\Sigma$, R_Σ is the expected career interests for journalists of Σ, w_Γ are the wages for Γ, $\hat{\alpha}_H(p_\Sigma)$ is given in $(A7)$, and $\alpha_L^*(p_\Gamma)$ is given by

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

The equilibrium prices p_Σ^* and p_Γ^* for $\alpha_L^*(p_\Gamma^*) > 0$ are

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

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

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 individuals are more tolerant of bias toward fewer precautions and high risk aversion individuals are more tolerant of bias toward greater precautions. The self-selection seems natural, but the reasons for it are perhaps counterintuitive. High risk aversion individuals act 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 Σ biased toward greater precautions. Similarly, low risk aversion individuals value a more accurate report $r_i = \beta$ that would lead them to act, and the more accurate report comes from the news organization Γ biased toward fewer precautions. Individuals 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.

If career opportunities have expected reward R_Γ for the journalists at news organization Γ, the wages are $w_\Gamma = w_o - (1 - \rho_o q(1-\bar{\gamma}))R_\Gamma$. When ρ_o is small, the journalists at news organization Γ

report $r_\Gamma = \phi$ with high probability even in the absence of bias, so R_Γ conditional on $r_\Gamma = \phi$ could be substantially lower than R_Σ. With the information structure in Figure 1 the news organization with the stronger wage incentive to tolerate bias is the one Σ that biases its reports toward the 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 optimality conditions for the equilibrium biases, which are similar to those in Sections V and VII, numerical examples are provided. Let $c = 0.7, b = 40, q = 0.7, \rho_o = 0.1, \bar{\alpha} = 4, w_o = 12, R_\Sigma = 26, R_\Gamma = 6$, and $K = 0.01$. The equilibrium biases are $\bar{\gamma}^* = 0.0, \bar{\sigma}^* = 0.421$, the prices are $p_\Gamma^* = 8.781, p_\Sigma^* = 2.542$, and the wages are $w_\Gamma = 6.420$ and $w_\Sigma = 0$. Individuals self-select according to the cutpoints $\alpha_L^* = 0.0709, \alpha^* = 0.1738, \hat{\alpha}_H = 0.4260$. The profits are $\pi_\Gamma^* = 0.0926$ and $\pi_\Sigma^* = 0.1503$. In this example, the news organization that grants its 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 $\bar{\gamma}^* = 0.061, \bar{\sigma}^* = 0.374, p_\Gamma^* = 8.027$, and $p_\Sigma^* = 3.074$. The profits are $\pi_\Gamma^* = 0.0025$ and $\pi_\Sigma^* = 0.0933$, and the cutpoints are $\alpha_L^* = 0.0307, \alpha^* = 0.0403, \hat{\alpha}_H = 0.1747$. In this example, both news organizations bias their news reports, both are profitable, and the one with the greater bias has higher profits.

These examples indicate that in an equilibrium in which only one news organization biases its reporting that news organization can have higher profits than the news organization with no bias. Moreover, in an equilibrium in which both news organizations bias their reporting, the one with the greater bias can have higher profits.

C. Extensions

An individual 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 subscribers will act in response to both news reports unless $r_\Gamma = r_\Sigma = \phi$. The additional surplus $S_{\Gamma\Sigma}(\alpha)$ is then

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

which is positive for $\bar{\sigma}^* < 1$. The subscriber to Γ will not subscribe to Σ if $S_{\Gamma\Sigma}(\alpha) \leq p^*_\Sigma$. As an example, with $c = 0.7, b = 40, q = 0.09, \rho_o = 0.1, w_o = 12, R_\Sigma = 26$, and $R_\Gamma = 6$, the surplus $S_{\Gamma\Sigma}(\alpha^*) = 1.368$ and $p^*_\Sigma = 2.473$, so no individual has an incentive to subscribe to both publications. Other examples, however, indicate that for some parameter values some individuals 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.

IX. Conclusions

News organizations select which stories to cover and how those stories are treated. Journalists who have career interests 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 can take the form of bias or unbalanced reporting in the terminology of The Times' public editor. Bias affects both coverage and treatment. It affects coverage in the sense that the probability is higher that a news story on the hazards of GMO foods will be published. Treatment pertains to individuals' beliefs after seeing a news report. Individuals understand that the probability that a particular story is reported is a function of media bias and 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 instituted by the news organization. A profit-maximizing news organization, however, may have an incentive to tolerate bias or unbalanced reporting 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 individuals are more skeptical of 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 presence of media bias in the model.

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

4. With competition between like-oriented news organizations individuals 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, average bias can be greater with competition than with a single news organization. Lower quality (more biased) news commands a lower price, but lower quality news can be more profitable than higher quality news.

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

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

The orientation of a news organization could be aligned with the orientation of interest groups; e.g., those that want individuals to take greater precautions and those that want individuals 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 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 individuals subscribe to liberal publications and low risk aversion individuals subscribe to conservative publications. Individuals 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.

Another interpretation of partisan bias in the model could be based on the commentary of The Times' public editor and the study of The Times by Puglisi. The public editor's identification of unbalanced reporting identifies the partisan orientation of the news publication, and Puglisi's perspective on the coverage of issues on which a party is perceived by the public to be strong

identifies the mechanism for a partisan effect. This perspective is consistent with Groseclose and Milyo's finding that The Times is located near the median Democrat in the House.

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 offered. Some studies of elections have shown that individuals' beliefs are not affected by news reports, and the model has this feature in the sense that individuals 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 individuals taking precautions, i.e., $\hat{\alpha}_L$ is increasing in σ. Moreover, individuals 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 particular 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

The Demand for News

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

$$\alpha \geq \alpha_L \equiv \max\Big\{0, \frac{c-\rho_\beta}{\rho_\beta b}\Big\}, \tag{A1}$$

where ρ_β is given in (1). Those individuals with $\alpha\in[0,\alpha_L]$ do not act based on prior information nor on a report $r=\beta$, but if $\rho_\beta\geq c$, all low risk-aversion individuals act in response to $r=\beta$. The bound α_L, when positive, is strictly decreasing in the quality q of the news service, the seriousness b 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 $\alpha_L>0$, and in the limit as $\sigma\to 1$, $\alpha_L\to\alpha^{oo}$. When σ is low, $\alpha_L=0$ and all individuals take precautions based on $r=\beta$, but for σ higher some individuals are sufficiently skeptical not to act.

A high risk aversion individual ($\alpha>\alpha^{oo}$) 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

$$\alpha_H = \frac{c-\rho_\phi}{\rho_\phi b} > \alpha^{oo}, \tag{A2}$$

where ρ_ϕ is given in (2). A type $\alpha \in (\alpha^{oo}, \alpha_H)$ does not take precautions given $r = \phi$, whereas a type $\alpha > \alpha_H$ takes precautions based on prior information as well as on the report $r = \phi$. 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.

The expected surplus $S_H(\alpha;\sigma)$ from a subscription for an $\alpha \in [\alpha^{oo}, \alpha_H)$ individual is

$$\begin{aligned} S_H(\alpha;\sigma) &= Pr(r=\beta)EU(1;\rho_\beta,\alpha) + Pr(r=\phi)EU(0;\rho_\phi,\alpha) - EU(1;\rho_o,\alpha) \\ &= (1-\sigma)(1-\rho_o q)b\big[c - \rho_\phi(1+\alpha b)\big], \end{aligned} \tag{A3}$$

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 individuals 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 individuals. Since

$$\frac{\partial^2 S_H(\alpha;\sigma)}{\partial\sigma\partial\alpha} = \rho_\phi(1-\rho_o q)b^2 > 0,$$

more risk averse individuals are more tolerant of bias.

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

$$\begin{aligned} S_L(\alpha;\sigma) &= Pr(r=\beta)EU(1;\rho_\beta,\alpha) + Pr(r=\phi)EU(0;\rho_\phi,\alpha) - EU(0;\rho_o,\alpha) \\ &= -cb(\rho_o q + (1-\rho_o q)\sigma) + b(1+\alpha b)\rho_o(q + \sigma(1-q)). \end{aligned} \tag{A4}$$

This surplus is zero for $\alpha = \alpha_L$ and is strictly increasing in α. Moreover,

$$\frac{d^2 S_L(\alpha;\sigma)}{d\alpha d\sigma} = \rho_o(1-q)b^2 = \rho_\phi(1-\rho_o q)b^2 > 0,$$

so more risk averse individuals 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 individuals then is continuous in α and continuously differentiable in σ with

$$\frac{dS(\alpha;\sigma)}{d\sigma} = -(1-\rho_o q)(c - (1+\alpha b)\rho_\phi), \tag{A5}$$

which from (A2) is negative for $\alpha \in [\alpha_L, \alpha_H)$.

Subscriptions

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

$$S_H(\hat{\alpha}_H; \sigma) - p \equiv 0 \tag{A6}$$

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

$$\hat{\alpha}_H = \max\Big\{\alpha^{oo}, \frac{(1-\sigma)b(c(1-\rho_o q) - \rho_o(1-q)) - p}{(1-\sigma)\rho_o(1-q)b^2}\Big\}. \tag{A7}$$

The bound $\hat{\alpha}_H$ on the set of high risk aversion subscribers is strictly decreasing in p and σ.

For low risk aversion individuals let $\hat{\alpha}_L$ denote the lowest type that subscribes, i.e., $S_L(\hat{\alpha}_L; \sigma) - p \leq 0$, where

$$\hat{\alpha}_L \equiv \max\Big\{0, \frac{p - b(\rho_o(q + \sigma(1-q)) - c(\rho_o q + (1-\rho_o q)\sigma))}{b^2\rho_o(q + \sigma(1-q))}\Big\}. \tag{A8}$$

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 individuals.

Pricing and Subscriptions

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

$$\frac{d\pi}{dp}\,|_{p=p^*} = \frac{\hat{\alpha}_H - \hat{\alpha}_L}{\bar{\alpha}} + \Big(\frac{p^* - w}{\bar{\alpha}}\Big)\Big[\frac{d\hat{\alpha}_H}{dp} - \frac{d\hat{\alpha}_L}{dp}\Big] = 0. \tag{A9}$$

The first term in $(A9)$ is positive, and the second is negative. The second-derivative is

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

The number Q of subscribers, when $\hat{\alpha}_L > 0$, is

$$\begin{aligned} Q = \frac{1}{\bar{\alpha}}(\hat{\alpha}_H - \hat{\alpha}_L) &= \frac{p^* - w}{\bar{\alpha}b^2\rho_o(1-q)(q + \sigma(1-q))(1-\sigma)} \\ &= \frac{\frac{1}{2}(cbq(1-\rho_o)(1-\sigma) - w)}{\bar{\alpha}b^2\rho_o(1-q)(q + \sigma(1-q))(1-\sigma)}. \end{aligned} \tag{A10}$$

An increase in bias decreases subscriptions, so demand is decreasing in the discretion granted by the news organization.[37] The number of subscribers is strictly increasing in c and is increasing in

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

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

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 individuals 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.

Competition with Like-Oriented News Organizations

For prices such that $\hat{\alpha}_L>0$ the first-order conditions are

$$\frac{\partial \pi_1}{\partial p_1} \mid_{p_1=p_1^*} = \frac{\alpha^o - \hat{\alpha}_L}{\bar{\alpha}} + \frac{1}{\bar{\alpha}}(p_1^* - w_1)\Big(\frac{\partial \alpha^o}{\partial p_1} - \frac{\partial \hat{\alpha}_L}{\partial p_1}\Big) = 0 \qquad (A11)$$

$$\frac{\partial \pi_2}{\partial p_2} \mid_{p_2=p_2^*} = \frac{\hat{\alpha}_H - \alpha^o}{\bar{\alpha}} + \frac{1}{\bar{\alpha}}(p_2^* - w_2)\Big(\frac{\partial \hat{\alpha}_H}{\partial p_2} - \frac{\partial \alpha^o}{\partial p_2}\Big) = 0, \qquad (A12)$$

where p_1^* and p_2^* are the equilibrium prices.

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

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

Proof of Proposition 5:

The first-order conditions in $(A11)$ and $(A12)$ imply

$$\frac{\hat{\alpha}_H - \alpha^o}{\alpha^o - \hat{\alpha}_L} = \Big(\frac{p_2^* - w_2}{p_1^* - w_1}\Big)\frac{(1-\bar{\sigma}_1)(q+\bar{\sigma}_1(1-q))}{(1-\bar{\sigma}_2)(q+\bar{\sigma}_2(1-q))}. \qquad (A13)$$

The following Lemma is required:

Lemma: $\frac{(1-\bar{\sigma}_1)(q+\bar{\sigma}_1(1-q))}{(1-\bar{\sigma}_2)(q+\bar{\sigma}_2(1-q))} > 1$.

Proof: Assume that the inequality is false. Algebra yields

$$(1-\bar{\sigma}_1)(q+\bar{\sigma}_1(1-q)) \leq (1-\bar{\sigma}_2)(q+\bar{\sigma}_2(1-q))$$

$$\bar{\sigma}_1[2q-1+\bar{\sigma}_1(1-q)] \geq \bar{\sigma}_2[2q-1+\bar{\sigma}_2(1-q)].$$

Since $q>\frac{1}{2}$ and $\bar{\sigma}_2>\bar{\sigma}_1$, the assumption is contradicted. Q.E.D.

The second term on the right side of $(A13)$ is greater than 1, so

$$p_2^* - w_2 \geq p_1^* - w_1 \;\Rightarrow\; \hat{\alpha}_H - \alpha^o > \hat{\alpha}_L - \alpha^o$$

and

$$\alpha^o - \hat{\alpha}_L \geq \hat{\alpha}_H - \alpha^o \;\Rightarrow\; p_1^* - w_1 > p_2^* - w_2.$$

Rewriting the profit expressions in (15) and (16) in terms of the number of subscribers and forming the ratio yields

$$\frac{\pi_1^* + K}{\pi_2^* + K} = \Big(\frac{\alpha^o - \hat{\alpha}_L}{\hat{\alpha}_H - \alpha^o}\Big)^2 \frac{(1-\bar{\sigma}_1)(q + \bar{\sigma}_1(1-q))}{(1-\bar{\sigma}_2)(q+\bar{\sigma}_2(1-q))}. \tag{A14}$$

The second term on the right side of $(A14)$ is greater than 1, so

$$\alpha^o - \hat{\alpha}_L \geq \hat{\alpha}_H - \alpha^o \;\Rightarrow\; \pi_1^* > \pi_2^*.$$

$$\pi_1^* \leq \pi_2^* \;\Rightarrow\; \alpha^o - \hat{\alpha}_L < \hat{\alpha}_H - \alpha^o.$$

Subtracting (16) from (15) yields

$$\pi_1^* - \pi_2^* = \frac{(p_1^* - w_1)^2(1-\bar{\sigma}_2)(q+\bar{\sigma}_2(1-q)) - (p_2^* - w_2)^2(1-\bar{\sigma}_1)(q+\bar{\sigma}_1(1-q))}{\bar{\alpha}\rho_o(1-q)b^2(\bar{\sigma}_2 - \bar{\sigma}_1)(q+\bar{\sigma}_1(1-q))(1-\bar{\sigma}_2)}.$$

From the Lemma, $(1-\bar{\sigma}_2)(q+\bar{\sigma}_2(1-q)) < (1-\bar{\sigma}_1)(q+\bar{\sigma}_1(1-q))$, so

$$\pi_1^* \geq \pi_2^* \;\Rightarrow\; p_1^* - w_1 > p_2^* - w_2,$$

and

$$p_2^* - w_2 \geq p_1^* - w_1 \;\Rightarrow\; \pi_2^* > \pi_1^*.$$

Competition between News Organizations with Opposing Biases

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 an individual with $\alpha \in [\alpha^{oo}, \alpha_{H\Gamma})$ is

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

which is positive and decreasing in α and $\bar{\gamma}$.[38] The surplus $S_{L\Gamma}(\alpha;\bar{\gamma})$ for an individual with $\alpha \in [0, \alpha^{oo}]$ is

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

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

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

$$S_\Gamma(\alpha;\bar{\gamma}) = \begin{cases} S_{L\Gamma}(\alpha;\bar{\gamma}) & \text{if } \alpha \in [0,\alpha^{oo}) \\ S_{H\Gamma}(\alpha;\bar{\gamma}) & \text{if } \alpha \in [\alpha^{oo},\alpha_{H\Gamma}], \end{cases}$$

which is continuous and increasing (decreasing) in α for $\alpha<(>)\alpha^{oo}$. To determine the relative tolerance of individuals for bias $\bar{\gamma}$, note that

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

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 $(A3)$ and $(A4)$, 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 $\bar{\sigma}$.

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Figure 2

Citizen Responses to News Reports

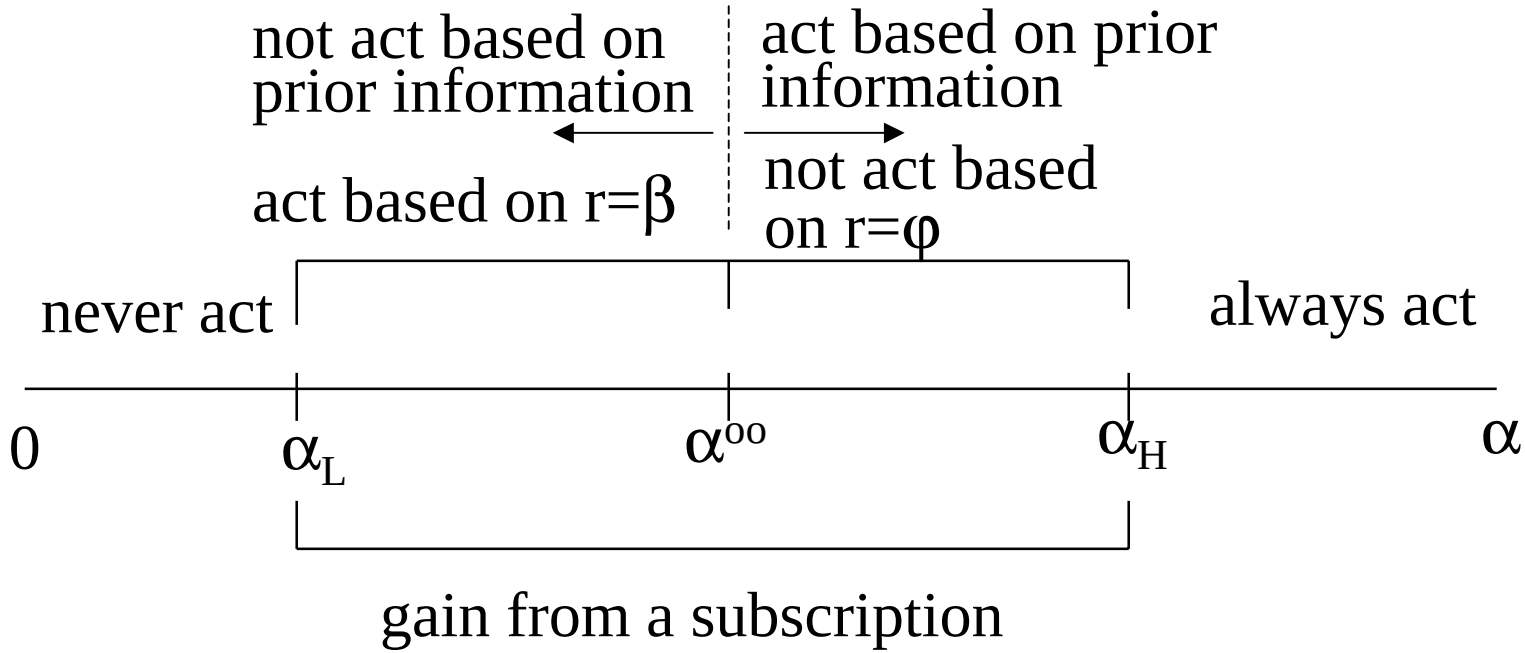

Figure 3

Citizen Responses to News Reports

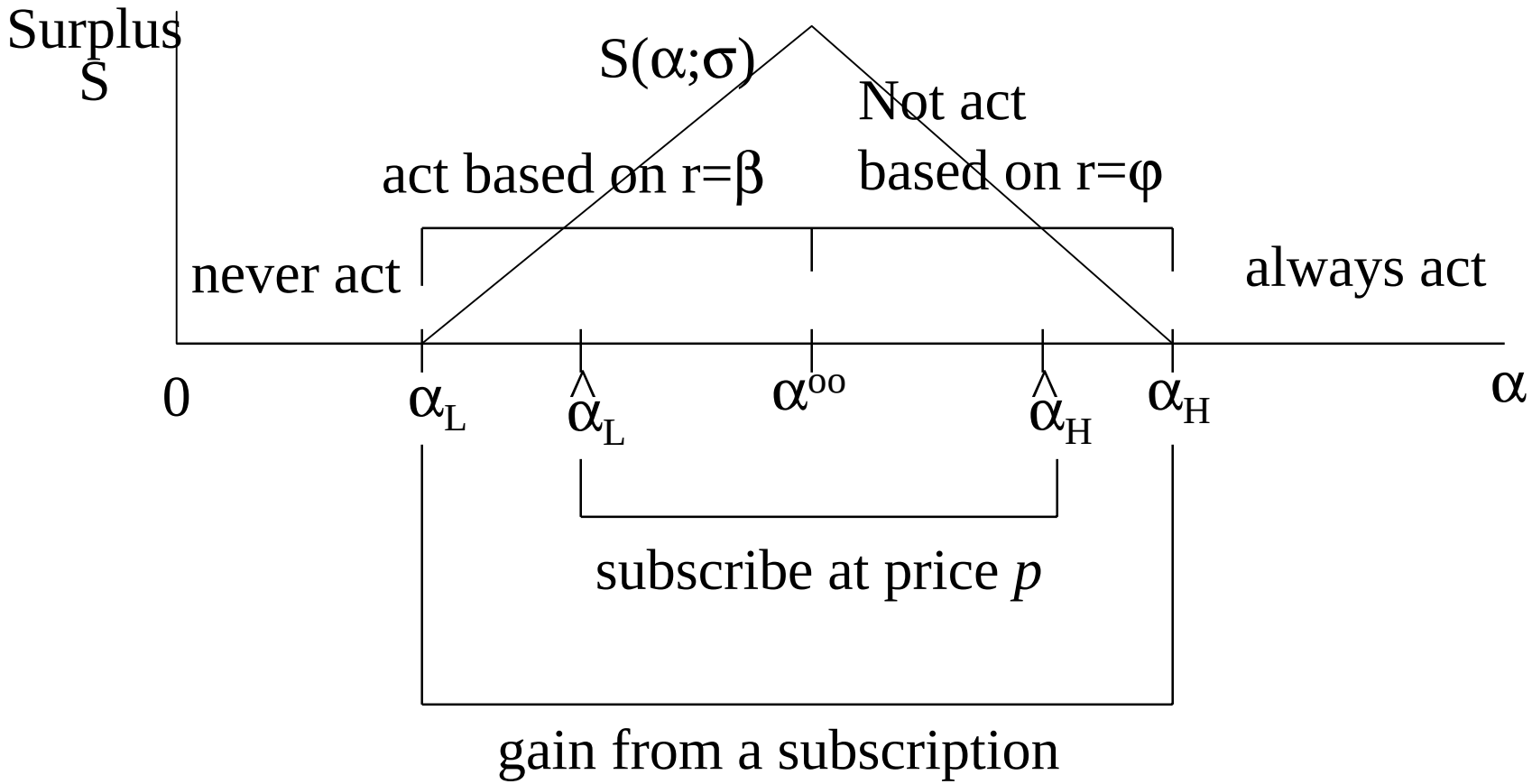

Figure 4

Competition Between News Organizations