A Spatial Theory of News Consumption and Electoral Competition*

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November 27, 2007

Abstract. We characterize the optimal editorial positions of the media in a model in which the media influence both voting behavior and party policies. Political parties are less likely to choose partisan policies when more voters consume informative news. When there are two media outlets, each should be slightly biased relative to its audience in order to attract voters with relatively extreme views. Voter welfare is typically higher under a duopoly than under a monopoly. Two media outlets under joint ownership may provide more diverse viewpoints than two independent ones, but voter welfare is not always higher.

JEL classification. D72, L82

Keywords. media bias, commercial media, voter welfare

*For hospitality while part of this research was conducted, Chan thanks the Hong Kong Institute of Economics and Business Strategy. We also thank Nicholas Hill for research assistance, David Wilmshurst for help with editing, and the referees for constructive comments. The study described in this paper was partially supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (Project No. HKU 7232/04H).

1 Introduction

The mass media are the main source of political information for many voters. A recent survey conducted in the United States found that 65 percent of the respondents regularly read newspapers and 80 percent regularly watch television news programs.[1] Because of its role in the political process, the news media industry is one of the most tightly regulated industries. In many countries, there are restrictions on market concentration and foreign ownership, and mainstream news media, especially television news companies, are often required to provide equal coverage to all major electoral candidates.[2]

In order to fully understand the political role of the media, we must realize that consumers are not passive receivers of news. The first column of Table 1 lists the ratio of Republicans to Democrats among regular followers of several popular news and current affairs programs (normalized by the ratio of Republicans to Democrats in the sample) in the United States. A ratio greater than one indicates that a show is more popular among Republicans. The Fox Cable News Channel is generally regarded to be more conservative than the Cable News Network (CNN) and the three national television broadcast networks (e.g., Groseclose and Milyo 2005; Kull, Ramsay, and Lewis 2003), and Table 1 shows that Fox indeed attracts a more conservative core audience than the CNN news channel and the nightly news of the broadcast networks. This table also shows that the National Public Radio is more popular among Democrats, while the conservative talk shows *The Rush Limbaugh Radio Show* and *The O'Reilly Factor* attract a mostly Republican audience. The second column of Table 1 shows the same pattern when we replace Republicans with white evangelical Christians, who tend to be socially conservative and Republicans. Since religious beliefs are unlikely to be caused by news consumption, these figures suggest that the positive correlation between the ideological stances of the news sources and those of their audiences is at least in part caused by self-selection.

In this paper we construct a model of news consumption and electoral competition that explains the tendency of news consumers to consume news from media outlets whose ideological positions are close to their own. Using this model, we examine the media's influence on party policies, derive the media's optimal editorial positions, and analyze voter welfare under different market structures.

Our model consists of an electoral campaign and a media market. In the electoral campaign, two political parties compete by adopting either a liberal or a conservative policy as a platform. Voters' policy preferences depend on a one-dimensional state variable, which summarizes all information regarding the desirability of the policies. Before they vote, voters learn about the state through the media. Because of the short attention span of news consumers, media outlets must apply some principles to select a small fraction of the available information to convey to their consumers. We capture the limited capacity of a media outlet by the assumption that it can report only whether the state exceeds a certain threshold. Intuitively, the threshold represents the editorial position or principle a media outlet uses to select news or make endorsements. A media outlet with a high reporting

[1] The Biennial Survey of Media Consumption, The Pew Research Center for the People and the Press, 2002.

[2] In the United States, the Federal Communication Commission (FCC) revoked the so called "fairness doctrine" in 1987, but it is unclear whether the rule still applies. See, for example, Dorf (2003).

Table 1
Audience Composition of Several News Sources in the United States

News Sources	% Rep ÷ % Dem[a]	% WEC ÷ % non-WEC[b]
national nightly news (ABC, CBS, NBC)	0.98	1.06
Cable News Network	1.00	1.10
Fox Cable News Network	1.27	1.21
National Public Radio	0.86	0.77
The O'Reilly Factor	3.34	1.30
The Rush Limbaugh Radio Show	7.90	1.27

Note: In the sample, 935 respondents are Republicans and 957 are Democrats; 760 are white evangelical Christians and 2242 are not.
[a] The figures in the first column are the fraction of Republicans who regularly watch or listen to the shows divided by the fraction of Democrats who do the same.
[b] The figures in the second column are the fraction of white evangelical Christians who regularly watch or listen to the shows divided by the fraction of non-whites or non-evangelical Christians who do the same.
Source: Biennial Media Consumption Survey, The Pew Research Center for the People and the Press, 2002.

threshold is more conservative in the sense that it is more likely to report that the state is below its threshold (lower states favor the conservative policy).

With this type of information coarsening, advice from like-minded experts is more valuable for informing voting decisions than advice from other sources (Calvert, 1985; Crawford and Sobel, 1982; Suen, 2004). A conservative voter, for example, might prefer to watch Fox News rather than CNN because while he would vote for a Democratic candidate if Fox News endorses the candidate, he would never do so regardless of CNN's view. Since voters in our model consume news only when it informs their voting decisions, those whose ideological preferences are closer to the position of a party than to that of any media outlet always vote for that party and do not consume any news. All other voters consume news from media outlets whose editorial positions are the closest to their own ideological preferences, and vote according to the news.

The various news media affect not only voting behavior. By informing voters about which policy better serves their interests, they also indirectly make the parties more responsive to the needs of the voters. Since voters only consume news from media outlets whose editorial positions are sufficiently similar to their own, media outlets with more partisan positions may still serve a useful social function by engaging voters who would not consume more mainstream news. In our model, a new entrant in the media market can only make party policies (weakly) more likely to be the one favored by the median voter, regardless of the number and editorial positions of the incumbent newspapers. For a fixed number of media outlets, voter welfare is maximized when the outlets have a diverse set of editorial positions. Since a slightly partisan media outlet is more effective in inducing a party to adopt less partisan policies, a media outlet should actually be biased relative to the preferences of its readers. The optimal editorial positions depend on both the preferences of voters and the preferences of the political parties. Other things being equal, the media should take more liberal positions when the parties themselves are more liberal.

To investigate how the profit motive shapes the news contents, we consider a commercial media market, where each individual media outlet chooses an editorial position to maximize the size of its audience, and compare editorial positions under a monopoly and a duopoly. We find that although both media outlets choose the same editorial position under a duopoly, the chosen position is in general different from the one chosen by a monopoly. The duopoly position tends to result in higher voter welfare when the media effect on policy is weak. We also find that two media outlets under joint ownership produce a greater variety of editorial content than two competing media outlets. This result has been anticipated by Steiner (1952), and it receives some empirical support from the work of George (2007). What we show in this example, however, is that greater variety does not always bring about greater welfare when the policy effect is taken into account. One of the main arguments in the United States against the relaxation of the ownership rules of media companies is that doing so may reduce program diversity. Although our results do not capture all the complexities in the real world, they serve to show that the relationship between social welfare and diversity is more complex than it may seem.

2 Related Literature

The first economic analysis of the role of information in political competition was made by Downs (1957). He argued that a rational voter would economize on information cost by delegating information collection and selection to an agent whose selection principle was close to his own. Our model formalizes this idea within the framework of Downsian electoral competition.

Stromberg (2004a) has constructed a formal model of electoral competition in which the mass media affect public policy since they provide a channel through which politicians convey campaign promises to the electorate. He shows that the technology of the mass media induces media firms to provide more news to large groups and to groups that are more valuable to advertisers, thereby creating an incentive for politicians to bias public policy in favor of these groups. Stromberg (2004b) offers some evidence regarding the impact of radio ownership on the distribution of New Deal relief programs. The main difference between Stromberg's model and ours is that we assume that the preferences of voters are ordered along a one-dimensional space. We shift attention away from distributional issues and focus instead on the spatial aspects (i.e., left versus right) of political competition.

There is a growing theoretical literature on the economics of news and the industrial organization of the mass media. Baron (2006) suggests that media owners may tolerate biased reporting in exchange for paying lower wages to ideologically-driven journalists. Balan, DeGraba and Wickelgren (2005) study a model in which media owners trade off profits for their ideological motives. They find that mergers between media outlets with identical ideologies raise the level of ideological persuasion, while mergers between outlets with different ideologies can raise or lower the level of persuasion. Anderson and McLaren (2007) examine similar issues using a rational-choice model where the media manipulate the beliefs of news consumers by hiding information. They argue that a media merger can raise profits but reduce the amount of information transmission. While these papers attempt to model media bias based on the tastes of media owners or journalists, Mullainathan and Shleifer (2005) argue that the media slant the news to satisfy biased readers who prefer news that conform to their existing biases. In such an environment, media competition can cause different media outlets to adopt more extreme positions. Nevertheless, news consumers with access to all news sources can reduce the effect of this bias by cross-checking the diverse reports. Gentzkow and Shapiro (2006) show how media bias can arise endogenously when Bayesian consumers infer that news reports which conform to their prior beliefs are from high quality news sources. Like Mullainathan and Shleifer (2005), their model also predicts that media competition can reduce bias.

Our model differs from these earlier models in that it explicitly models the process of electoral competition. This allows us to study the media's effect on party policies. Another crucial difference is that previous models have ignored the severe information constraint faced by the media and assumed that the media can report the "whole truth." As a result, in these models media bias is bad by supposition, and there is no normative reason for the media to contain diverse viewpoints (since all outlets should report the same truth). Since in our model every media outlet must report selectively, we can only define the bias of a media outlet with respect to the policy preferences of a specific group of news consumers. It is therefore natural in our model that the optimal media should adopt different editorial positions.

Finally, our model is related to another model by Chan and Suen (2007). The key difference between these two models concerns the structure of the policy space. Since Chan and Suen (2007) are mainly interested in the extent to which parties can signal the state through policy platforms, they allow for a rich set of signals by making the policy space continuous. They show that even then the media may still affect political outcomes through its effect on party policies. The present model, by assuming a binary policy space, provides a more complete picture of the political role of the media, capturing their effect both on party policies and on voting behavior. For this reason, the present model is better suited for welfare analysis and the study of the industrial organization of the media market.

3 The Model

3.1 Electoral Competition

Two political parties, L and R, compete for an electoral office. There are two feasible policies, namely l and r. There is a continuum of voters of unit mass. The policy preference of a voter j is represented by the utility function

$$v_j(y,\theta) = \begin{cases} \theta - b_j & \text{if } y = l, \\ b_j - \theta & \text{if } y = r; \end{cases}$$

where θ, which is uniformly distributed on $[0,1]$, denotes the state of the economy. The parameter b_j measures voter j's preference for policy r—voter j prefers l to r if and only if $\theta \geq b_j$. The preference parameter b follows an atomless distribution F on the support $[0,1]$.

The median position is b_m (i.e., $F(b_m) = 0.5$). While voters have diverse policy preferences, they share a common party preference measured by 2δ. Let y_i denote party i's policy. The total utility of voter j is $v_j(y_L, \theta)$ if party L is elected, or $v_j(y_R, \theta) + 2\delta$ if party R is elected.

The policy preference of party $i \in \{L, R\}$ takes the form:

$$u_i(y, \theta) = \begin{cases} \theta - \beta_i & \text{if } y = l, \\ \beta_i - \theta & \text{if } y = r. \end{cases}$$

The parameter $\beta_i \in (0, 1)$ denotes party i's preference for policy r. The parties' policy preferences are systematically different from that of the median voter. In particular, we assume $\beta_L < b_m < \beta_R$. For convenience, we refer to party L's preference as liberal and party R's as conservative. In addition to policy payoffs, a party receives a rent $2d > 0$ when it holds office. Party i's total utility is $u_i(y, \theta) + 2d$ when elected, and $u_i(y, \theta)$ when not.

Voters' common party preference δ has an atomless distribution π that is symmetric across zero and has zero mean on the support $[\underline{\delta}, \overline{\delta}]$. When the parties choose policies, they know θ, F, and π, but not the actual value of δ. The parties' uncertainty over δ means that they cannot predict with certainty the electoral outcome given party policies.

A strategy for party $i \in \{L, R\}$ is a function that assigns a policy y_i to each state θ; it is monotone if it prescribes policy l if and only if θ exceeds some cut-point. Since the payoff to policy l is increasing in θ for both parties, we focus on equilibria in which both parties' strategies are monotone.

3.2 Mass Media

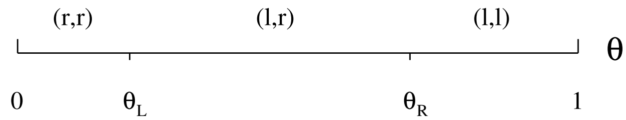
Before they vote, voters may acquire information about θ through the media.[3] Since the amount of time voters are willing to spend on news is limited, news reports must be highly condensed.[4] We capture this information constraint by the assumption that news reports must take the form of binary messages. Specifically, we assume there are n media outlets, which we refer to as newspapers. Each newspaper k can report only whether or not θ exceeds some cut-point θ_k, which we refer to as newspaper k's "editorial position." Since voters' preference for policy l is increasing in θ, we say that media outlet k reports l if $\theta \geq \theta_k$ and that it reports r if $\theta < \theta_k$. One interpretation of a newspaper's editorial position is that it reflects the policy preferences of its editor. Since news consumers prefer news from sources that share their ideological preferences, it is in the interest of a newspaper to establish a clear ideological reputation by hiring an editor with known views. A newspaper can commit to any editorial position. But once chosen, the position is fixed and known

[3]Our results would not change if parties were allowed to send messages about θ directly to voters. Since each party has an incentive to say that θ is such that its policy is better for the median voter, such messages have no information value.

[4]In reality the payoff of a policy depends on a large number of factors. For example, the desirability of a carbon tax may depend on the its effect on economic growth, its effectiveness in reducing emissions of greenhouse gas, the availability of alternative technologies, the consequences of global warming, and the projected future energy consumption of China and India. We think of the parameter θ as a summary of all these factors. A newspaper cannot directly report θ, because brief statements like "the overall desirability of adopting a carbon tax is 0.4" has no meaning. Instead, a newspaper must communicate each factor separately in a common language (like English). This process requires newspaper space and readers' time, and newspapers must selectively choose which factors to report.

Figure 1

Party policies in different states



to all voters. In reality, a media outlet's editorial reputation is an important aspect of its product characteristics and is hard to change.

3.3 Voter Behavior

We focus on equilibria in which both parties choose monotone strategies. Let θ_L and θ_R denote the cut-points of parties L and R, respectively. Since party L likes policy l better than party R does, we also assume $\theta_L < \theta_R$. Under these policies, the state space is divided into three regions:

$$(y_L, y_R) = \begin{cases} (r,r) & \text{if } \theta \in [0, \theta_L], \\ (l,r) & \text{if } \theta \in (\theta_L, \theta_R], \\ (l,l) & \text{if } \theta \in (\theta_R, 1]. \end{cases}$$

See Figure 1.

Voters vote for the party that maximizes their expected utility. A voter j, whose expectation over θ is $\tilde{\theta}_j$, prefers party L with policy l over party R with policy r if and only if

$$\tilde{\theta}_j \geq b_j + \delta. \tag{1}$$

In the following paragraphs, we refer to $b_j + \delta$ as voter j's "indifference position."

Voters' posterior beliefs over θ are consistent with Bayes' rule whenever the rule is well-defined. In events where Bayes' rule is not defined, we assign specific values to these beliefs in order to ease exposition. The specific values of these off-equilibrium beliefs are not important to our results.

Information about θ matters only when the parties choose different policies. Consider the case where party L chooses l and party R chooses r. If voter j does not read any newspaper, then his only information, based on the party strategies, is that θ is between θ_L and θ_R. If he reads newspaper k, he also knows whether θ exceeds θ_k. When $\theta_k \in (\theta_L, \theta_R)$, voter j updates his expectation over θ via Bayes' rule. When $\theta_k \leq \theta_L$, the newspaper is expected to report l when party L chooses l and party R chooses r. While an l report from such a newspaper is not informative, an r report indicates that party L has deviated. In the latter case, Bayes' rule is not defined, and we assume that the voter would believe θ is exactly θ_k. Similarly, we assume that voter j would believe θ is θ_k after reading an l report from a newspaper with editorial position $\theta_k \geq \theta_R$. To summarize, voter j's expectation of θ, conditional on different parties' policies and newspaper k's report, is

$$\tilde{\theta}_j(\mathcal{E}) = \begin{cases} 0.5(\theta_L + \theta_R) & \text{if } \mathcal{E} = \phi, \\ 0.5(\max\{\theta_k, \theta_L\} + \max\{\theta_k, \theta_R\}) & \text{if } \mathcal{E} = l_k, \\ 0.5(\min\{\theta_k, \theta_L\} + \min\{\theta_k, \theta_R\}) & \text{if } \mathcal{E} = r_k; \end{cases} \tag{2}$$

where $\mathcal{E} = \phi$ denotes the event that voter j does not read any newspaper, and $\mathcal{E} = l_k, r_k$ the event that voter j learns that newspaper k reports l or r.

The editorial positions of the n newspapers are denoted by $\theta_1 \leq \ldots \leq \theta_n$. We assume that voters consume campaign news in order to cast an informed vote, and they only read a newspaper when party L chooses l and party R chooses r. In this case, a voter j with an indifference position $b_j + \delta$ less than $0.5(\theta_L + \theta_R)$ will vote for party L if he does not read newspapers, and a newspaper is of value to him only if an r report can change his vote from L to R. Similarly, a newspaper is of value to a voter with an indifference position greater than $0.5(\theta_L + \theta_R)$ only if it can change his vote from R to L when it reports l.

Define the value of newspaper k to voter j as

$$V_k(j) = \begin{cases} \max\{0, 2(\theta_k - \theta_L)(b_j + \delta - 0.5(\theta_k + \theta_L))\} & \text{if } b_j + \delta \leq 0.5(\theta_L + \theta_R), \\ \max\{0, 2(\theta_R - \theta_k)(0.5(\theta_k + \theta_R) - b_j - \delta)\} & \text{otherwise.} \end{cases}$$

The value $V_k(j)$ is the gain in expected utility for voter j when he, assuming that his vote is decisive, votes for the party whose policy the newspaper reports rather than the party he would have voted for in the absence of information. We assume that voters choose the newspaper that has the highest non-negative value and whose editorial position lies between $[\theta_L, \theta_R]$. While this news consumption rule is not derived from standard utility maximization (as a single vote is never decisive and the time cost of news consumption is not modeled), we feel that it provides a reasonable foundation for the study of media influence on politics. It is a common practice in the political economy literature to gloss over the "paradox of voting" to assume voters participate and vote for the party they like better in two-party elections even though the pivotal probability of a single vote is practically zero. Our news consumption rule is an extension of that assumption—if the goal of the voters is to vote for the better party, then it is natural to assume that they select media outlets that will help them to decide which party is actually better.[5]

Since any newspaper whose editorial position lies outside $[\theta_L, \theta_R]$ is not read, we assume in this section that $\theta_1 \geq \theta_L$ and $\theta_n \leq \theta_R$. Write θ_0 for θ_L and θ_{n+1} for θ_R. Suppose all newspapers have distinct positions. Define for $k \in \{1, \ldots, n\}$ the *territory* of newspaper k as

$$T_k = [0.5(\theta_{k-1} + \theta_k), 0.5(\theta_k + \theta_{k+1})]\,. \tag{3}$$

For any two newspapers $k < k'$, $V_k(j) \geq V_{k'}(j)$ if $b_j + \delta \leq 0.5(\theta_k + \theta_{k'})$. Hence, a voter j reads newspaper k if and only if $b_j + \delta$ belongs to T_k. Let $q(b_j, \delta) \in \{1, \ldots, n\}$ denote the newspaper choice of a voter with policy preference b_j and party preference δ when the parties choose different policies. We have

$$q(b_j, \delta) = \begin{cases} k & \text{if } b_j + \delta \in T_k, \\ \phi & \text{otherwise;} \end{cases} \tag{4}$$

[5] High electoral turnout is a paradox only when voters care solely about the electoral outcome. In reality, many citizens feel a moral obligation to vote. What we are effectively assuming here is that voters receive some psychological utility from knowing that they are voting for the right party. The assumption that they are willing to read a newspaper so long as V is non-negative is unrealistic but greatly simplifies the model. In section 7.2, we consider the more realistic case where the chance that a person will read a newspaper is strictly increasing in V.

where $q = \phi$ means not reading newspapers. When two newspapers have the same position, assume that each captures half of the readers in their common territory. The news consumption pattern is consistent with that shown in Table 1.

Since a voter reads a newspaper only if the value of the newspaper is non-negative, (1) implies that a voter always votes for the party reported by the newspaper he reads. Since $q(b_j, \delta)$ is the most informative newspaper for voter j, he would rather vote for the party reported by $q(b_j, \delta)$ than the one reported by any other newspaper when the two report differently. Thus, voters who seek to minimize the cost of reading news and who care only about casting the right vote would have no reason to read more than one newspaper. Even if they did, the above argument implies that their voting behavior would remain unchanged. Thus, the news consumption rule mainly affects a profit-maximizing newspaper's editorial choice. All of our results concerning party policies and voter welfare under a fixed profile of editorial positions would be unchanged if voters read all newspapers.

3.4 Political Equilibrium

To summarize, the political process proceeds with the following sequence of events:

1. The newspapers choose editorial positions $\theta_1, \ldots, \theta_n$ and the parties choose their policy functions $\sigma_L(\theta)$ and $\sigma_R(\theta)$ where σ_i ($i = L, R$) is a mapping from $[0, 1]$ to $\{l, r\}$. In this and the following two sections, we assume that the editorial positions are fixed and consider the determination of σ_L and σ_R as best responses to the editorial positions and to each other. Section 6 discusses how editorial positions are determined in the commercial media, where the editorial positions are the best responses both to one another and to the parties' policy functions.

2. The state θ is realized.[6] Party $i \in \{L, R\}$ proposes $y_i = \sigma_i(\theta)$. Newspaper $k \in \{1, \ldots, n\}$ reports r_k or l_k depending on whether $\theta \geq \theta_k$.

3. The party preference δ is realized. Voters decide whether to consume news and, if so, which newspaper to read according to (4) after they observe (y_L, y_R) and δ.

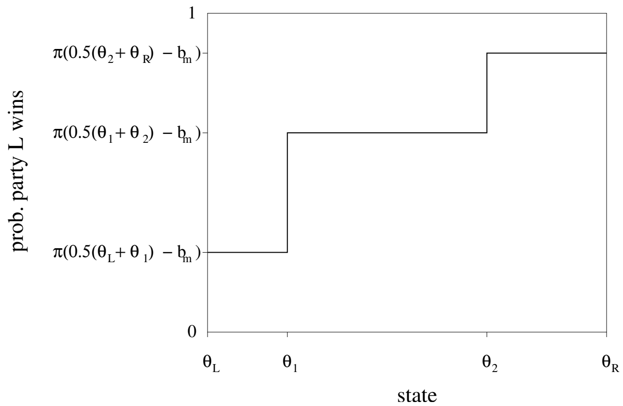
4. A voter j who chooses newspaper $k = q(b_j, \delta)$ learns whether the report is r_k or l_k, and updates his belief according to (2).

5. The election is conducted. Voters vote according to (1). The party that receives a majority of votes wins and implements its proposed policy.

Let $k^*(\theta)$ denote the newspaper with the most conservative editorial position of those that report l in state θ. Since voters always vote for the party reported by the newspaper they read, party L is elected when the median voter is a reader of a newspaper $i \leq k^*(\theta)$; that is, when $b_m + \delta \leq 0.5(\theta_{k^*(\theta)} + \theta_{k^*(\theta)+1})$. Hence, party L's probability of election is an increasing step function in θ, with jump points at θ_k, $k = 1, \ldots, n$. See Figure 2.

[6] Since a newspaper's editorial position is a product characteristic known to the voters, it must be chosen before a newspaper observes θ. Allowing a newspaper to choose its editorial position after observing θ would lead to a situation where voters could infer θ directly through the editorial position without actually reading the newspaper.

Figure 2
Probability of winning as a function of the state



When the parties choose the same policy, or when party L chooses r and party R chooses l, each party is elected with probability 0.5.[7] When party L chooses l and party R chooses r in state θ, party L is elected with probability $\pi(\delta^*(\theta))$, where

$$\delta^*(\theta) \equiv 0.5(\theta_{k^*(\theta)} + \theta_{k^*(\theta)+1}) - b_m.$$

Let $U_i(y_L, y_R, \theta; \theta_L, \theta_R)$ denote party i's expected payoff in θ as a function of the parties policies (y_L, y_R) and their overall strategies (θ_L, θ_R). For $i \in \{L, R\}$,

$$\begin{aligned} U_i(l, l, \theta; \theta_L, \theta_R) &= d + \theta - \beta_i, \\ U_i(r, r, \theta; \theta_L, \theta_R) &= d + \beta_i - \theta, \\ U_i(r, l, \theta; \theta_L, \theta_R) &= d; \end{aligned}$$

and

$$\begin{aligned} U_L(l, r, \theta; \theta_L, \theta_R) &= \pi(\delta^*(\theta))(2d + \theta - \beta_L) + (1 - \pi(\delta^*(\theta)))(\beta_L - \theta), \\ U_R(l, r, \theta; \theta_L, \theta_R) &= (1 - \pi(\delta^*(\theta)))(2d + \beta_R - \theta) + \pi(\delta^*(\theta))(\theta - \beta_R). \end{aligned}$$

Definition 1 *A pair of monotone strategies θ_L and θ_R, with $\theta_L < \theta_R$, is a Nash equilibrium of the electoral game if, given that voters expect the parties to adopt (θ_L, θ_R), neither party has incentives to deviate from its own strategy in any state; that is, for each i, $j \in \{L, R\}$, $i \neq j$, $y_i \in \{l, r\}$, and $\theta \in [0, 1]$,*

$$U_i(\sigma_i(\theta), \sigma_j(\theta), \theta; \theta_L, \theta_R) \geq U_i(y_i, \sigma_j(\theta), \theta; \theta_L, \theta_R),$$

where, for $i \in \{L, R\}$,

$$\sigma_i(\theta) = \begin{cases} l & \text{if } \theta > \theta_i, \\ r & \text{if } \theta \leq \theta_i. \end{cases}$$

[7] Since voters never observe $(y_L, y_R) = (r, l)$ on the equilibrium path under monotone party strategies, their beliefs over θ in this event cannot be derived from the Bayes' rule. We assume in this case that $\tilde{\theta}_j = b_m$ and, hence, the median voter is indifferent between l and r.

So far, it is assumed that the equilibrium is monotone. In fact, in any equilibrium in which the parties' strategies are not identical and in which the probability that a party proposing l is elected over one proposing r is increasing in θ, the parties' strategy must be monotone, and party L's cut-point must be lower than party R's. A formal proof of this statement is provided in Appendix A. There are non-monotone equilibria in which the parties choose the same strategy. But these equilibria require strong assumptions on voters' off-equilibrium beliefs. Furthermore, in these equilibria the news media obviously would play no role as the parties' policies are always identical.

4 Equilibrium Party Policies

In this section we seek to understand how the filtering of information by the media can influence party positions.[8] To set up a benchmark for the subsequent analysis, we first consider the case of "full information," where voters directly observe θ. When voters have full information about θ, the parties' policy decisions in each state can be analyzed independently as a 2×2 game described by the payoffs shown in Table 2.

Table 2

Payoff Table for Full Information Game

		R: l	R: r
L	l	$d + \theta - \beta_L$, $d + \theta - \beta_R$	$\pi_\theta(2d + \theta - \beta_L) + (1 - \pi_\theta)(\beta_L - \theta)$, $\pi_\theta(\theta - \beta_R) + (1 - \pi_\theta)(2d + \beta_R - \theta)$
	r	$\pi_\theta(\theta - \beta_L) + (1 - \pi_\theta)(2d + \beta_L - \theta)$, $\pi_\theta(2d + \theta - \beta_R) + (1 - \pi_\theta)(\beta_R - \theta)$	$d + \beta_L - \theta$, $d + \beta_R - \theta$

In the table, $\pi_\theta \equiv \pi(\theta - b_m)$ is increasing in θ and greater than 0.5 when $\theta \geq b_m$. When $\theta = b_m$, party L strictly prefers proposing l because it likes policy l better than policy r, and its chance of winning the election is the same no matter which policy it proposes. When $\theta = \beta_L$, party L strictly prefers proposing r because it is indifferent between the two policies in that state, and it is more likely to win the election by proposing policy r. Similarly, party R strictly prefers proposing r when $\theta = b_m$ and l when $\theta = \beta_R$. Since the payoff for proposing policy l is higher in higher states, there is a unique pair $(\theta_L^{FI}, \theta_R^{FI})$, with

$$\beta_L < \theta_L^{FI} < b_m < \theta_R^{FI} < \beta_R,$$

such that each party i ($i = L, R$) is better off proposing policy l if and only if $\theta \geq \theta_i^{FI}$. We thus establish the following result:

Proposition 1 *When voters observe θ, there is a unique equilibrium in which each party $i \in \{L, R\}$ proposes policy l if and only if $\theta \geq \theta_i^{FI}$.*

[8]In our model, media outlets are influential because there are only a finite number of them. If there were a media outlet for each possible cutoff, then each voter would consume news from a media outlet whose editorial position was exactly equal to his ideal cutoff. In that case, the model effectively becomes one of complete information. In reality, the number of media outlets is finite due to the fixed cost of collecting and disseminating news.

Proposition 1 captures the trade-off a party faces between choosing a policy that it prefers and one that the median voter prefers. A party is more likely to propose a policy preferred by the median voter when it cares more about winning (i.e., when d is large) and when voters care more about policies (i.e., when the support δ is narrow). Full policy convergence occurs when either $d = \infty$ or $\underline{\delta} = \overline{\delta} = 0$.

Consider the other benchmark case of "no information," where voters observe only party strategies. In this case, the party strategy profile described in Proposition 1 would no longer be an equilibrium. If voters expect the parties' cutoffs to be $(\theta_L^{FI}, \theta_R^{FI})$, then their expectation of θ conditional on $(y_L, y_R) = (l, r)$ would be $\tilde{\theta} = 0.5(\theta_L^{FI} + \theta_R^{FI})$. Since $\pi(\tilde{\theta} - b_m) > \pi(\theta_L^{FI} - b_m)$, party L would be strictly better off proposing policy l in state θ_L^{FI}.

To characterize the equilibrium in the no-information case, define the functions $\rho_L(z)$ and $\rho_R(z)$ for $z \in [0,1]$ by the equations

$$2\pi(0.5(\rho_L(z) + z) - b_m)(d + \rho_L(z) - \beta_L) = d; \tag{5}$$

$$2(1 - \pi(0.5(z + \rho_R(z)) - b_m))(d + \beta_R - \rho_R(z)) = d. \tag{6}$$

The function $\rho_L(z)$ is defined such that party L is indifferent between policy platforms l and r when the state is $\rho_L(z)$ and when the median voter's expectation of the state is $0.5(\rho_L(z) + z)$. Figure 3 illustrates the ρ_L and ρ_R functions. It is apparent that both functions are well-defined and are decreasing with slopes less than one in absolute value. To simplify the subsequent exposition, we assume $\rho_L(1) > 0$ and $\rho_R(0) < 1$.[9]

In equilibrium voters have the correct expectation of θ, and each party is indifferent between the two policy platforms at its own cut-point. Therefore the no-information equilibrium cut-points $(\theta_L^{NI}, \theta_R^{NI})$ must satisfy

$$\theta_L^{NI} = \rho_L(\theta_R^{NI}) \text{ and } \theta_R^{NI} = \rho_R(\theta_L^{NI}).$$

By comparison, the full-information cut-points θ_L^{FI} and θ_R^{FI} satisfy the conditions

$$\theta_L^{FI} = \rho_L(\theta_L^{FI}) > \theta_L^{NI} \text{ and } \theta_R^{FI} = \rho_R(\theta_R^{FI}) > \theta_R^{NI}.$$

See Figure 3.

Proposition 2 *When voters observe only (y_L, y_R) and not θ, there is a unique monotone equilibrium in which party $i \in \{L, R\}$ proposes policy l if and only if $\theta \geq \theta_i^{NI}$. Moreover, these no-information equilibrium cut-points are farther apart from the median voter's ideal cut-point b_m than are the full-information equilibrium cut-points:*

$$\theta_L^{NI} < \theta_L^{FI} < b_m < \theta_R^{FI} < \theta_R^{NI}.$$

[9] This is a fairly weak assumption, which holds so long as $|b_m - 0.5|$ is not too large. The assumption ensures that in the case where voters observe only party policies, the parties' equilibrium cut-points are strictly between 0 and 1.

The proof of Proposition 2 is in Appendix D. This proposition underlines the importance of information in electoral competition. When voters observe only party strategies, they cannot vote correctly for the party whose policy better furthers their welfare. As a result, parties have less incentive to adopt the policy that maximizes the utility of the median voter, and the party equilibrium cut-points are farther apart than they are in the full-information case.

Having established the benchmark cases of full information and no information, we now turn to the main focus of this section: the determination of political equilibrium when voters are partially informed by the media. In this and the following sections, most of the insights into political equilibrium, voter welfare, and media competition can be obtained from a model with two media outlets. We therefore focus on the case of two newspapers in the remainder of the paper.

The news consumption rule described in the earlier section implies that a newspaper with an editorial position outside the range $[\theta_L, \theta_R]$ attracts no readers. We say that such a newspaper is *ineffective* because its existence does not affect political outcomes. The following proposition provides a sufficient condition for a newspaper to be ineffective (the proof is in Appendix D).

Proposition 3 *Any newspaper with editorial position $\theta_k < \theta_L^{NI}$ or $\theta_k > \theta_R^{NI}$ is ineffective.*

In any political equilibrium, a newspaper with editorial positions more extreme than the no-information cut-points always gives the same report whenever the parties' proposed policies differ. Precisely because their reports are so predictable, they have no information value to news consumers and therefore cannot influence political outcomes in our model where voters interpret the news rationally.

From here on, we confine our attention to newspapers with editorial positions in the range $[\theta_L^{NI}, \theta_R^{NI}]$. Note, however, that depending on the editorial positions of all newspapers in the market, a newspaper with $\theta_k \in [\theta_L^{NI}, \theta_R^{NI}]$ may still be ineffective. We leave the full characterization of political equilibrium, including whether a newspaper is ineffective or not, to Appendix B. In the text, we focus on describing the case in which both newspapers are effective in equilibrium.

Proposition 4 *Suppose there are two newspapers with editorial positions $\theta_1, \theta_2 \in [\theta_L^{NI}, \theta_R^{NI}]$. If $\theta_1 > \rho_L(\theta_2)$ and $\theta_2 < \rho_R(\theta_1)$, then both newspapers are effective in a unique monotone equilibrium with policy cut-points given by*

$$\theta_L = \begin{cases} \rho_L(\theta_1) & \text{if} \quad \theta_1 \geq \theta_L^{FI}; \\ \theta_1 & \text{if} \quad \theta_1 < \theta_L^{FI}, \end{cases}$$

and

$$\theta_R = \begin{cases} \rho_R(\theta_2) & \text{if} \quad \theta_2 \leq \theta_R^{FI}; \\ \theta_2 & \text{if} \quad \theta_2 > \theta_R^{FI}. \end{cases}$$

The proof of this proposition is subsumed under a more general proposition for the n-newspaper case in Appendix B. Proposition 4 shows that there are two types of equilibrium policy cut-points for party L. If $\theta_1 \geq \theta_L^{FI}$, we say that newspaper 1 is *moderate*. In this case, the equilibrium cut-point is an "interior solution" that satisfies $\theta_L = \rho_L(\theta_1) \leq \theta_1$. To understand why this is an equilibrium strategy for party L, notice that newspaper 1 (and newspaper 2 as well) will report r when party L chooses policy l in state θ_L. In that state, only the *uninformed supporters* of party L (i.e., people with $b_j + \delta \leq 0.5(\theta_L + \theta_1)$, whose priors favor party L to such an extent that their voting decisions would not be swayed by newspaper 1) would vote for L. The probability that the median voter is among this group of uninformed supporters is $\pi(0.5(\theta_L + \theta_1) - b_m)$. Party L is indifferent between policy l and policy r when θ_L satisfies

$$2\pi(0.5(\theta_L + \theta_1) - b_m)(d + \theta_L - \beta_L) = d.$$

By definition, the solution to this equation is $\theta_L = \rho_L(\theta_1)$.

The second type of equilibrium cut-point obtains when $\theta_1 < \theta_L^{FI}$. In this case, we say that newspaper 1 is *leftist*. (Similarly, we say that newspaper 2 is *moderate* if $\theta_2 \leq \theta_R^{FI}$ or *rightist* if $\theta_2 > \theta_R^{FI}$.) The interior solution is not feasible because $\rho_L(\theta_1) > \theta_1$. Instead, equilibrium is a "corner solution," with $\theta_L = \theta_1$. In this equilibrium, party L strictly prefers policy r to policy l for all $\theta < \theta_L$, and it strictly prefers policy l to policy r for all $\theta \geq \theta_L$. The discontinuity in the payoff from choosing l at $\theta = \theta_L$ is caused by the fact party L would lose the votes of all readers of newspaper 1 if it chose policy l in states below that newspaper's editorial position.

The equilibrium described in Proposition 4 has several interesting properties. First, for any combination of (θ_1, θ_2), the equilibrium cut-point of each party always lies between its full-information and no-information benchmarks. In other words, introducing the media into our model of political competition helps partially overcome the asymmetric information problem faced by voters. When θ_L and θ_R are closer to their full-information benchmarks, the probability that both parties propose the policy favored by the median voter increases.

Second, an effective newspaper need not have information value in equilibrium. Consider a corner solution with $\theta_L = \theta_1$. Since newspaper 1 always reports l when the policies are (l, r), its report has no information value. Nevertheless it is effective in preventing party L from deviating to policy l in states slightly below θ_L.

Third, the equilibrium policy cut-point of party L is determined solely by the editorial position of the more liberal newspaper (i.e., newspaper 1). This result obtains because policy cut-points are determined by the size of the uninformed supporters of a party. Marginal changes in θ_2 only affect the news consumption behavior of those who were originally indifferent between newspaper 1 and newspaper 2. Because this group of individuals does not constitute the uninformed supporters of party L, their behavior does not affect θ_L.[10]

Fourth, party policies are not monotone with respect to newspaper editorial positions. When newspaper 1 is *moderate,* moving θ_1 to the right would shift $\theta_L = \rho_L(\theta_1)$ to the left. The reason is that voters with indifference positions near $0.5(\theta_L + \theta_1)$ stop reading newspaper 1 as θ_1 increases. In a sense, newspaper 1 alienates its fringe readers on the left when it becomes more conservative. These fringe readers join the ranks of the uninformed supporters of party L, which encourages party L to adopt a more liberal policy cut-point.

[10] Changes in θ_2 does not affect the probability of election for party L when the state is $\theta = \theta_L$. Nevertheless, θ_2 is not completely inconsequential for party L since it affects the probability of election in some other states.

The analysis is different when newspaper 1 is *leftist.* In that case, $\theta_L = \theta_1$ and the two moves in the same direction. Recall that in a corner solution, the editorial position of newspaper 1 acts as a binding constraint on the policy of party L. If newspaper 1 becomes more conservative, it no longer supports policy l in state θ_L. So the incentive for party L to choose l in that state disappears, and party L moves its policy cut-point to the right as well.

We can extend the analysis to allow for multiple newspapers. The characterization of the political equilibrium in the n-newspaper case is relegated to Appendix B. Here, we simply illustrate the main ideas by considering the effect of newspaper entry in a market with two existing media outlets.

Panel (a) of Figure 4 illustrates the case when the incumbent newspapers are *moderate.* If the editorial position θ_e of the entrant newspaper is in region A or E of the figure, this newspaper will simply be ignored and it will be ineffective. If θ_e is in region B (i.e., $\theta_e \in [\theta_L, \theta_1]$), the entrant will attract some readers from the uninformed supporters of party L. This reduces the incentive of party L to choose policy l, and hence pulls θ_L toward the center. If θ_e is in region C (i.e., $\theta_e \in [\theta_1, \theta_2]$), the entrant takes away readers from existing newspapers 1 and 2, but does not affect the mass of the uninformed supporters of either party. Although this entrant newspaper will affect election outcomes under some states, it has no effect on equilibrium policy cut-points. Finally, if θ_e is in region D, the entrant attracts readers from the uninformed supporters of party R and induces θ_R to shift toward the center.

Panel (b) depicts the case when the incumbent newspapers are *leftist* and *rightist.* Again, an entrant newspaper with θ_e in regions A and E will be ineffective. If entry occurs in region B, with an editorial position sufficiently close to θ_1 (i.e., $\theta_e \in [\theta_1, \rho_L^{-1}(\theta_1)]$), the readership of the incumbent leftist newspaper is sufficiently curtailed that it is no longer effective in preventing party L from choosing r in states slightly above θ_L. As a result, θ_L moves to the right and the incumbent leftist newspaper becomes ineffective following the new entry. On the other hand, if θ_e is farther away from θ_1, newspaper 1 still maintains a large enough readership base to prevent party L from deviating to r. So, entry in region C has no effect on the equilibrium cut-points. Finally, if θ_e is in region D, entry shifts θ_R to the left and renders the incumbent rightist newspaper ineffective.

Our discussion leads to the following general conclusion.

Proposition 5 *Regardless of the number and editorial positions of the incumbent newspapers, a new entrant always makes party policy cut-points (weakly) closer to the median voter's ideal cut-point, and hence raises the probability that both parties choose the policy favored by the median voter.*

This proposition is a direct consequence of the characterization of political equilibrium in Appendix B, and its formal proof is therefore omitted. Intuitively, the result is due to the fact that the entry of a newspaper always reduces the number of uninformed voters.

5 Voter Welfare

In this section we examine the relationship between newspaper editorial positions and voter welfare. Suppose there are two effective newspapers with editorial positions $\theta_1 \leq \theta_2$. Let

Figure 3
Equilibrium party cut-points under full information and under no information

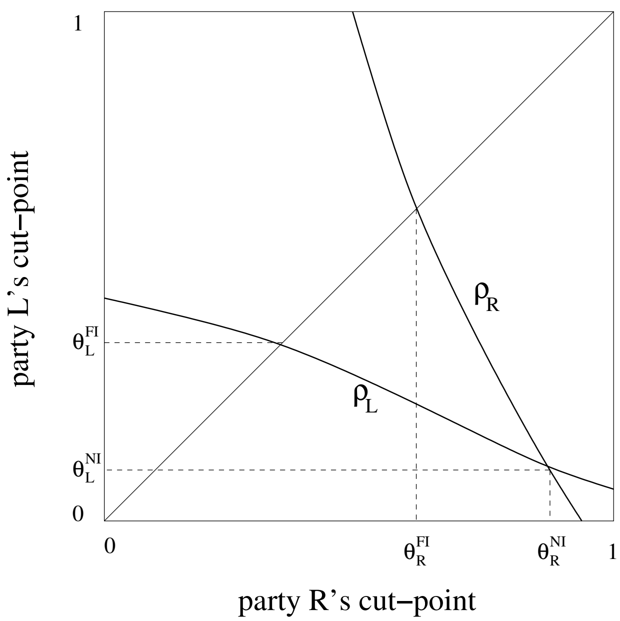
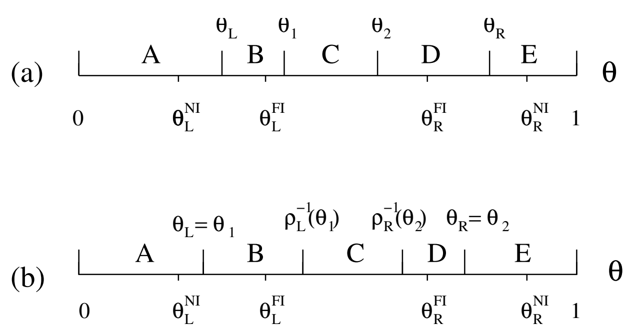


Figure 4
Effect of newspaper entry with editorial position in different regions



$\theta_0 = \theta_L^*(\theta_1)$ and let $\theta_3 = \theta_R^*(\theta_2)$. When the state is $\theta < \theta_L^*$, both parties propose policy r, and party L is elected if $\delta \leq 0$. When the state is $\theta > \theta_R^*$, both parties propose policy l. Again, party L is elected if $\delta \leq 0$. When $\theta \in [\theta_{k-1}, \theta_k]$, $k = 1, 2, 3$, the parties propose different policies, and party L is elected if the median voter reads a newspaper more liberal than newspaper $k-1$; that is, if

$$\delta \leq \delta_k \equiv 0.5(\theta_{k-1} + \theta_k) - b_m.$$

Integrating over θ and δ, the expected utility for a voter with policy preference b is

$$\begin{aligned} W(\boldsymbol{\theta}, \boldsymbol{\delta}; b) &= \sum_{k=1}^{3} \int_{\theta_{k-1}}^{\theta_k} [(2\pi(\delta_k) - 1)(\theta - b) + 2\mu(\delta_k)] \; d\theta \\ &\quad + \int_0^{\theta_L^*(\theta_1)} [b - \theta + 2\mu(0)] \, d\theta + \int_{\theta_R^*(\theta_2)}^{1} [\theta - b + 2\mu(0)] \, d\theta, \end{aligned}$$

where $\boldsymbol{\theta} \equiv (\theta_0, \theta_1, \theta_2, \theta_3)$, $\boldsymbol{\delta} \equiv (\delta_1, \delta_2, \delta_3)$, and $\mu(z) = \int_z^{\overline{\delta}} \delta \, d\pi(\delta)$. Let $b_{ave} \equiv \int_0^1 b \, dF(b)$ denote the mean voter's policy preference. Since W is linear in b, the aggregate voter utility is equal to $W(\boldsymbol{\theta}, \boldsymbol{\delta}; b_{ave})$.

The editorial position of a newspaper can affect voter welfare through the following channels:

Direct effect. Suppose newspaper k moves its editorial position from θ_k to $\theta_k' > \theta_k$. Since the newspaper reports r instead of l in states between θ_k and θ_k', its readers would vote for party R instead of L in those states. This would change the election outcome if the median voter was a reader of newspaper k (i.e., if $\delta \in [\delta_k, \delta_{k+1}]$). The effect on voter welfare is, for $k = 1, 2$,

$$\frac{\partial W}{\partial \theta_k} = 2 \int_{\delta_k}^{\delta_{k+1}} [-\theta_k + b_{ave} + \delta] \; d\pi(\delta). \tag{7}$$

This effect is positive if, conditional on the median voter being a reader of the newspaper, the mean voter prefers party R to party L in state θ_k.

Policy effect. The parties' policies in a state determine the policy choices that are available to voters. If party L moves θ_L to $\theta_L' > \theta_L$, then only policy r can be implemented in states between $[\theta_L, \theta_L')$. Write $\delta_L \equiv \delta_1$ and $\delta_R \equiv \delta_3$. The welfare effects due to policy changes are:

$$\frac{\partial W}{\partial \theta_0} \frac{\partial \theta_L^*}{\partial \theta_1} = 2 \left[(1 - \pi(\delta_L))(b_{ave} - \theta_L^*) - \int_{\delta_L}^{0} \delta \, d\pi(\delta) \right] \frac{\partial \theta_L^*}{\partial \theta_1}, \tag{8}$$

$$\frac{\partial W}{\partial \theta_3} \frac{\partial \theta_R^*}{\partial \theta_2} = 2 \left[\pi(\delta_R)(b_{ave} - \theta_R^*) - \int_0^{\delta_R} \delta \, d\pi(\delta) \right] \frac{\partial \theta_R^*}{\partial \theta_2}. \tag{9}$$

Readership effect. The change in the editorial position of a newspaper affects also the composition of its readership. As the newspaper becomes more conservative, it will lose readers at the left fringe of its territory to the more liberal newspaper $k-1$, while gaining readers near the right fringe from the more conservative newspaper $k+1$. Since both groups of readers would then be consulting more liberal news sources, the first group would vote for party L instead of R when $\theta \in [\theta_{k-1}, \theta_k]$, and the second group would vote for party L instead of R when $\theta \in [\theta_k, \theta_{k+1}]$. The effects on voter welfare are:

$$\sum_{k=0,1} \frac{\partial W}{\partial \delta_k} \frac{\partial \delta_k}{\partial \theta_1} = (b_m - b_{ave}) \left[\pi'(\delta_L) \left(1 + \frac{\partial \theta_L^*}{\partial \theta_1} \right) + \pi'(\delta_2) \right], \tag{10}$$

$$\sum_{k=1,2} \frac{\partial W}{\partial \delta_k} \frac{\partial \delta_k}{\partial \theta_2} = (b_m - b_{ave}) \left[\pi'(\delta_2) + \pi'(\delta_R) \left(1 + \frac{\partial \theta_R^*}{\partial \theta_2} \right) \right]. \tag{11}$$

We say that a vector of editorial positions (θ_1^*, θ_2^*) is *optimal* if it maximizes $W(\boldsymbol{\theta}, \boldsymbol{\delta}; b_{ave})$, taking into the account the dependence of (θ_L, θ_R) and $\boldsymbol{\delta}$ on (θ_1, θ_2). In models of political economy, since electoral outcomes are determined by the median voter, it is a well-known problem that welfare analysis is difficult when there is a divergence of interests between the mean voter and the median voter. To avoid this common problem and to emphasize instead the unique features that arise from our model, we assume for the welfare analysis that the mean voter is also the median voter, i.e., $b_{ave} = b_m$.

Consider the readership effect first. Equations (10) and (11) show that the readership effect is zero when $b_{ave} = b_m$. A change in the composition of the readership of newspapers affects the election outcome only when it changes the newspaper choice of the median voter. But a marginal change in editorial position would make the median voter switch from one newspaper to another only if the median voter is initially indifferent between the two. Hence, the readership effect is zero if the mean voter is also the median voter. We therefore only need to consider the direct effect and the policy effect.

For newspaper 1, the term in square brackets of the policy effect (8) is positive because $\theta_L^* < b_m$. Since the median voter strictly prefers policy r in state θ_L^*, he is better off when party L moves its cut-point toward the center. Suppose newspaper 1 is leftist. Then $\partial \theta_L^* / \partial \theta_1 = 1$ and, hence, the policy effect is positive. Since the direct effect (7) is also positive at $\theta_1 = \theta_L$, aggregate voter welfare strictly increases as a leftist newspaper moves its editorial position to the right. Similar reasoning suggests that voter welfare strictly increases as a rightist newspaper moves its editorial position to the left. Thus, the optimal position of the two newspapers must lie in the region $[\theta_L^{FI}, \theta_R^{FI}]$. In other words, moderate newspapers are better than leftist or rightist newspapers from the standpoint of aggregate welfare.

If newspaper 1 is moderate, the policy effect (8) is always negative as $\partial \theta_L^* / \partial \theta_1 < 0$. Furthermore, the direct effect (7) is also negative at $\theta_1 = \theta_2$. This means that if the two moderate newspapers have the same editorial position, voter welfare can be raised by moving θ_1 to the left. It is never optimal for different newspapers to speak with the same voice; voters benefit from a media industry with a diversity of viewpoints.

Finally, note that the direct effect (7) of a change in editorial position is equal to zero when

$$\theta_k - b_m = E[\delta \mid b_m + \delta \in T_k], \tag{12}$$

where T_k is newspaper k's territory as defined in (3). Newspaper k affects the outcome of an election only when the median voter is a reader of that newspaper, in which case the median voter's preference for party R is on average $E[\delta \mid b_m + \delta \in T_k]$. If newspaper positions did not affect party policies, the condition (12) means that an optimal newspaper k should report l in a state if and only if conditional on the newspaper's report being decisive, the median voter on average prefers policy l in that state. We say that such a newspaper is *conditionally unbiased* for the median voter. In our model, however, the policy effect (8) of θ_1 is negative in the region $[\theta_L^{FI}, \theta_R^{FI}]$. At the conditionally unbiased position, therefore, the total effect of a leftward shift in θ_1 would increase voter welfare. Hence, the optimal θ_1^* must satisfy the condition that

$$\theta_1^* - b_m < E[\delta \mid b_m + \delta \in T_1]. \tag{13}$$

Similarly, the optimal position for newspaper 2 must satisfy

$$\theta_2^* - b_m > E[\delta \mid b_m + \delta \in T_2]. \tag{14}$$

The conditions (13) and (14) mean that the newspaper on the left should be conditionally biased in favor of party L, while the newspaper on the right should be conditionally biased for party R. The reason is that policy cut-points are determined by a party's uninformed supporters. By moving the editorial positions closer to these groups, the newspapers encourage them to become better informed, thereby exerting a moderating influence on the parties' policy choices.

The following proposition summarizes the properties of the optimal positions of the media when the mean voter and the median voter coincide.

Proposition 6 *Suppose $b_{ave} = b_m$. The optimal editorial positions are:*
(1) moderate: $\theta_k^* \in [\theta_L^{FI}, \theta_R^{FI}]$ for $k = 1, 2$;
(2) diverse: $\theta_1^* \neq \theta_2^*$; and
(3) conditionally biased: θ_1^* satisfies (13) and θ_2^* satisfies (14).
Furthermore, if the distribution function π is log-concave, then the optimal editorial positions are also:
(4) monotone in party preferences: for $k = 1, 2$, θ_k^* is increasing in both β_L and β_R.

We have already established conditions (1) to (3). Condition (4) is proved in Appendix D. To understand this monotonicity result, note that the optimal position of a newspaper balances the trade-off between the need to provide information to voters and the need to induce the parties to move their policy cut-points toward the center. The terms of this trade-off are affected by the parties' ideological positions. Suppose, for example, that party L becomes more extreme (i.e., β_L decreases). Other things being equal, party L would choose a lower cut-point θ_L. A lower cut-point makes the policy effect (8) relatively more important as the cost to the median voter from having policy l in state θ_L rises. As a result, the optimal position for newspaper 1 must shift to the left to constrain party L from pursuing partisan policies. Moreover, as newspaper 1 moves to the left, some of its readers will switch to newspaper 2. To provide useful information to these relatively liberal voters, the optimal response is for newspaper 2 to move its editorial position to the left as well.

Our discussion in this section suggests that media bias need not be such a threat to democracy as it is sometimes perceived. Proposition 6 says that editorial positions should be moderate, but it does not say that all newspapers should be "unbiased." Even if it were possible to define a unique editorial position commonly agreed to be "unbiased" or "objective," it would be preferable to have a media industry with a diversity of biases than for every media outlet to share the same "objective" viewpoint. The role of the media is not merely to provide information to voters. Once the effect of media presence on equilibrium policy choices is recognized, Proposition 6 shows that some degree of media bias (relative to the conditionally unbiased position) is optimal. Moreover, our monotonicity result highlights the fact that optimal editorial positions cannot be defined without regard to the political environment. When party preferences shift systematically in one direction, the optimal media positions should follow in the same direction even if the preferences of the voters remain fixed.

6 Commercial Media

In this section, we consider how editorial positions are determined when media firms are primarily motivated by commercial interests. Since advertising revenue for media firms depends on how many readers or viewers they attract, while the cost of content is largely fixed, we assume for simplicity that the objective of a newspaper is to maximize the size of its (expected) readership.[11]

Recall that voter j reads newspaper k if and only if $b_j + \delta \in T_k$. Let

$$F^*(x) = \int_{\underline{\delta}}^{\overline{\delta}} F(x - \delta)\, d\pi(\delta)$$

be the distribution of $b_j + \delta$. Then, the expected readership of newspaper k is given by:

$$S_k(\theta_k) = F^*(0.5(\theta_k + \theta_{k+1})) - F^*(0.5(\theta_k + \theta_{k-1})).$$

As in any product market, the choice of editorial positions (product characteristics) depends on the industry structure of the media. Since our main focus is the relationship between the mass media and electoral politics, we explore this relationship with some simple illustrative industry structures in the following subsections.

6.1 Monopoly versus Duopoly

Consider the simplest case of a monopoly firm operating one newspaper (newspaper 1). The readership S_1 of this newspaper depends on the cut-points θ_L and θ_R of the political parties, and these cut-points in turn are affected by the editorial position θ_1. We can model this relationship either as a "Cournot" game in which θ_1, θ_L and θ_R are chosen simultaneously, or as a "Stackelberg" game in which newspaper 1 takes into account its effect on party

[11] Broadcast television and radio derive virtually no revenue from viewers or listeners. Newspapers and magazines obtain some revenue from their readers, but far less than they get from advertising. In general, if advertisers are willing to pay a constant amount for each viewer, and news consumers are sufficiently price sensitive, then it would be optimal for a media outlet to provide news for free. See Mullainathan and Shleifer (2005) for a more detailed analysis of pricing decisions by media firms. Other models that assume a zero price for news include Steiner (1952) and Hamilton (2004).

policies when it chooses the editorial position. Since in reality both party preferences and the media editorial positions evolve gradually, we feel that it is more appropriate to model the interaction between the media and the parties as a "Cournot" game.

When newspaper 1 moves its editorial position to the right, it gains readers whose indifference positions are near $0.5(\theta_1+\theta_R)$ while it loses readers whose indifference positions are near $0.5(\theta_L+\theta_1)$. Given θ_L and θ_R, the readership-maximizing position θ_1 must satisfy

$$f^*(0.5(\theta_L+\theta_1)) = f^*(0.5(\theta_1+\theta_R)) \tag{15}$$

at an interior solution. We have the following proposition:

Proposition 7 *Suppose f^* is single-peaked with a mode $b_0 \in (\theta_L^{FI}, \theta_R^{FI})$. If*

$$f^*(\theta_L^{FI}) < f^*(0.5(\theta_L^{FI} + \rho_R(\theta_L^{FI}))), \tag{16}$$

$$f^*(\theta_R^{FI}) < f^*(0.5(\rho_L(\theta_R^{FI}) + \theta_R^{FI})); \tag{17}$$

then there exists a unique monotone equilibrium in which the monopoly newspaper is moderate with an editorial position θ_1^m that satisfies (15) and the parties' cut-points satisfy $\theta_L = \rho_L(\theta_1^m)$ and $\theta_R = \rho_R(\theta_1^m)$.

Since f^* is a convolution of the density f of voter policy preferences and the density π' of party preferences, a sufficient condition for f^* to be single-peaked is that the latter two densities are both log-concave (e.g., Dharmadhikari and Joag-dev, 1988). Conditions (16) and (17) of Proposition 7 are used to ensure an interior equilibrium with $\theta_L < \theta_1 < \theta_R$.[12]

When the media market is a duopoly, one newspaper can invade the territory of the other newspaper by changing its editorial position. A form of Hotelling competition ensues. Each newspaper wants to establish an editorial position near the median position among newspaper consumers. More precisely, we have the following result:

Proposition 8 *Suppose f^* is single-peaked with a mode $b_0 \in (\theta_L^{FI}, \theta_R^{FI})$. There exists a unique monotone equilibrium in which both newspapers are moderate and adopt the same editorial position θ^d and $\theta_i = \rho_i(\theta^d)$ for $i = L, R$ if and only if θ^d satisfies:*

$$F^*(0.5(\theta_R+\theta^d)) - F^*(\theta^d) = F^*(\theta^d) - F^*(0.5(\theta_L+\theta^d)), \tag{18}$$

and

$$f^*(\theta^d) \geq \max\{f^*(0.5(\theta_L+\theta^d)), f^*(0.5(\theta_R+\theta^d))\}. \tag{19}$$

In equilibrium, the editorial positions of both newspapers converge to θ^d. Because they take the same editorial position, newspaper readers are shared equally by them. Equation (18) requires that the expected number of news consumers who are more conservative than θ^d must be the same as the number of those who are more liberal than θ^d. If there are more

[12] If condition (16) fails, for example, it is an equilibrium to have $\theta_L = \theta_1 = \theta_L^{FI}$ and $\theta_R = \rho_R(\theta_L^{FI})$, because the monopoly firm has no incentive to move its editorial position to the right. The firm has no incentive to move its editorial position to the left either, because it would then become ineffective and lose all its readers.

conservatives than liberals, for example, each newspaper has an incentive to differentiate itself from the other by moving slightly to the right to capture the entire conservative reader market. Even if (18) is satisfied, newspapers may still have an incentive to move to the right if there are more readers with indifference positions near the right fringe of the market than those with indifference positions near the median. Condition (19) guarantees that this kind of move will not increase the readership of any individual newspaper.

In general the equilibrium editorial position θ_1^m under a monopoly differs from the equilibrium position θ^d under a duopoly. More importantly, equilibrium editorial positions react very differently to changes in the political environment under the two alternative market structures. Consider, for example, the effect of an increase in β_L. Other things being equal, party L chooses a more moderate position θ_L as its preference becomes less liberal. As θ_L increases, a monopoly newspaper loses readers at the left fringe of its territory. When f^* is single-peaked, such a change means that the density of readers on the left fringe of the monopoly newspaper's territory exceeds the density of readers on the right fringe. The monopoly newspaper therefore shifts its editorial position θ_1^m to the left in response. In the case of a duopoly, on the other hand, an increase in β_L reduces the size of the liberal segment of the newspaper market relative to the conservative segment. Each newspaper then has an incentive to capture the conservative segment by moving to the right. Therefore, the equilibrium editorial position θ^d becomes more conservative. We summarize this result in the following proposition.

Proposition 9 *Suppose f^* is single-peaked and an interior equilibrium exists under both a monopoly and a duopoly. As one of the parties becomes more conservative (β_i increases, $i = L, R$), θ_1^m will shift to the left while θ^d will shift to the right.*

Recall that party cut-points are decreasing functions of a newspaper's editorial position. A media monopoly exacerbates the party asymmetry by moving away from the more extreme position, while a duopoly counteracts it by moving toward the extreme position. As a result, equilibrium party cut-points are more symmetric under a duopoly than under a monopoly. Since optimal media positions should move in the same direction as β_L (Proposition 6), Proposition 9 implies that θ^d responds in the same direction to β_L as the optimal position does, while θ_1^m responds in the "wrong" direction. In general, voter welfare under a duopoly may not be higher than under a monopoly, as θ^d may "overshoot" the optimal position. We can establish, however, that voter welfare is higher under a duopoly than under a monopoly under some specific circumstances.

Proposition 10 *If the density function f is symmetric and unimodal about* 0.5*, and if the distribution function π is uniform on $[-\overline{\delta}, \overline{\delta}]$ (with $\overline{\delta} > 0.5$), then voter welfare is higher under a duopoly than under a monopoly.*

To understand why this is true, suppose $\beta_L + \beta_R > 1$. Since party preferences are tilted to the right, Proposition 9 implies that $\theta_1^m < 0.5 < \theta^d$. Under the assumed conditions of Proposition 10, the density function f^* is symmetric and unimodal about 0.5.[13] Hence, equation (18) for the duopoly equilibrium implies that θ^d is closer to θ_L than to θ_R. However,

[13]The restriction that $\overline{\delta} > 0.5$ is used to ensure that $\pi(\delta_L)$ and $1 - \pi(\delta_R)$ are strictly between 0 and 1.

when π is uniform, the conditionally unbiased position θ_1 for a single newspaper requires that θ_1 be mid-way between θ_L and θ_R. Thus, the direct effect of an increase in θ_1 is positive for all $\theta_1 \leq \theta^d$. The proof of Proposition 10 (Appendix D) establishes that the direct effect always dominates the policy effect when the two effects differ in sign. More generally, we expect the duopoly welfare to be higher when the policy effect is relatively unimportant.[14]

6.2 Independent versus Consolidated Ownership

In the previous subsection, we assumed that a monopoly media firm operated one newspaper only. However, media industry regulators are often concerned about the effect of monopoly control over multiple media outlets. This subsection addresses the differences between independent and joint control of media outlets.

When there are two newspapers, the case of independent ownership is the same as the duopoly case described in the earlier subsection. Now, suppose these two newspapers are consolidated under unified ownership. Expected total readership of the two newspapers is given by

$$S_1 + S_2 = F^*(0.5(\theta_1 + \theta_L)) - F^*(0.5(\theta_2 + \theta_R)).$$

Note that voters with indifference positions $b + \delta \in [\theta_1, \theta_2]$ either read newspaper 1 or newspaper 2. When the two newspapers are jointly owned, the monopoly owner has no incentive to cater to the preferences of these voters, but rather to cater to the fringe voters so as to expand the set of voters who choose to read newspapers. Thus, instead of converging toward the center, the two editorial positions tend to diverge to the fringes. This gives the following result.

Proposition 11 *When a monopoly operates two newspapers, editorial positions and party positions constitute an equilibrium if and only if one newspaper is leftist, with* $\theta_L = \theta_1 \in [\theta_L^{NI}, \theta_L^{FI}]$*, and the other newspaper is rightist, with* $\theta_R = \theta_2 \in [\theta_R^{FI}, \theta_R^{NI}]$.

Proposition 11 does not pin down a unique equilibrium. The multiplicity of equilibria can be resolved if we assume that the monopoly firm takes into account its effect on party policies when it chooses its editorial positions (i.e., if we assume that the monopoly is a "Stackelberg leader"). In that case, the readership-maximizing equilibrium is obviously $\theta_1 = \theta_L^{NI}$ and $\theta_2 = \theta_R^{NI}$.

In a way, the tendency for a monopoly to produce greater divergence in editorial positions recalls the findings Steiner's (1952) model, in which a monopoly leads to greater program variety. However, there is a crucial difference between the present result and Steiner's result in terms of welfare evaluation. In Steiner's model, which deals mainly with entertainment programs, a greater program variety generally leads to better match with consumers' tastes

[14] Modeling the relationship as a "Stackelberg" game would not change the equilibrium editorial positions of the newspaper in the duopoly case because the policy effect reinforces the incentives for the newspapers to move their editorial positions towards the center. The situation is more complicated in the monopoly case. If the monopoly newspaper shift its editorial position, say, to the left, it will lose some readers on the left as party L shifts its cutoff to the right, while gaining readers on the right as party R shifts its cutoff to the right. Whether the newspaper would benefit from this change depends on which of these two effects is stronger. Since the distribution of readers is single-peaked, the monopoly editorial position will not change so long as party L moves its cut-point more than party R does (when the newspaper moves to the left).

and therefore higher consumer welfare. In our model, a greater divergence in editorial positions also affects the political equilibrium by producing a greater divergence between θ_L and θ_R. Indeed, the (Stackelberg) monopoly outcome is the same as the no information outcome, which maximizes the divergence between θ_L and θ_R. Since policy divergence is generally bad for the mean voter, the externality induced by the policy shift effect would tilt the balance against monopoly ownership in the media market.

7 Extensions

7.1 Apolitical News Consumption Rules

A key feature of this paper is that voters choose to consume news from media outlets with editorial positions closest to their own political preferences. In reality, some consumers choose to obtain their news from a certain outlet for its business or sports coverage or for its entertainment value. We can capture these other aspects of news consumption behavior by assuming that only a fraction $1-\gamma$ of the population choose their news sources according to the news consumption rule posited by equation (4) of our model. The remaining fraction γ of the voters choose newspapers for other reasons than their political preferences.

The introduction of apolitical news consumers will change our results in several ways. First, party L's cut-point is no longer solely determined by θ_1. Instead, a marginal increase in θ_2 will reduce θ_L. The reason is that a rightward shift in the editorial position of newspaper 2 makes its report r less credible to its apolitical news consumers. Some of these readers will ignore the report and support l, thus allowing party L to pursue more partisan policies. Second, an increase in γ reduces θ_L and raises θ_R. When voters do not choose their news from the most informative source, political parties are less likely to choose policies that benefit the median voter. Finally, our result that newspaper entry will always make parties' cut-points more centrist will no longer hold. Suppose that an extreme newspaper with editorial position $\theta_e < \theta_L^{NI}$ enters the market, and consider an apolitical news consumer with an indifference position in the range $[0.5(\theta_1+\theta_L), 0.5(\theta_L+\theta_R)]$. If this voter switches from reading newspaper 1 to reading the extreme newspaper, he will support policy l instead of policy r in state $\theta=\theta_L$. In this case, the entry of an extreme newspaper will lead to greater extremism among the political parties.[15]

7.2 The Cost and Benefit of News

In our basic model, we make the simplifying assumption that voter j strictly prefers to consume news whenever there is a newspaper k such that value of information $V_k(j)$ is positive. One way to relax this assumption is to allow incomplete consumption of news among voters for whom the value of news is positive. Suppose there is a cost c_j of reading news. Since the cost of news consumption is largely a matter of time and effort rather than monetary cost, we assume that the cost c_j is different for different voters, with a distribution

[15] Our basic model also assumes that voter turnout is exogenous. When this is not the case, the mass media can also affect political competition through the "intensive margin" (Glaeser, Ponzetto and Shapiro, 2005). For example, an extreme left-wing media outlet reinforces the beliefs of the uninformed supporters of the liberal policy and encourages more of these voters to cast their votes for the liberal party. Again in this case, extreme media outlets will not be ineffective.

that is independent of voters' political preferences. Voter j reads newspaper k if and only if the value $V_k(j)$ is the highest among all newspapers in the market and $V_k(j) \geq c_j$. On this assumption, the number of voters who read newspaper k is increasing in V_k.

As in the original model, the equilibrium cut-points θ_L and θ_R are determined by the number of uninformed supporters of policies l and r. Given our relaxed assumption, there are two groups of uninformed supporters of policy l: (1) voters who find the newspapers non-informative; and (2) voters who do not read news because their costs are too high. Consider the effect of the entry of a newspaper with an editorial position θ_e between θ_1 and θ_2. In the original model, its entry has no effect on the equilibrium cut-points because it does not change the number of uninformed supporters of either party. Notice, however, that the value of the entrant newspaper must be higher than V_1 and V_2 in its territory $[0.5(\theta_1 + \theta_e), 0.5(\theta_e + \theta_2)]$. Because the value is higher, more voters in this region will become news consumers. This reduces the number of uninformed voters, with the result that equilibrium cut-points will be closer to the median voter's ideal cut-point. This extension of the basic model reveals another advantage of media diversity that did not show up in the original formulation: where there is a large number of media outlets that more closely correspond to the preferences of different segments of the population, media diversity encourages more people to read the news and therefore reduces the imperfect information problem of the electoral process.

When the probability of news consumption depends on the value of news, changes in the editorial position of a media outlet affect the number of news consumers. Note that $\partial V_1(j)/\partial\theta_1$ is positive if voter j has an indifference position greater than θ_1 and negative if voter j has an indifference position less than θ_1. An increase in θ_1 tends to increase total news consumption and hence pulls θ_L toward the center when θ_1 is small, while it lowers total news consumption and pushes θ_L away from the center when θ_1 is large. Thus, our earlier finding that a newspaper's editorial position has a non-monotonic effect on policy cut-points is robust to the introduction of incomplete news consumption.

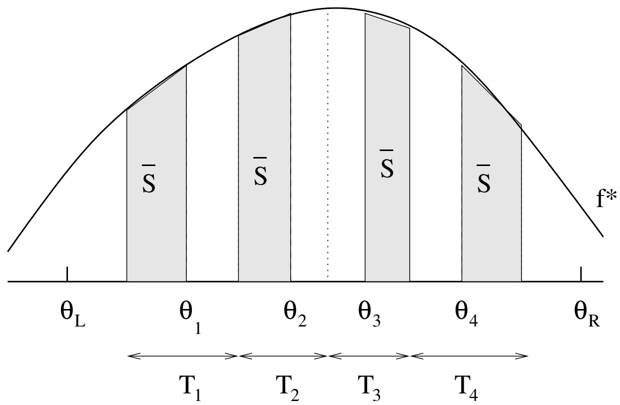
Since a shift of a newspaper's editorial position now affects the news consumption of all consumers in its territory, the two newspapers may not choose the same editorial position in a duopoly market as in section 6.1. Moreover, a newspaper with an editorial position equal to θ_L or θ_R has a readership of zero. Therefore a monopoly controlling two newspapers will not set $\theta_1 = \theta_L$ and $\theta_2 = \theta_R$ as in section 6.2. However, it remains true that a consolidated ownership may lead to a greater degree of product diversity but lower voter welfare than a duopoly.

7.3 Entry-Deterring Equilibrium

In our discussion of spatial competition between media firms, we focus on the case of a monopoly versus a duopoly because equilibrium existence is rare in location models with more than two firms (e.g., Eaton and Lipsey, 1975). A detailed analysis of the many possible extensions of our simple model of spatial competition is beyond the scope of this paper. However, a suitably defined concept of entry deterrence will allow us to explore how entry barriers in the media industry affect the political process.

Suppose there is a fixed cost but no variable cost of operating a media outlet. To break even, a media firm must have at least $\overline{S}$ readers on average. Let there be n incumbent firms

Figure 5
Entry-deterring equilibrium



in the industry, with editorial positions $\theta_1 \leq \ldots \leq \theta_n$. An entrant newspaper with editorial position $\theta_e \in (\theta_k, \theta_{k+1})$ will have an expected readership of

$$S_e(\theta_e) = F^*(0.5(\theta_{k+1} - \theta_e)) - F^*(0.5(\theta_e - \theta_k)).$$

If $\theta_e = \theta_k$, the entrant shares equally the readers in the territory of the incumbent newspaper k, i.e.,

$$S_e(\theta_e) = 0.5\left[F^*(0.5(\theta_{k+1} - \theta_k) - F^*(0.5(\theta_k - \theta_{k-1}))\right].$$

We say that *entry is deterred* if, given (θ_L, θ_R) and $(\theta_1, \ldots, \theta_n)$, there is no $\theta_e \in [0,1]$ such that $S_e(\theta_e) \geq \overline{S}$.

Definition 2 *The editorial positions $(\theta_1, \ldots, \theta_n)$ and the political cut-points (θ_L, θ_R) constitute an entry-deterring equilibrium if (1) entry is deterred; (2) $S_k(\theta_k) \geq \overline{S}$ for each incumbent newspaper; (3) given θ_{-k}, $S_k(\theta_k) \geq S_k(\theta_k')$ for any θ_k' such that entry is deterred; and (4) (θ_L, θ_R) is the political equilibrium given $(\theta_1, \ldots, \theta_n)$.*

In an entry-deterring equilibrium, each incumbent firm chooses its editorial position to maximize its readership subject to the constraint that this editorial position does not invite profitable entry. In our model of localized competition, even though there can be many firms in equilibrium, each firm is a localized monopoly in its own territory and therefore has an incentive to deter entry. We show that an entry-deterring equilibrium exists if the density f^* of indifference positions is single-peaked and if the fixed cost $\overline{S}$ is sufficiently small. The precise statement of our result is given in Appendix C. Figure 5 gives a diagrammatic illustration of the properties of an entry-deterring equilibrium.

The market for each newspaper k can be divided into a "liberal segment" and a "conservative segment." The size of the liberal segment of newspaper k is given by

$$SL_k(\theta_{k-1}, \theta_k) = F^*(\theta_k) - F^*(0.5(\theta_{k-1} + \theta_k)).$$

Similarly, the size of the conservative segment is

$$SR_k(\theta_k, \theta_{k+1}) = F^*(0.5(\theta_{k+1} + \theta_k)) - F^*(\theta_k).$$

Let b_0 be the mode of the density f^*. For newspapers to the left of b_0 (newspapers 1 and 2 in Figure 5), the equilibrium editorial positions must be such that $SL_k = \overline{S}$. For newspapers to the right of b_0 (newspapers 3 and 4), entry-deterring equilibrium requires $SR_k = \overline{S}$.

The entry-deterring equilibrium has several interesting properties. First, each incumbent newspaper earns positive profits since $S_k = SL_k + SR_k > \overline{S}$. Second, because the density of news consumers is increasing to the left of b_0, newspapers with more liberal editorial positions require a larger territory to capture the same number of consumers. In other words, the condition $SL_k = SL_{k+1}$ implies that

$$\theta_k - \theta_{k-1} > \theta_{k+1} - \theta_k$$

for $\theta_{k+1} < b_0$. Similarly, for a newspaper to the right of b_0, we must have

$$\theta_{k+1} - \theta_k > \theta_k - \theta_{k-1}$$

if $\theta_{k-1} > b_0$. This means that in equilibrium there are more media outlets with editorial positions clustered near b_0 than media outlets with editorial positions farther to the right or left. Finally, this model also suggests that greater competition in the media industry tends to promote the efficacy of electoral competition. To understand why this is true, note that one condition for entry-deterring equilibrium is

$$SL_1(\rho_L(\theta_1), \theta_1) = \overline{S}.$$

Since SL_1 is decreasing in the first argument and increasing in the second argument, $d\theta_1/d\overline{S}$ is negative. Suppose there are lower fixed costs or lower barriers to entry in the media industry, so that the break-even size of the market $\overline{S}$ is reduced. The equilibrium editorial position of newspaper 1 must move further to the left to deter entry. Since the cut-point of party L is decreasing in θ_1, this means that equilibrium θ_L will move toward the center in response. Similarly, a fall in $\overline{S}$ increases θ_n and decreases θ_R. The result is that both parties are more likely to choose policies that accord with the preferences of the median voter. In the limit as $\overline{S}$ tends to zero, (θ_L, θ_R) converge to the full-information cutoffs $\left(\theta_L^{FI}, \theta_R^{FI}\right)$.

8 Conclusion

We construct a model of media and electoral competition to examine the media effect on political outcomes. Starting from the premise that voters tend to consume news from news sources with similar ideological positions to their own, we show that:

- A party's policy is mainly influenced by media outlets whose ideological positions are close to it.
- If a moderate media outlet becomes more partisan, a party will be less likely to adopt a partisan policy.
- If the editorial positions of the incumbent media outlets remain constant, a new entrant increases the chance that parties will adopt the policy that maximizes voter welfare.

The results highlight the point that the "bias" of a media outlet depends on the preferences of its audience. While a liberal may find Fox News biased, it is a credible news source for its conservative viewers. If Fox News did not exist, many of these viewers might switch to an even more conservative news source or stop consuming news altogether.

In section 7 we consider the robustness of our results. We find that the first two conclusions continue to hold under more realistic assumptions. The last conclusion, however, does not hold when some news consumers choose media outlets for reasons unrelated to politics. In that case, the entry of an extreme media outlet may increase the chance that a party adopt a partisan policy, as the new entrant will distract consumers who would otherwise get their news from a more credible news source. Nevertheless, we believe that outlets with partisan viewpoints may not be as harmful and polarizing as some media critics describe.

How to regulate the media is an important policy question that has not been addressed by the recent political economy literature on the media. In section 6 we compare the equilibrium editorial positions under a monopoly and under a duopoly, and in section 7 we examine an entry-deterrence equilibrium. To keep the model simple, we assume that media outlets select editorial positions to maximize the size of their audiences. Future work should take into account other important characteristics of the media market. For example, some media outlets may care directly about policy outcomes and not merely about their effects on profits. Since extreme viewpoints may be more entertaining than moderate ones, media outlets may also be tempted to adopt more partisan editorial positions to attract consumers who treat news as entertainment.

Appendices

A Monotone Strategies

Lemma 1 *In any equilibrium σ of the election game, there is no θ such that $\sigma_L(\theta) = r$ and $\sigma_R(\theta) = l$.*

Proof. Let $p(y_L, y_R, \theta)$ denote party L's probability of winning the election when the state is θ and when parties L and R chose y_L and y_R, respectively. Suppose, by way of contradiction, that $\sigma_L(\theta) = r$ and $\sigma_R(\theta) = l$ for some θ. Since party L prefers r to l,

$$2p(r, l, \theta)(\beta_L - \theta) \geq (1 - 2p(r, l, \theta))d. \tag{20}$$

Since party R prefers l to r,

$$2(1 - p(r, l, \theta))(\theta - \beta_R) \geq (2p(r, l, \theta) - 1)d. \tag{21}$$

Combining (20) and (21), we have

$$p(r, l, \theta)(\beta_L - \theta) \geq (1 - p(r, l, \theta))(\beta_R - \theta). \tag{22}$$

When $\theta \leq \beta_L$, (21) requires $p(r, l, \theta) < 0.5$, while (22) requires $p(r, l, \theta) > 0.5$.
When $\theta \in (\beta_L, \beta_R)$, there is no $p(r, l, \theta)$ that satisfies (22).
Finally, when $\theta > \beta_R$, (20) requires $p(r, l, \theta) > 0.5$, while (22) requires $p(r, l, \theta) < 0.5$.
Hence, there is no θ where (20), (21), and (22) hold simultaneously. ■

Lemma 2 *Suppose $\sigma_L(\theta) = l$ and $\sigma_R(\theta) = r$ for some θ in an equilibrium σ of the election game. If $p(l, r, \theta)$ is increasing in θ, then (1) for all $\theta' < \theta$, $\sigma_L(\theta') = l$ implies $\sigma_R(\theta') = r$, and (2) for all $\theta'' > \theta$, $\sigma_R(\theta'') = r$ implies $\sigma_L(\theta'') = l$.*

Proof. We prove part 1. Since, by supposition, party R prefers r to l in θ,

$$2(1 - p(l, r, \theta))(d + beta_R - \theta) \geq d.$$

As $p(l, r, \theta)$ increases in θ, for $\theta' < \theta$

$$2(1 - p(l, r, \theta'))(d + \beta_R - \theta') > 2(1 - p(l, r, \theta))(d + \beta_R - \theta) \geq d.$$

Hence, in equilibrium in any $\theta' < \theta$ party R chooses r if party L chooses l. The proof for part 2 is similar and hence omitted. ■

Proposition 12 *In any equilibrium in which $\sigma_L \neq \sigma_R$ and in which $p(l, r, \theta)$ is increasing in θ, the party strategies must be monotone. Furthermore, party L's cut-point must be lower than party R's.*

Proof. By Lemma 1, $\sigma(\theta^*) = (l, r)$ for some θ^*. For any $\theta' > \theta^*$, $\sigma_L(\theta') = l$ if $\sigma_R(\theta') = l$ (Lemma 1), and $\sigma_L(\theta') = l$ if $\sigma_R(\theta') = r$ (Lemma 2). Hence $\sigma_L(\theta') = l$ for $\theta' > \theta^*$. Similarly, $\sigma_R(\theta'') = r$ for $\theta'' < \theta^*$. Let $\theta_L \equiv \inf\{\theta' \leq \theta^* \mid \sigma_L(\theta') = l\}$ and $\theta_R \equiv \sup\{\theta' \geq \theta^* \mid \sigma_R(\theta') = r\}$. Then it follows that for each $i \in \{L, R\}$, $\sigma_i(\theta) = l$ for all $\theta > \theta_i$ and $\sigma_i(\theta) = r$ for all $\theta < \theta_i$. Finally, note that by construction, $\theta_L \leq \theta_R$. ■

B Political Equilibrium with n Newspapers

Proposition 13 *Suppose there are n newspapers with editorial positions* $\theta_1, \ldots, \theta_n \in [\theta_L^{NI}, \theta_R^{NI}]$*. Denote* $\rho_L^*(z) = \max\{\rho_L(z), z\}$ *and* $\rho_R^*(z) = \min\{\rho_R(z), z\}$*. There is a unique monotone equilibrium with equilibrium cut-points*

$$\theta_L^* = \max\{\rho_L^*(\theta_k),\ k = 1, \ldots, n\},$$
$$\theta_R^* = \min\{\rho_R^*(\theta_k),\ k = 1, \ldots, n\}.$$

Proof. Let $\theta^a \equiv \max\{\theta_k, k = 1, \ldots, n \mid \theta_k < \theta_L^{FI}\}$ and $\theta^b \equiv \min\{\theta_k, k = 1, \ldots, n \mid \theta_k \geq \theta_L^{FI}\}$. By definition,

$$\theta_L^* = \begin{cases} \theta^a & \text{if } \theta^a > \rho_L(\theta^b), \\ \rho_L(\theta^b) & \text{if } \theta^a \leq \rho_L(\theta^b). \end{cases}$$

Suppose $\theta_L^* = \theta^a$. Since $\theta^a < \theta_L^{FI}$, party L's optimal response is to choose r when $\theta < \theta^a$. Since $\theta^a > \rho_L(\theta^b)$, party L's optimal response is to choose l when $\theta \geq \theta^a$.

Suppose $\theta_L^* = \rho_L(\theta^b)$. Then, party L is indifferent between platforms l and r in state θ_L^*. Since the utility it receives when l is implemented and the probability that it gets elected by choosing l are both increasing in θ, it is optimal for party L to choose r when $\theta < \theta_L^*$ and l when $\theta \geq \theta_L^*$. Thus, θ_L^* is optimal. The case for party R can be proved similarly.

For any $\theta_L > \theta_L^*$, there exists some $\theta_k > \theta_L^{FI}$ such that there is no $\theta_{k'} \in (\theta_L, \theta_k)$ and that $\rho_L(\theta_k) < \theta_L$. Suppose the party strategies are $\theta_L^* < \theta_L < \theta_R$. Then, party L would be strictly better off to deviate and choose l in a state slightly less than θ_L. Similarly, for any $\theta_L < \theta_L^*$, there is some θ_k such that there is no $\theta_{k'} \in (\theta_L, \theta_k)$ and $\rho(\theta_k) > \theta_L$. Hence, if the party strategies are $\theta_L < \theta_L^* < \theta_R$, party L would be strictly better off to deviate and choose r in a state greater than θ_L. Hence there is no equilibrium with $\theta_L \neq \theta_L^*$. The case for party R can be proved similarly. ■

C Characterization of Entry-Deterring Equilibrium

We introduce some notation before characterizing the entry-deterring equilibrium. Given z_0, define $z_1(z_0), z_2(z_0), \ldots$ recursively as the solution to

$$SL_k(z_{k-1}, z_k) = \overline{S}.$$

Similarly, given $\hat{z}_{n+1}$, define $\hat{z}_n(\hat{z}_{n+1}), \hat{z}_{n-1}(\hat{z}_{n+1}), \ldots$ recursively by

$$SR_k(\hat{z}_k, \hat{z}_{k+1}) = \overline{S}.$$

Let k_l be the largest k such that $z_k(z_0) \leq b_0$, and let k_r be the smallest k such that $\hat{z}_k(\hat{z}_{n+1}) \geq b_0$. Finally, let

$$\hat{\theta}(z_0, \hat{z}_{n+1}) = \arg\max_{\theta} \hat{S}_e(\theta) = F^*(0.5(\hat{z}_{k_r} + \theta)) - F^*(0.5(\theta + z_{k_l})).$$

Proposition 14 *Suppose f^* is single-peaked with a mode $b_0 \in (\theta_L^{FI}, \theta_R^{FI})$ and suppose $\overline{S}$ is sufficiently small. Then, there exists an entry-deterring equilibrium with editorial positions*

$$(z_1(\theta_L), \dots, z_{k_l}(\theta_L), \hat{z}_{k_r}(\theta_R), \dots, \hat{z}_n(\theta_R))$$

and party cut-points $\theta_L = \rho_L(z_1(\theta_L))$ and $\theta_R = \rho_R(\hat{z}_n(\theta_R))$ if $\hat{S}_e(\hat{\theta}(\theta_L, \theta_R)) < \overline{S}$. There exists an entry-deterring equilibrium with editorial positions

$$(z_1(\theta_L), \dots, z_{k_l}(\theta_L), \hat{\theta}(\theta_L, \theta_R), \hat{z}_{k_r}(\theta_R), \dots, \hat{z}_n(\theta_R))$$

and party cut-points $\theta_L = \rho_L(z_1(\theta_L))$ and $\theta_R = \rho_R(\hat{z}_n(\theta_R))$ if $\hat{S}_e(\hat{\theta}(\theta_L, \theta_R)) \geq \overline{S}$.

The proof of this proposition is sketched in the text and is therefore omitted.

D Proofs

Proof of Proposition 2. Under $(\theta_L^{NI}, \theta_R^{NI})$, it follows from the definition of (5) and the fact that the payoff from policy l increases in θ that it is optimal for party L to choose r when $\theta < \theta_L^{NI}$ and l when $\theta \in [\theta_L^{NI}, \theta_R^{NI})$. Recall that voters believe $\tilde{\theta} = b_m$ when $(y_L, y_R) = (r, l)$. Hence, when $\theta \geq \theta_R^{FL}$, party L's probability of election is 0.5 regardless of whether it chooses l or r. Since party L prefers l to r when $\theta \geq \theta_R^{FL}$, it is optimal to choose l. Thus, $(\theta_L^{NI}, \theta_R^{NI})$ is an equilibrium.

In any equilibrium the parties' cut-points must satisfy (5) and (6). Define $\psi(z) \equiv \rho_L(\rho_R(z))$. The equilibrium cut-point θ_L^{NI} is given by the fixed point of ψ. Since ρ_L and ρ_R are decreasing in z, ψ is increasing in z. By assumption,

$$\psi(0) = \rho_L(\rho_R(0)) > \rho_L(1) > 0.$$

Furthermore,

$$\psi(\theta_R^{FI}) = \rho_L(\rho_R(\theta_R^{FI})) = \rho_L(\theta_R^{FI}) < \theta_R^{FI}.$$

Since ψ is continuous, there exists some $x^* \in (0, \theta_R^{FI})$ such that $x^* = \psi(x^*)$. Furthermore, since both ρ_L and ρ_R have a slope less than one in absolute value, we have $\psi' < 1$, which establishes that equilibrium is unique. ■

Proof of Proposition 3. Let there be a newspaper with editorial position $\theta_1 < \theta_L^{NI}$. If this newspaper is effective, we must have $\theta_1 \geq \theta_L$.

Consider first the case $\theta_1 > \theta_L$. Since $\rho_L(\theta_1) > \theta_L^{NI} > \theta_L$, party L strictly prefers policy r to policy l in state θ_L, and this cannot be an equilibrium.

Consider next the case $\theta_1 = \theta_L$. Since the function $\rho_L(\rho_R(x))$ has a slope less than one, and since $\theta_1 < \theta_L^{NI} = \rho_L(\rho_R(\theta_L^{NI}))$, we obtain $\rho_L(\rho_R(\theta_1)) > \theta_1$. Now, if $\theta_2 \leq \rho_R(\theta_1)$, then $\rho_L(\theta_2) > \theta_1$. This in turn implies that party L strictly prefers policy r to l in states slightly greater than θ_1. So $\theta_L = \theta_1$ cannot be an equilibrium if $\theta_2 \leq \rho_R(\theta_1)$.

Suppose $\theta_2 > \rho_R(\theta_1)$. Since this condition implies that $\theta_2 > \theta_R^{NI}$, the previous argument applied to party R establishes that newspaper 2 can be effective in equilibrium only if $\theta_1 < \rho_L(\theta_2)$. But then party L has an incentive to choose r in states slightly greater than θ_1. So this cannot be an equilibrium either. ■

Proof of Proposition 6. Conditions 1 to 3 have already been established in the text. We only prove the monotonicity result.

Consider first the case in which newspaper 1 is moderate. Let $W^*(\theta_1, \theta_2) \equiv W(\boldsymbol{\theta}, \boldsymbol{\delta}(\boldsymbol{\theta}); b_{ave})$. The partial derivative $W_1^* \equiv \partial W^*/\partial\theta_1$ is simply the sum of (7) and (8). Differentiate W_1^* respect to β_L, we get

$$\begin{aligned} \frac{\partial W_1^*}{\partial \beta_L} &= 0.5\left(1+\frac{\partial\theta_L^*}{\partial\theta_1}\right)\pi'(\delta_L)(\theta_1-\theta_L)\frac{\partial\theta_L^*}{\partial\beta_L} - 2\pi(\delta_L)\frac{\partial\theta_L^*}{\partial\theta_1}\frac{\partial\theta_L^*}{\partial\beta_L} \\ &\quad +2\left[\pi(\delta_L)(b_{ave}-\theta_L) - \int_{\delta_L}^{0}\delta\, d\pi(\delta)\right]\frac{\partial}{\partial\beta_L}\left(\frac{\partial\theta_L^*}{\partial\theta_1}\right). \end{aligned}$$

The first term in this expression is positive, since $\partial\theta_L^*/\partial\theta_1 > -1$ and $\partial\theta_L^*/\partial\beta_L > 0$. The second term is positive, because $\partial\theta_L^*/\partial\theta_1 < 0$. Finally, in an interior solution,

$$\frac{\partial\theta_L^*}{\partial\theta_1} = -\frac{0.5d\pi'(\delta_L)/\pi(\delta_L)}{0.5d\pi'(\delta_L)/\pi(\delta_L)+2\pi(\delta_L)}.$$

As β_L increases, δ_L rises and so the term $\partial\theta_L^*/\partial\theta_1$ increases when π is log-concave. Hence, the third term is also positive. We thus obtain $\partial W_1^*/\partial\beta_L > 0$. Moreover, it is easy to see that $\partial W_2^*/\partial\beta_L = 0$, since both the direct effect (7) and the policy effect (9) of θ_2 are independent of β_L. In vector notation, if we let the column vector $\mathbf{h}_L = (\partial W_1^*/\partial\beta_L, \partial W_2^*/\partial\beta_L)'$, then $\mathbf{h}_L \geq \mathbf{0}$.

Differentiate W_1^* with respect to θ_2, the cross partial derivative W_{12}^* is given by:

$$W_{12}^* = 0.5\pi'(\delta_2)(\theta_2-\theta_1) > 0.$$

Since the off-diagonal elements of the Hessian matrix of W^* are non-negative, the Hessian matrix must be negative semi-definite at an interior solution. It then follows that the inverse of the Hessian matrix, denoted $\mathbf{H}^{-1}$, is totally negative (e.g., Takayama, 1985, Theorem 4.D.3). By the implicit function theorem, we obtain

$$(\partial\theta_1^*/\partial\beta_L, \partial\theta_2^*/\partial\beta_L)' = -\mathbf{H}^{-1}\mathbf{h}_L > \mathbf{0}.$$

Next, consider the case in which newspaper 1 is leftist. Since $\partial\theta_L^{FI}/\partial\beta_L > 0$, θ_1^* must increase when β_L increases. Moreover,

$$\frac{\partial\theta_2^*}{\partial\beta_L} = \frac{\partial\theta_2^*}{\partial\theta_1} = -{W_{22}^*}^{-1}W_{12}^* > 0.$$

Similar reasoning establishes that $\partial\theta_k^*/\partial\beta_R > 0$ for $k = 1, 2$. ■

Proof of Proposition 7. In an interior equilibrium, the readership-maximizing editorial position θ_1^m must satisfy the first-order condition (15), and the cut-points θ_L and θ_R must be the best responses to θ_1^m. We therefore require

$$f^*(0.5(\theta_1^m + \rho_R(\theta_1^m))) - f^*(0.5(\theta_1^m + \rho_L(\theta_1^m))) = 0. \tag{23}$$

Given conditions (16) and (17), the intermediate value theorem ensures that a solution $\theta_1^m \in (\theta_L^{FI}, \theta_R^{FI})$ to equation (23) exists. Note that $0 > \rho_i'(\theta_1) > -1$ for $i = L, R$. Hence,

$0.5(\theta_1 + \rho_R(\theta_1))$ and $0.5(\theta_1 + \rho_L(\theta_1))$ are both increasing in θ_1. Since f^* is single-peaked, $f^*(0.5(\theta_1 + \rho_R(\theta_1))) - f^*(0.5(\theta_1 + \rho_L(\theta_1))) < 0$ for all $\theta_1 > \theta_1^m$ and $f^*(0.5(\theta_1 + \rho_R(\theta_1))) - f^*(0.5(\theta_1 + \rho_L(\theta_1))) > 0$ for all $\theta_1 < \theta_1^m$. The interior equilibrium is unique.

Moreover, $f^*(\theta_L^{FI}) < f^*(0.5(\theta_L^{FI} + \rho_R(\theta_L^{FI})))$ implies $f^*(\theta_1) < f^*(0.5(\theta_1 + \rho_R(\theta_1)))$ for all $\theta_1 \in [\theta_L^{NI}, \theta_L^{FI}]$. Hence, there is no equilibrium in which $\theta_1 = \theta_L$ when conditions (16) and (17) hold. Similar reasoning suggests that there is no equilibrium in which $\theta_1 = \theta_R$ either. ■

Proof of Proposition 8. First, suppose there is an equilibrium in which the two newspapers take different editorial positions, with $\theta_2 > \theta_1$. For newspaper 2 not to lower θ_2, we require

$$f^*(0.5(\theta_1 + \theta_2)) \leq f^*(0.5(\theta_2 + \theta_R)).$$

Since f^* is single-peaked, and since $\theta_L < \theta_2$, this inequality in turn implies

$$f^*(0.5(\theta_L + \theta_1)) < f^*(0.5(\theta_1 + \theta_2)).$$

Hence, newspaper 1 would want to deviate by choosing an editorial position to the right of θ_1. This argument establishes that $\theta_1 = \theta_2$ in any equilibrium.

Next, consider the equation

$$[F^*(0.5(\rho_R(\theta) + \theta)) - F^*(\theta)] = [F^*(\theta) - F^*(0.5(\theta + \rho_L(\theta)))]. \tag{24}$$

The intermediate value theorem ensures that a solution $\theta^d \in (\theta_L^{FI}, \theta_R^{FI})$ to (24) exists. At $\theta_2 = \theta^d$ and holding θ_1, θ_L and θ_R fixed, (19) and the single-peakedness of f^* imply that S_1 is increasing for $\theta_1 \in (\theta_L^{FI}, \theta^d)$ and is decreasing for $\theta_1 \in (\theta^d, \theta_R^{FI})$. Hence $\theta_1 = \theta_2 = \theta^d$ is indeed an equilibrium. Conversely, if (19) is violated, at least one newspaper could increase the size of its readership by unilaterally deviating from θ^d. Since there is no equilibrium with $\theta_1 \neq \theta_2$, this means that equilibrium does not exist when there is no θ^d that satisfies (19).

To show that equilibrium is unique, note that (19) implies

$$f^*(\theta^d) > \max\{0.5(1 + \rho_L'(\theta^d))f^*(0.5(\theta^d + \theta_L)), 0.5(1 + \rho_R'(\theta^d))f^*(\theta^d + \theta_R))\}. \tag{25}$$

This inequality implies that the left-hand-side of (24) is decreasing while the right-hand-side is increasing at θ^d. By the single-peakedness of f^*, both the left-hand-side and the right-hand-side of (24) are single-peaked. Thus there is only one solution to (24) which satisfies the requirement that left-hand-side is decreasing and the right-hand-side is increasing. ■

Proof of Proposition 9. Equilibrium in the monopoly case is characterized by equation (23). Differentiate this equation with respect to β_L, we get

$$\left((1 + \rho_R')f^{*\prime}_R - (1 + \rho_L')f^{*\prime}_L\right) \frac{\partial \theta_1^m}{\partial \beta_L} - f^{*\prime}_L \frac{\partial \theta_L^*}{\partial \beta_L} = 0,$$

where $f^{*\prime}_R$ denotes $f^{*\prime}(0.5(\theta_1 + \theta_R))$ and $f^{*\prime}_L$ denotes $f^{*\prime}(0.5(\theta_1 + \theta_L))$. Since f^* is single-peaked, equation (23) implies that $f^{*\prime}_R < 0$ and $f^{*\prime}_L > 0$. Furthermore, $\partial\theta_L^*/\partial\beta_L > 0$. Hence, we have $\partial\theta_1^m/\partial\beta_L < 0$.

In the duopoly case, equilibrium is characterized by equation (24). Differentiate this equation with respect to β_L, we obtain

$$\left[(0.5(1+\rho_R')f_R^* - f_d^*) - (f_d^* - 0.5(1+\rho_L')f_L^*)\right]\frac{\partial\theta^d}{\partial\beta_L} + 0.5 f_L^* \frac{\partial\theta_L^*}{\partial\beta_L} = 0,$$

where $f_R^* = f^*(0.5(\theta^d + \theta_R))$, $f_L^* = f^*(0.5(\theta^d + \theta_L))$, and $f_d^* = f^*(\theta^d)$. The term in brackets is negative by (25). Thus, $\partial\theta^d/\partial\beta_L > 0$. ■

Proof of Proposition 10. When $\beta_L + \beta_R = 1$, symmetry of f^* about 0.5 implies that $\theta^d = \theta_1^m = 0.5$. Therefore aggregate welfare is the same under duopoly and under monopoly.

Suppose $\beta_L + \beta_R > 1$. Proposition 9 implies that $\theta^d > 0.5 > \theta_1^m$. We show that the function $W^*(\theta_1) = W(\boldsymbol{\theta}, \boldsymbol{\delta}(\boldsymbol{\theta}), b_{ave})$ is increasing in θ_1 for all $\theta_1 \in [\theta_1^m, \theta^d]$. The proof proceeds in several steps.

Step 1. Since f^* is symmetric about 0.5, equation (15) implies that $\delta_L + \delta_R = 0$ at $\theta_1 = \theta_1^m$. Since $\delta_L + \delta_R$ is increasing in θ_1, this in turn implies that $\delta_L + \delta_R \geq 0$ for all $\theta_1 \geq \theta_1^m$.

Step 2. Since f^* is symmetric and unimodal about 0.5, and since $\theta^d > 0.5$, equation (18) implies that $\theta_R - \theta_1 > \theta_1 - \theta_L$ at $\theta_1 = \theta^d$. Furthermore, since the left side of the inequality is decreasing in θ_1 while the right side of the inequality is increasing in θ_1, the inequality is true for all $\theta_1 \leq \theta^d$.

Step 3. The derivative of W^* with respect to θ_1 is the sum of the direct effect (7) and the policy effects (8) and (9). When π is a uniform distribution on $[-\overline{\delta}, \overline{\delta}]$ (with $\overline{\delta} > 0.5$), the direct effect (7) is equal to

$$\frac{1}{2\overline{\delta}}(\delta_R - \delta_L)(0.5(\theta_R + \theta_L) - \theta_1).$$

The last term in this expression is positive for all $\theta_1 \leq \theta^d$ by step 2 above. Hence, the direct effect of an increase in θ_1 is positive in the range $[\theta_1^m, \theta^d]$.

Step 4. Since the uniform distribution π is symmetric and log-concave, and since $\delta_L \geq -\delta_R$ by step 1, we have $\pi(\delta_L) > 1-\pi(\delta_R)$ and $\pi'(\delta_L)/\pi(\delta_L) < \pi'(\delta_R)/(1-\pi(\delta_R))$. Therefore, $\partial\theta_R/\partial\theta_1 < \partial\theta_L/\partial\theta_1$. This implies that the sum of the policy effects (8) and (9) is greater than

$$2\left[(1-\pi(\delta_R))(\theta_R - 0.5) - \pi(\delta_L)(0.5 - \theta_L) + \int_{\delta_L}^{\delta_R} \delta \, d\pi(\delta)\right]\left(-\frac{\partial\theta_R}{\partial\theta_1}\right). \tag{26}$$

If the expression in brackets is positive, then both the direct effect and the policy effects are positive. We can conclude that $\partial W^*/\partial\theta_1 > 0$. When the expression in brackets is negative, since $\partial\theta_R/\partial\theta_1 > -1$, the expression in (26) must be greater than the bracketed term itself. Adding this bracketed term to the direct effect (7), the total effect of an increase in θ_1 is greater than

$$2\left[(\pi(\delta_R) - \pi(\delta_L))(0.5 - \theta_1) + (1-\pi(\delta_R))(\theta_R - 0.5) - \pi(\delta_L)(0.5 - \theta_L)\right]. \tag{27}$$

If $\delta_L < 0$, (27) can be re-written as

$$2\left[(0.5 - \pi(\delta_L))(1-\theta_1) + \pi(\delta_L)\theta_L + 2\delta_R(1-\pi(\delta_R))\right],$$

which is positive since $\delta_L < 0$ implies $\pi(\delta_L) < 0.5$. If $\delta_L \geq 0$, (27) can be re-written as

$$2\left[(0.5 - (1 - \pi(\delta_R)))(1 - \theta_1) + (1 - \pi(\delta_R))\theta_R + 2\delta_L \pi(\delta_L)\right],$$

which is positive since $\delta_R > 0$ implies $1 - \pi(\delta_R) < 0.5$. Hence, regardless of the sign of the bracketed term in (26), $\partial W^*/\partial\theta_1 > 0$ for $\theta_1 \in [\theta_1^m, \theta^d]$.

The proof for the case $\beta_L + \beta_R < 1$ is analogous. ■

Proof of Proposition 11. When $\theta_L = \theta_1 \in [\theta_L^{NI}, \theta_L^{FI}]$, total readership is reduced by either a rightward move or a leftward move in editorial position (recall that readership of newspaper 1 is zero if $\theta_1 < \theta_L$). Hence total readership is maximized by setting $\theta_1 = \theta_L$. Conversely, when $\theta_L < \theta_1$, total readership can be increased by lowering θ_1. So there is no equilibrium in which $\theta_L < \theta_1$. ■

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