Mass Media Competition, Political Competition, and Public Policy

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Abstract

If better informed voters receive favorable policies, then mass media will affect policy because mass media provide most of the information people use in voting. This paper models the incentives of the media to deliver news to different groups. The increasing-returns-to-scale technology and advertising financing of media firms induce them to provide more news to large groups, such as tax payers and dispersed consumer interests, and groups that are valuable to advertisers. This news bias alters the trade-off in political competition and therefore introduces a bias in public policy. The paper also discusses the effects of broadcast media replacing newspapers as the main information source about politics. The model predicts that this change should raise spending on government programs used by poor and rural voters.

1. Introduction and summary

If politicians bias government policies in favor of informed voters, then mass media will influence public policy. This is because the media play a unique role in transmitting information to mass audiences and supply most of the information people use in voting. For instance, when a survey organization asked a cross section of American voters what their principal source of information in the 1996 presidential election was, 72 percent answered "television" and 60 percent said "newspapers"[1]. Further, mass media are not neutral devices that distribute information uniformly to all. Each of the large mass media (radio, TV, newspapers) has its own cost and revenue structure that affects how much news it provides to different groups.

To study the effects of mass media on policy, this paper combines a model of mass-media competition with a model of political competition. In this hybrid model, the distribution of informed and uninformed voters arises endogenously through the deliberate and purposeful actions of mass media, voters and politicians. Some common features of the mass media are found to have important political consequences.

One feature is that mass media operate under increasing-returns-to-scale. For example, once a TV program has been produced, the extra cost of an additional viewer is quite small. For a newspaper, the cost of producing the first newspaper is high. But once this fixed cost has been borne, the variable cost of selling additional newspapers is just the cost of printing and delivering[2]. This feature induces profit motivated media to cover issues that concern large groups, while minority groups and special interests will often be neglected.

If this was the only aspect of news reporting, media would never report on, say, operas whose audiences constitute a very small share of the population. Yet clearly they do. One reason for this may be that the main revenue for both newspapers and TV stations is advertising. Estimates vary, but advertising revenues normally comprise between 60 and 80 percent of total revenues for US newspapers and even more for TV broadcasts[3]. For advertisers, not only the size but also the

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[1]Princeton Survey Research Associates (1996). The answers sums to more than 100%, due to multiple responses.

[2]For the cost structure of newspapers see Rosse (1970) and Litman (1988).

[3]See for example U.S. Department of Commerce, "1987 Census of Manufactures" or Dunnett

characteristics of the audience are important. To quote Otis Chandler, the late owner of the Los Angeles Times, "The target audience of the Times is ... in the middle class and ... the upper class ... We are not trying to get mass circulation, but quality circulation."[4] In a frequently cited case from American TV, the show Gunsmoke was cancelled despite its high ratings. The show's audience was apparently too old and too rural to be worth much to advertisers[5]. Consistent with these anecdotes, the model predicts that in mass media competition, groups for whom advertisers pay more get more attention.

In the model, media affect public policy since they provide the channel through which politicians convey campaign promises to the electorate. As media coverage of different issues changes, the efficiency with which politicians can reach different groups with campaign promises also changes. If a party promises to raise spending in that area that receives very little news coverage, only a small fraction of the voters who would benefit learns about it. As such a spending promise will not win many votes for the party, this area attracts little spending.

The mass media's news bias thus translates into a policy bias: large groups, and groups valuable to advertisers receive favorable policies.

In the model, mass media also boost unexpected increases in spending and moderate unexpected cut-backs. Unexpected increases or decreases in spending draw the attention of the press, thereby making increases in spending more politically profitable and decreases more costly.

I also explore some possible effects of the decline of newspapers, and the rise of broadcast media. The emergence of broadcast media increased the proportion of rural and low-education media consumers as it became less expensive to distribute radio-waves than newspapers to remote areas, and as these groups preferred audible and visual entertainment and information to reading. As politicians could reach rural, and low-education voters more efficiently, the model predicts an expansion in programs that benefit these voters.

The model of political competition in this paper builds on that of Lindbeck and Weibull (1987). Grossman and Helpman (1996) use a similar framework to analyze the effects of lobby contributions which may affect the uninformed voters. In their model, as well as in Baron (1994), voters are exogenously informed. In contrast, voters are endogenously informed in the model of Lohmann (1998), which uses a principal-agent framework to analyze political competition with costly information

(1988) and Dunnett (1990).

[4]Bagdikian, "The Media Monopoly", p. 116.

[5]See Barnouw, "The Sponsor", p. 73.

gathering by individual voters. None of these models include mass media. Models of media firms are instead found in the industrial organization literature. Steiner (1952) and Spence and Owen (1977), for example, discuss the programming choices of broadcast media, while Masson, Mudambi and Reynolds (1990) discuss the relationship between concentration and advertising rates, and Anderson and Coate (2000) discuss the levels of advertising in broadcast industries. The model of media competition developed in this paper is quite different from those models.

Last, but not least, an empirical political science literature has studied the effects of mass media on politics. The classic study in this field, Lazarsfeld, Berelson and Gaudet (1944), and a number of sequels, found that mass media had only minimal effects in persuading voters to change their votes. The model of this paper is also consistent with this finding; the simultaneous responses of political parties to media coverage may keep voting intentions and public opinion relatively constant, while policies change considerably. Another finding of Lazarsfeld et al., consistent with the assumptions of the model, was that people using mass media perceived the candidates' stands more accurately. This finding has been confirmed by a number of studies; see for example Delli Carpini and Keeter (1996), and Bartels (1988).

The structure of the paper is as follows. In Section 2, the basic model is developed, first for the media market, and then for the political market. Section 3 collects a number of extensions to the basic model. Subsection 3.1 allows news coverage to respond to specific campaign promises. Subsection 3.2 endogenizes prices in the subscription and advertising markets, as well as the total government budget. Finally, subsection 3.3 analyzes the expansion of broadcast media. Section 4 discusses further empirical implications of the model and concludes.

2. The Basic Model

The structure of the model is the following. Two parties, L and R, compete for votes by making binding announcements of the amount z_s that they plan to spend on each of a number $S > 2$ government programs, indexed by s. There are n_s voters in group s who benefit from program s. Each voter benefits from exactly one program, so the total number of voters is $\sum n_s = N$. The total budget is fixed at I, and the set of feasible per capita spending levels is $X = \left\{ z \in \Re_+^S : \sum n_s z_s \leq I \right\}$.

The parties' announcements are covered by two newspapers,[6] A and B. These

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[6] For the purpose of the main points of this section, the cost and revenue structure of TV and

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newspapers compete for readers by allocating quantities of space, q^A and q^B, to news on the S announced platform spending levels. The set of feasible news profiles for newspaper A is $Q = \left\{ q^A \in \Re_+^S \right\}$, and similarly for newspaper B.

The N voters are identical to the N newspaper readers. The voters buy newspaper A or newspaper B; every voter buys exactly one newspaper. Voters read the newspapers and change their expectations of how much the parties will spend. Each of them votes for party L or party R; there is no abstention. Finally, the winning party implements its platform.

2.1. Media Competition

Why do voters value news about political platforms? Voters use this information when voting, but the probability that any voter is pivotal in the election is extremely small, and it seems unlikely that the benefit of making a more informed choice in the election could justify the cost of buying and reading a newspaper during an election campaign. In this paper, it is assumed that the readers use the news they receive from the media to decide on a private action which affects the value of the government program. More precise news about future policies makes it more probable that the reader will take the right private action. For example, early news about changes in agricultural subsidies help farmers produce the right crops to realize the full value of these subsidies.

The voters can only realize the full value of the government programs if they know the value of z_s in advance. Voters who know the value of z_s with certainty before the election receive utility

$$u_i \left(z_s \right) = \theta_i u \left(z_s \right) \tag{2.1}$$

from the program, whereas uninformed voters receive utility

$$u_i \left(z_s \right) = \theta_i u \left(z_s \right) - v_s. \tag{2.2}$$

To keep this basic model simple, the utility loss v_s is treated as exogenous. In Section 3.1, an endogenous utility loss $v_s = v_s \left(z_s, a \right)$ will explicitly depend on the private action a, and on z_s. The parameter θ_i captures that the program may be intrinsically be more valuable to some individuals.

Assume that all voters who use program s will read any article they find about z_s, while voters who do not use program s do not read articles about z_s. The

radio are similar in the relevant aspects, and all mass media will be referred to as newspapers.

probability that a reader will spot some news in the newspaper, ρ, is increasing in the space allocated to this news in the newspaper, but at a decreasing rate: $\rho'(q_s) > 0$, $\rho''(q_s) < 0$. Empirical findings support these assumptions.[7] Denote the expected utility from a newspaper with newsprofile q to a reader in group s, $w_s(q_s) = \rho(q_s) v_s$, we thus have $w_s'(q_s) > 0$ and $w_s''(q_s) < 0$.

A reader's valuation of a newspaper also depends on other news, and some characteristics that the newspapers cannot change by assumption. Other news are left out of the analysis[8]. The fixed characteristics include, for example, the paper's editorial stance, and the name and logotype of the newspaper. Voter i's valuation of these aspects is captured by the parameters a_i and b_i. The news profiles of newspaper A and B give utility $w_s(q_s^A) + a_i$ and $w_s(q_s^B) + b_i$ respectively to voter i using program s. This voter buys newspaper A if

$$\Delta w_s = w_s(q_s^A) - w_s(q_s^B) \geq b_i - a_i$$

and newspaper B otherwise (everyone buys some newspaper.) The newspapers assign a probability distribution $G_s(\cdot)$, with density $g_s(\cdot)$, to the difference $b_i - a_i$. The probability the newspapers attach to individual i reading newspaper A is $G_s(\Delta w_s)$.

Having specified the demand for newspapers, I now turn to their costs. The newspapers have the same cost functions. Newspapers A's expected-cost function, C, is assumed to be of the following linear form:

$$C(q^A, q^B) = \underbrace{c_q \sum_s q_s^A}_{\text{first copy costs}} + \underbrace{\sum_s n_s G_s[\Delta w_s] c_s,}_{\text{reproduction and distribution costs}}$$

where c_q is the cost of producing one unit of news space, and c_s is the average cost of reproducing and delivering a newspaper to readers in group s. The above cost categories were suggested by Rosse and Dertouzos (1979). The cost function is consistent with their finding of roughly constant long run marginal costs in printing and delivering newspapers.

The newspapers maximize expected profits. Let p_s be the marginal profit increase from selling an additional newspaper to a person in group s. This includes

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[7]See, for example, Cahners Publishing Company, "How Advertising Readership Is Influenced by Ad Size", Cahners Advertising Research Report, no. 110.1.

[8]If voters' utility from other news is additively separable from news on election platforms, then equation (2.5) below would still characterize the allocation of the subset of news on election platforms.

the price of the newspaper plus the price per reader in group s paid by advertisers, minus the average cost of reproducing and delivering a newspaper to a person in group s.[9] The expected profit of newspaper A is

$$E\left[\pi^A\right] = \sum p_s n_s G_s \left[\Delta w_s\right] - c_q \sum q_s^A. \tag{2.3}$$

A Nash Equilibrium in the competition between the two newspapers is characterized by $E[\pi^A \mid q^A, q^{B*}] \leq E[\pi^A \mid q^{A*}, q^{B*}]$ and $E[\pi^B \mid q^{A*}, q^B] \leq E[\pi^B \mid q^{A*}, q^{B*}]$, for all $q^A \in Q$, $q^B \in Q$. Assume that $w_s'(0)$ is sufficiently large so that the solution to one newspaper's maximization problem, given the other newspaper's news profile, is always interior. Given the conditions for concavity of the profit function specified in Appendix 5.1, the best-reply function of newspaper A is described by

$$n_s p_s g_s \left[\Delta w_s\right] w_s'\left(q_s^A\right) = c_q \tag{2.4}$$

for all s. The corresponding condition for newspaper B is:

$$n_s p_s g_s \left[\Delta w_s\right] w_s'\left(q_s^B\right) = c_q.$$

Thus the ratios,

$$\frac{w_s'\left(q_s^A\right)}{w_s'\left(q_s^B\right)} = 1$$

are equal for all s. This implies that both newspapers must set the same news profiles, i.e. $q^A = q^B$.[10]

Proof of the uniqueness and existence of equilibrium is given in Appendix 5.1. For simplicity, assume that $g_s[0] = 1$ for all groups s. Note that $w_s'(q_s) = v_s \rho'(q_s)$. We have proved the following:

Proposition 1. *A pair of strategies $\left(q^A, q^B\right)$ that constitute a NE in the game of maximizing expected profits must satisfy $q^A = q^B$, and for all s*

$$n_s p_s v_s \rho'\left(q_s^*\right) = c_q. \tag{2.5}$$

Equation (2.5) implicitly defines equilibrium news coverage: $q_s^* = q^*\left(n_s, p_s, v_s, c_q\right)$. Newspapers will have more extensive coverage of issues concerning large groups, groups more valuable to advertisers, and groups with a high private value of news.

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[9]An explicit expression for p_s is derived in section 3.2, describing the price setting of newspapers in the subscription and advertising markets.

[10]One might think that allowing for price competition would force the newspapers to choose different news profiles, $q^A \neq q^B$, in order to avoid Bertrand competition. However, the newspapers are exogenously differentiated and Bertrand competition can never occur. Section 3.2 endogenizes prices and makes this point explicit. See also de Palma et al. (1985).

2.2. Political competition

An individual i derives utility $u_i(z_s^L) + l_i$ and $u_i(z_s^R) + r_i$ from the implemented platforms of parties L and R, respectively. As in Lindbeck & Weibull (1987), l_i and r_i describe preferences for other fixed policies or personal characteristics of the candidates.

Each voter i is uncertain about how useful the publicly provided services are to the other voters, that is, the parameters θ_j, $j \neq i$, see equation (2.1). They know the continuous distribution from which these parameters are drawn, but not the realized values. This makes the voters unable to solve for the unique political equilibrium spending levels, which makes information about these spending levels potentially valuable. Any other or additional uncertainty on the part of the voters could play the same role. Voter i votes for party L if

$$\Delta u_i = E_i \left[u_i \left(z_s^L \right) - u_i \left(z_s^R \right) \right] \geq r_i - l_i, \qquad (2.6)$$

and for party R otherwise (no abstentions.) For voters who have been informed about the parties' campaign promises, $\Delta u_i = u_i(z_s^L) - u_i(z_s^R)$, that is, the difference between the actual platforms of the parties. For uninformed voters, $\Delta u_i = E[u_i(z_s^L) - u_s(z_s^R)] = \overline{\Delta u_i}$ is a constant, independent of any announcements the parties might make during the election campaign.

The parties maximize expected votes[11]. They assign a probability distribution F_s to the difference $r_i - l_i$. The probability that individual i votes for party L is then $F_s[\Delta u_i]$. The expected number of votes for party L is

$$E\left[n^L\right] = \sum_i \rho_s F_s \left[\Delta u_i \right] + (1 - \rho_s) F_s \left[\overline{\Delta u_i} \right].$$

The expected outcome is a function of the parties' proposed spending allocations. A Nash equilibrium is characterized by $E\left[n^L \mid z^L, z^{R*}\right] \leq E\left[n^L \mid z^{L*}, z^{R*}\right] \leq E\left[n^L \mid z^{L*}, z^R\right]$ for all $z^L \in X$, $z^R \in X$.

Assume that $u_i'(0)$ is sufficiently large so that the solution to one party's maximization problem given the other party's platform is always interior. Given the conditions for concavity of the profit function specified in Appendix 5.1, the best reply functions of party L are described by

$$\rho_s n_s f_s \left[\Delta u_s \right] u_s' \left(z_s^L \right) = \lambda^L n_s, \qquad (2.7)$$

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[11] The equation charaterizing equilibrium spending when parties maximize the probability of re-election will be the same in all aspects relevant to this paper; see Lindbeck and Weibull (1987).

where $u'_s\left(z_s^L\right)$ is the average marginal utility in group s, for all s and some $\lambda^L > 0$. The corresponding equation for party R is ($\lambda^R > 0$):

$$\rho_s n_s f_s\left[\Delta u_s\right] u'_s\left(z_s^R\right) = \lambda^R n_s. \tag{2.8}$$

Thus, the ratios

$$\frac{u'_s\left(z_s^L\right)}{u'_s\left(z_s^R\right)} = \frac{\lambda^L}{\lambda^R} \tag{2.9}$$

are equal for all s in equilibrium. This, together with the budget constraint, implies that both parties will set the same platform, i.e. $z^L = z^R$. Proof of uniqueness and existence of equilibrium is given in Appendix 5.1. For expositional simplicity, assume that $f_s\left[0\right] = 1$. We have thus proved the following:

Proposition 2. *A pair of strategies for the parties $\left(z^L, z^R\right)$ that constitute a NE in the game of maximizing expected votes must satisfy $z^L = z^R = z^*$, and for all s and for some $\lambda > 0$,*

$$n_s\rho\left(q_s^*\right) u'_s\left(z_s^*\right) = n_s\lambda. \tag{2.10}$$

Note that the equilibrium spending levels equate marginal utilities weighted by the share of voters in the group who find the news on election platforms, $\rho(q_{s_1}^*)u'_{s_1}(z_{s_1}^*) = \rho(q_{s_2}^*)u'_{s_2}(z_{s_2}^*)$, for all groups s_1, s_2. Further, voters without information understand that in all equilibria, both parties will choose the same spending level, although they do not know exactly what that level is. Therefore, party L receives a share $F_s\left[0\right]$ of the votes also from voters who have not been informed by the newspapers about z_s.

Corollary 1. *Equilibrium spending on program s, z_s^*, is increasing in news coverage, q_s^*, the size of the group, n_s, the revenue per reader in the group, p_s, and the private value of news, v_s.*

Proof: An increase in news coverage to group s' will increase the share of readers who find news about the platform spending levels, $\rho\left(q_{s'}^*\right)$. Equation (2.10) states that $\rho\left(q_{s'}^*\right) u'_{s'}\left(z_{s'}^*\right) = \rho\left(q_s^*\right) u'_s\left(z_s^*\right)$ for all s. In order to satisfy these equalities and the budget constraint, an increase in $\rho\left(q_{s'}^*\right)$ must be coupled with an increase in $z_{s'}^*$, pushing down $u'_{s'}\left(z_{s'}^*\right)$, and a decrease in z_s^* for all $s \neq s'$.

The size of the group, n_s, and the revenue per reader, p_s, only affect spending via the media market. Equilibrium spending, z_s^*, is increasing in n_s and p_s, and

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v_s, since, z_s^*, is increasing in news coverage, q_s^*, which in turn is increasing in n_s, p_s, and v_s.

The intuition for the above corollary is simple. Because of increasing returns to scale and advertising finance, newspapers will provide more news to large groups and groups who are valuable to advertisers. Additional news coverage of campaign promises on an issue makes more voters aware of them. In equilibrium, the increased sensitivity of voters to spending promises attracts more spending.

To illustrate the bias in spending induced by mass media, consider the following simple example. Let $u_i(z_s) = \theta_i \ln(z_s)$. The equilibrium condition, equation (2.10), will then be $\theta_s \rho_s / z_s^* = \lambda$. For simplicity, we evaluate the equilibrium at the point where all groups s have equal preference for the programs, $\theta_s = \theta$. Let $\bar{\rho}$ be the mean of the ρ_s. Using the budget constraint, the solution for z^* is

$$z_s^* = \frac{\rho_s}{\bar{\rho}} \frac{I}{S}.$$

In contrast, a Social Planner maximizing the sum of utilities would choose the same allocation as the political equilibrium with full information, $\rho_s = 1$, for all groups s. In this case, all groups will receive an equal share $z_s^f = \frac{I}{S}$ of the budget. The bias introduced by mass media is

$$z_s^* - z_s^f = \left(\frac{\rho\left(q_s^*\left(n_s, p_s, v_s\right)\right)}{\bar{\rho}} - 1 \right) \frac{I}{S}.$$

Policies will be biased in favor of groups who are better informed than average. Since media's news coverage is increasing in n_s, p_s, and v_s, groups that are larger than average, that are valued by advertisers, and that have larger private value of information than average will benefit politically from mass media provision of news.

2.3. Discussion

The model shows in detail how this bias arises. Comparing equation (2.10) with equation (2.5), it is clear how newspaper competition differs from political competition. In the political competition, there is no bias towards large groups. On the one hand, politicians want to attract larger groups because there are more votes to gain on the margin. This is seen in equation (2.10), as the expression on the left-hand side includes the size of the groups. On the other hand, since voters

care about spending per person (private services) it is more costly to augment the utility of members of large groups. This is seen on the right-hand side, as the cost of raising per-capita expenditures increases with n_s. The newspaper market is different in this respect, since there are increasing returns to news production. Newspapers want to attract the largest group because there are more copies to be sold on the margin. This is seen in equation (2.5), as the expression on the left hand side includes the size of the groups. However, it is equally costly to devote news space to issues concerning large and small groups. This is seen on the right-hand side, which is independent of n_s. Thus, unlike in political competition, there is a bias towards large groups in the newspaper market. This media bias will translate into a bias in the political outcome. Since the readers, newspapers and advertisers do not consider effects on political allocations, the effects via n_s and p_s, and v_s are externalities from the consumption and production of news. The empirical implications of these biases are discussed in Section 4.

In the light of the model, the alleged importance of mass media in politics can be reconciled with the findings of minimal effects of mass media on voting behavior. In search of media effects on politics, researchers have studied the effects of media coverage on voting intentions and public opinion. As mentioned earlier, the evidence of an impact on these variables is mixed. However, an implication of the model in this paper is that media may have a major effect on policy without changing either public opinion or voting behavior *in equilibrium*. The reason is that politicians respond at the same time and in a similar way to changes in media coverage, keeping voting intentions constant.

In order to show the main points in a clear way, the basic model was kept as simple as possible. Section 3 removes some of the more troublesome simplifications as news coverage independent of the platform announcements and exogenous prices in subscription and advertising markets. I now discuss some of the other assumptions of the basic model.

The assumption that the program provides a private good is not essential for the media-induced political bias towards large groups. To see this, suppose that the S services are non-rival although still excludable so that they only benefit members of each group. The equation describing the political equilibrium, equation (2.10), then takes the form $\rho_s n_s u_s'(z_s^*) = \lambda$. The full information (Social Planner) equilibrium is characterized by $n_s u_s'(z_s^*) = \lambda$, in accordance with the usual condition for efficient supply of a public good. Since ρ_s is increasing in n_s, the mass media equilibrium will again allocate more to large groups than under full information, thus introducing a bias to large groups.

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The bias against small groups persists, even with special-interest newspapers writing only about one specific issue. As all papers face the fixed cost of gathering news and producing the first copy of the paper, average costs decline with the number of copies sold. Small special-interest newspapers will not be able to spread this cost over as many copies as special-interest newspapers catering to larger groups. They will therefore spend less resources on news gathering.

In the basic model, only those informed of z_s can avoid the cost v_s and the value of news is thus v_s. Perhaps the benefit from a government program instead increases continuously as the voters become better informed. With a quadratic function $v_s(z_s, a)$, spending is still increasing in n_s and p_s.[12] A new feature is that politicians should spend more money on programs where the spending levels are very uncertain. This bias could, for example, work in favor of newly started programs. These programs receive a lot of news coverage because people are uncertain about what the new policies will actually look like, leading to higher equilibrium spending.

Another strong assumption of the model is that parties faithfully implement

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[12] Let $v_s(z_s, a) = (z_s - a)^2$, in equation (2.1). The optimal action for the uninformed is to set $a = \overline{z}_s = E[z_s]$, while the informed set $a = z_s$. Therefore, the value of news is

$$v_s = E(\overline{z} - z_s)^2.$$

Let $\rho(q_s) = 4q_s^{\frac{1}{4}}$, $c_q = 4^3$, and $u_i(z_s) = \theta_i \ln(z_s)$. Further assume that there is a special group j of voters who are always well informed and who have constant marginal utility of services: $\rho_j = 1$, and $u'_j(.) = 1$. This implies that the gains and losses of other groups will be in relation to this reference group. Then, the equilibrium in the political markets, equation (2.10), becomes

$$z_s = (n_s v_s p_s)^{\frac{1}{3}} \theta_s.$$

In a rational expectations equilibrium,

$$v_s = E(\overline{z} - z_s)^2 = (n_s v_s p_s)^{\frac{2}{3}} \sigma_{\theta_s}^2,$$

where $\sigma_{\theta_s}^2$ is the variance of θ_s. Solving for v_s and inserting in the above expression for z_s yields

$$z_s = n_s p_s \sigma_{\theta_s}^2 \theta_s,$$

it is assumed that $n_s p_s \sigma_{\theta_s}^2 < 1$. Spending is increasing in the variance in the demand for a program. For example, media would induce politicians to fight famines efficiently, but to ignore endemic hunger. This particular case has been argued by Drèze and Sen (1982), who finds that India (with a free media) has avoided famines, but not endemic hunger, more successfully than China (without a free media).

their campaign platforms. But it receives some support from empirical studies which find that parties typically implement around 70 to 80 percent of their explicit election promises; see Rose (1984), and Budge et al. (1987). One may still be uncomfortable with election platform models. However, all of the above points are also valid in a world where voters evaluate parties by their past performances in office. Mass media still matter because they inform voters about who is responsible for making cuts or increases in government programs. Voters with this information can better hold politicians accountable, which increases the politicians' incentives to deliver favorable policies to these voters; see Strömberg (1999).

The model's prediction that competing media will select the same news profile may seem at odds with casual observations. However, this result is a stylized fact in empirical studies of media content. For example, McCombs (1981) found that "a detailed content analysis of competing dailies in 23 US. cities found no statistically significant differences between 'leaders' and 'trailers' across the 22 content categories compared"; see also Graber (1997).

3. Extensions of the Model

This section collects a number of extensions of the basic model. First, I allow news coverage to respond to specific campaign promises. Then, I endogenize newspaper and advertisement prices, as well as the size of the government budget. Finally, I use the model to discuss effects of the increasing role of broadcast media.

3.1. News coverage that responds to campaign promises

In the model of Section 2, people choose the newspaper which has an average choice of topics they like. This section instead models a situation where voters learn over time how good a newspaper is at writing about the topics which are important for the day. This makes news coverage respond to campaign promises.

Formally, the newspapers' set of feasible news strategies now consists of the set of all vector valued functions $q : X \times X \to \Re_+^S$ which specify how much space they would allocate to news about each issue s, given any platform announcements z^L, z^R. Voters choose their newspaper on basis of how the newspapers say they will cover different campaign promises. The timing of the game is as in the basic model: parties choose platforms; newspapers select news coverage strategies; voters choose newspapers, take action a, and then vote; the winning party

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implements its platform.

In order to determine the voters demand for newspapers, the value of news must first be determined. The benefit from a program is now assumed to depend continuously on a, as $v_s = v_s(z_s, a) = (z_s - a)^2$, in equation (2.2). The optimal action, a, is then equal to the expected value of z_s which is denoted $\overline{z}_s^i$ for the informed voters and $\overline{z}_s^u$ for the uninformed. The value of knowing the election platforms is thus

$$v_s\left(z_s^L, z_s^R\right) = E\left[(\overline{z}_s^u - z_s)^2 - (\overline{z}_s^i - z_s)^2\right],$$

where the expectation is taken over election outcomes. In a symmetric equilibrium, $z_s^L = z_s^R = \overline{z}_s^i = z_s$, and

$$v_s(z_s) = (\overline{z}_s^u - z_s)^2.$$

The value of news is higher the further actual campaign promises are from those expected.[13] Voter i buys newspaper A if his expected utility from reading newspaper A is higher than the utility from reading newspaper B, that is if

$$\Delta w_s = E_{z^L, z^R}\left[\rho\left(q_s^A\right) v_s - \rho\left(q_s^B\right) v_s\right] \geq b_i - a_i$$

and newspaper B otherwise. The value of news, v_s, as well as news coverage, q_s^A and q_s^B, depend on the election promises, z^L, z^R, but this has been suppressed in the notation. A voter chooses newspaper A with probability $G_s[\Delta w_s]$.

Given the demand for newspapers, newspaper A selects a news coverage strategy $q^A\left(z^L, z^R\right)$ to maximize expected profits

$$E\left[\pi^A\right] = \sum p_s n_s G_s\left[\Delta w_s\right] - c_q q^A. \tag{3.1}$$

Given that the profit function is concave, the best reply function of newspaper A is described by

$$n_s p_s g_s\left[\Delta w_s\right] v_s\left(z_s^L, z_s^R\right) \rho'\left(q_s^A\left(z^L, z^R\right)\right) = c_q, \tag{3.2}$$

for all (s, z^L, z^R). Then there exists a unique solution to the above equations and the budget constraint. This solution is symmetric, $q_s^A(z^L, z^R) = q_s^B(z^L, z^R) =$

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[13]The form of $v_s(a, z_s)$ implies that the value of news is independent of the size of z_s. A voter who expects to receive \$100 but learns that he will in fact receive \$101, gains as much as a voter who expects to receive \$1 but learns that he will in fact receive \$2.

$q_s(z^L, z^R)$. To pin down strategies for campaign promises which have zero probability, the sequential equilibrium concept is used.[14] Assume again that $g_s[0] = 1$, then the equilibrium in the newspaper market is characterized by

$$n_s p_s v_s (z_s^*) \rho' (q_s^*) = c_q. \tag{3.3}$$

The parties select election platforms, anticipating how news coverage will depend on these platforms. Party L maximizes its expected number of votes:

$$E\left[n^L\right] = \sum_i \rho(q_s) F_i \left[\Delta u_i\right] + (1 - \rho(q_s)) F_i \left[\overline{\Delta u_i}\right].$$

The best reply functions for party L are described by

$$\rho_s n_s f_s \left[\Delta u_s^i\right] u_s' \left(z_s^L\right) + n_s \left(F_s \left[\Delta u_i\right] - F_s \left[\overline{\Delta u_i}\right]\right) \rho'(q_s) \frac{\partial q_s}{\partial z_s^L} = \lambda n_s \tag{3.4}$$

for all $s = \{1, 2, ..., S\}$.

As before, campaign promises can affect the election outcome by persuading informed voters to change their vote, which is described by the first term on the left hand side of the above equation. The new feature is that changing the campaign promises to program s also affects the amount of attention given to this issue by the press, as described by the second term on the left-hand side of the above equation. This, in turn, may have a separate effect on the election outcome if the informed voters in group s vote in a way that is systematically different from the uninformed voters in this group.

However, the symmetric equilibrium is still an equilibrium. Since all voters know that the equilibrium is symmetric, $\Delta u_i = \overline{\Delta u_i} = 0$, which implies that $F_s \left[\Delta u_i\right] - F_s \left[\overline{\Delta u_i}\right] = 0$. Therefore the second term in the above equation drops out. The intuition is that since voters are not systematically fooled, the informed and the uninformed on average vote the same. Therefore, making voters better

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[14]For all campaign promises (z^L, z^R) that will never occur in equilibrium, define a sequence of belief probabilities $\Pr(z^L, z^R)_t = \varepsilon_t$, where ε_t converges to zero, and let all other campaign promises keep their equilibrium probabilities. This sequence of beliefs implies a sequence of news coverage strategies $q_{st}(z^L, z^R)$ defined by equation (3.2) together with the budget constraints. The solution of the above equation is, in fact, the same for any strictly positive $\Pr(z^L, z^R)$, and thus, $q_{st}(z^L, z^R) = q_{st'}(z^L, z^R)$ for all t and t'. Therefore, the sequence is converging, and its limit defines the equilibrium news coverages. Thus, the equilibrium news profile is determined by equation (3.2) for any $\Pr(z^L, z^R) > 0$ and the budget constraint. In sum, equation (3.2) replaces equation (2.5) describing the equilibrium in the newspaper market.

informed has no effect on the election outcome. Assuming that $f_s[0] = 1$, the political equilibrium is characterized by

$$\rho_s(q_s) n_s u'_s(z_s^L) = \lambda n_s, \tag{3.5}$$

for all $s = \{1, 2, ..., S\}$. In this setting, the following proposition characterizes the symmetric equilibrium.

Proposition 3. *Two pairs of newspaper strategies (q^A, q^B) and party strategies (z^L, z^R) that constitute a symmetric NE in the game where individuals evaluate newspapers on basis of how news coverage responds to specific campaign promises, must satisfy $q^A = q^B = q^*$ and*

$$n_s p_s v_s(z_s^*) \rho'(q_s^*) = c_q, \tag{3.6}$$

for all $s = \{1, 2, ..., S\}$ in the newspaper competition, and $z^L = z^R = z^*$ and

$$\rho_s(q_s^*) u'_s(z_s^*) = \lambda, \tag{3.7}$$

in the party competition.

There is now a mutual dependence between news coverage and spending. To discuss the properties of this equilibrium first define the stability condition[15]

$$C1 : \frac{u''(z_s)}{u'(z_s)} \frac{\rho''(q_s)}{\rho'(q_s)} > \frac{v'_s(z_s)}{v_s(z_s)} \frac{\rho'(q_s)}{\rho(q_s)}, \text{ for all } z_s \text{ and } q_s.$$

The corollary below shows that the main results still hold, given the stability condition $C1$.

Corollary 2. *Spending, z_s^*, is increasing in n_s and p_s if stability condition C1 holds.*

Proof: see Appendix 5.2.

An interesting aspect of this modified model is that the media distort the policy response to unexpected preference shocks. This effect is most easily displayed in

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[15]The stability condition implies that the simple dynamic adjustment process in which the two parties and the two newspapers take turns at myopically playing a best response to each others' current strategies converges to the Nash equilibrium from any pair of strategies in a neighborhood of the equilibrium.
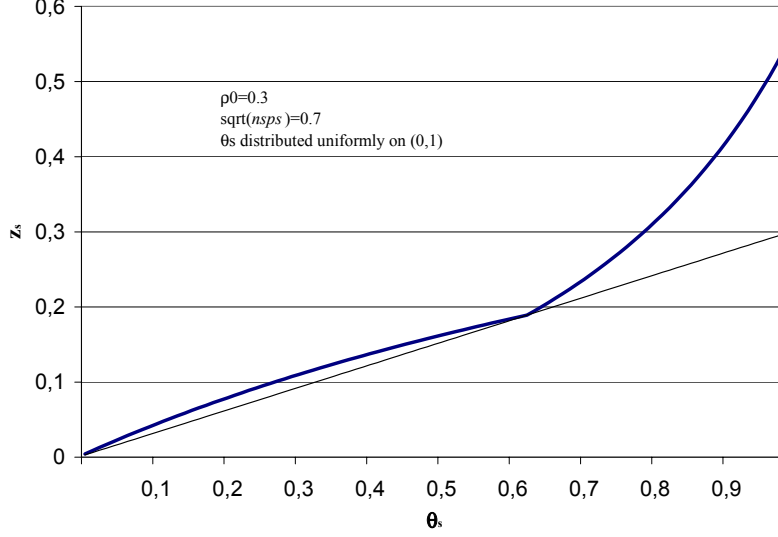
Figure 3.1: Spending, z_s, as a function of the realized preference parameters, θ_s.

an example. Let $\rho(q_s) = \rho^0 + 3(q_s)^{\frac{1}{3}}$, $c_q = 9$, and $u_i(z_s) = \theta_i \ln(z_s)$. To simplify, assume that there is a special group, j, of voters who are always well informed and have constant marginal utility of services: $\rho_j = 1$, and $u'_j(.) = 1$. This implies that $\lambda = 1$ in equation (3.7). The gains and losses of other groups will be in relation to this reference group. Then equations (3.6) and (3.7) characterizing the equilibrium in the newspaper and political markets become:

$$q_s = \left(\frac{n_s p_s (\overline{z}_s - z_s)^2}{c_q} \right)^{\frac{3}{2}},$$
(3.8)

$$z_s = \left(\rho^0 + (n_s p_s)^{\frac{1}{2}} |\overline{z}_s - z_s| \right) \theta_s.$$
(3.9)

A plot of the dependence of the equilibrium values of z_s on the realized preference parameters, θ_s is shown in Figure (3.1). The thick line depicts equilibrium spending. The thin line shows equilibrium spending with only the fraction ρ^0 of exogenously informed voters. The endogenous response of news coverage to campaign promises leads politicians to boost unexpected increases in programs and moderate unexpected cutbacks. When there is an exogenous increase in the utility

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of a program so that spending is higher than expected, then this announcement will receive more coverage in the press; see equation (3.8). This will make promises of increased spending more profitable in terms of votes, since more people who care about this program will be informed about the change. In anticipation of this, the parties will announce even larger increases in spending; see equation (3.9).

3.2. Endogenous prices and total budget

In this section, newspaper and advertisement prices are determined endogenously. Other aspects are as in the basic model of Section 2, except that the total budget is endogenous.[16] Following Butters (1977) and Grossman and Shapiro (1984), the function of advertisements is to inform consumers of new products and their prices. An advertisement provides full and truthful information about the product it promotes. Furthermore, the consumer has no alternative source of information, and is unaware of the products existence unless he sees an ad describing it.[17] Government expenditures are financed by a head tax t which is levelled on n_t taxpayers. Taxes will be treated as the $S + 1$:st issue.

The timing of the game with price-setting newspapers is the following. (i) The political parties announce how much they plan to spend on each government program, z_s, and how much to spend in total, t. (ii) Newspapers simultaneously choose how much space to devote to cover each government program, q_s, taxes, q_t, and set prices for subscriptions, p, and advertisements, p_a. (iii) Goods producers decide how much advertisement space to buy in each newspaper, q_a^A, q_a^B, and how to set, p_x, the price of their advertised products. (iv) Voters decide which newspaper to buy. (v) Based on information about policy platforms and new products in the newspapers, voters take the action a related to the government program and perhaps buy an amount x of the advertised goods. Finally, (vi) the voters cast their ballots, and the winning party implements its platform.

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[16]This specification is chosen for its simplicity. The model in this section is fully compatible with the model of Section 3.1 in the sense that model with both endogenous prices and news coverage that responds to campaign promises is characterized by the equilibrium equations from Proposition 3 with prices determined as in Proposition 4.

[17]Although this is the most obvious function of advertising, not all advertisements in newspapers perform this function. The description fits well advertisement for new computers or IT-products, but not so well advertisement for well-known fast-food chains or soft drinks. A number of alternative functions of advertisement have been discussed. Advertisements may persuade consumers, that is influence consumer preferences, they may signal high quality, or act as a coordination device between consumers and producers. For further references, see discussion in Anderson and Coate (2000).

The set of feasible spending levels and taxes is $\{(z, t) \in \Re_+^S \times [0, Y] : \sum z_s n_s \leq n_t t\}$, where Y is the income of each taxpayer. The newspapers set of feasible news space allocations and prices is $\{(q_1, q_2, ..., q_S, q_t, p, p_a) \in \Re_+^{S+3}\}$. Let $\delta_i^A = 1$ if voter i buys newspaper A, and $\delta_i^A = 0$ if he buys newspaper B. Similarly, $\delta_i^L = 1$ if voter i votes for party L, and $\delta_i^L = 0$ if he votes for party R. The set of feasible party choices, newspaper choices and actions is $\{\delta^L, \delta^A, a, x \in \{0, 1\}^2 \times \Re_+^2\}$. The producers/advertisers set of feasible advertisement quantities and prices is: $\{(q_a^A, q_a^B, p_x) \in \Re_+^3\}$.

The utility of a voter in group s depends on the spending on the government program that he uses, z_s, consumption x of the advertised good, and consumption y of a numeraire good:

$$u_i(z_s) + \beta_i u_a(x) + y + \xi_i,$$

where ξ_i is a parameter describing the utility the voter receives from the exogenous characteristics of parties and newspapers. (It takes on the value $a_i + l_i$ if i buys newspaper A and L wins the election, $b_i + r_i$ if i buys newspaper B and R wins the election, etc.) The tax payers do not benefit from public spending[18]. The parameter $\beta_i = 1$ if the voter values the advertised good and $\beta_i = 0$ otherwise. All voters have a fixed income Y which they can spend on newspapers, the advertised good and the numeraire good

$$p^A \delta_i^A + p^B \left(1 - \delta_i^A\right) + p_x x + y \leq Y. \tag{3.10}$$

Tax payers also have to pay the tax t. The income of each individual is assumed to be sufficiently large to always allow interior solutions.

In the last stage, (vi), when the voters cast their ballots, it only remains for

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[18]This assumption is perhaps more reasonable for targeted programs, such as unemployment benefits. It is made since the equilibrium would otherwise depend on the specification of out-of-equilibrium beliefs. Suppose some voters benefit from government programs and pay taxes, and that such a voter is informed that one party promises lower taxes than the other, but is not informed about the parties spending plans. This voter infers that at least one party has not set taxes according to the equilibrium. How does this affect his beliefs about the parties' platform spending levels? The voter may believe that the parties will still spend the same on the program that he cares about, and that the difference in taxes will be balanced by differences in other programs. With these beliefs, the model can be easily extended to include voters who benefit from government programs and pay taxes. The equilibrium will be the same as below, only that the set of tax payers includes some voters who also benefit from expenditure programs. However, since the selection of out-of-equilibrium beliefs seems arbitrary, the analysis is limited to the "targeted program" case.

the parties to implement their platforms. Therefore, voter i votes for party L if

$$\Delta u_i = E\left[u_i\left(z_s^L\right) - u_i\left(z_s^R\right)\right] \geq r_i - l_i,$$

for $i \in s$, and

$$\Delta u_i = E\left[-t^L + t^R\right] \geq r_i - l_i,$$

for $i \in t$, the set of taxpayers. We now assume that the probability distribution F which the parties assign to $r_i - l_i$ is uniform. This assumption assures that the conditions for concavity are fulfilled.

In order to determine the voters' demand for newspapers, the value of advertisements and election news must first be determined. These values are determined by the actions taken in stage (v). As in Section 2, knowing the election promises of the two candidates increases the utility of the program by v_s. The voters also choose how much of the advertised good x to buy. Advertisements are placed by producers of new goods, x, and inform readers of the nature and prices of these goods. Formally, the advertisement informs the reader whether β_i equals zero or one. Having read an advertisement, a voter knows his valuation of the good and will purchase it if the price is not higher than this valuation.

The new good is produced at zero marginal cost. Voter i's demand for the good is described by the inverse demand function $p_x(x) = \beta_i u_a'(x)$. The producer sets its price to maximize profits: $p_x(x)x$. Let x^* be the profit maximizing goods quantity. Then $PS = p_x(x^*)x^*$ is the resulting producer surplus and

$$v_a = u_a\left(x^*\right) - p_x(x^*)x^*$$

the consumer surplus of sales to one consumer. We will make the simplifying assumption that PS is a constant, equal to 1, and that the number of producers is 1.

In stage (iv), the voters decide which newspaper to buy. The expected utility that individual i derives from advertisement space q_a in newspaper A is the joint probability that the voter spots the advertisement and values the advertised good, multiplied by the consumer surplus realized from a purchase:

$$w_i\left(q_a\right) = \rho(q_a)\beta v_a,$$

where β is the probability that an individual asserts to valuing the advertised product prior to seeing the advertisement. Although the voters do not know their private valuation at this point, they do know the average valuation in the

population and assert that $\beta = \frac{1}{n} \sum \beta_i$. As before, the value of the news on z_s and t is:

$$w_i(q_s) = \rho(q_s)v_s.$$

Thus, the total expected utility of individual i belonging to group s from news and advertisement profile $q = (q_1, q_2, ..., q_S, q_t, q_a)$ equals

$$w_i(q) = \rho(q_s)v_s + \beta\rho(q_a)v_a,$$

for $s = \{1, 2, ..., S, t\}$. Let q^A and q^B be the news and advertisement profiles of newspapers A and B, respectively. The price of the newspapers are p^A and p^B, respectively. Voter i will purchase newspaper A if

$$\Delta w_i - \Delta p = w_i\left(q^A\right) - w_i\left(q^B\right) - (p^A - p^B) \geq b_i - a_i.$$

The probability the newspapers attach to individual i in group s reading newspaper A is $G_i(\Delta w_i - \Delta p)$.

Next, the demand for advertising space is analyzed. In stage (iii), producers decide how much advertisement space to buy in each newspaper. Let q_a^A and q_a^B be the advertisement space the firm buys in newspaper A and B, respectively. We now assume that the probability that a reader spots an advertisement (or news article) is described by the specific functional form

$$\rho(q_a) = \max\left[\frac{1}{\alpha}q_a^\alpha, 1\right],$$

for some $\alpha \in (0, 1)$. Let the price of an advertisement in newspaper A be p_a^A. The expected profit increase of the goods producer when buying an advertisement of size q_a is then

$$\frac{1}{\alpha}\left(q_a^A\right)^\alpha \sum_i \beta_i G_i - p_a^A q_a^A.$$

The advertiser buys the quantity of advertisement that maximizes his expected profits. This quantity is characterized by

$$p_a^A = q_a^{\alpha-1} \sum_i \beta_i G_i. \tag{3.11}$$

Having determined the voters' demand for newspapers and the producers demand for advertising, we are now ready to analyze the allocation of space in

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the newspaper and the newspaper and advertisement prices, stage (ii). We first introduce some new notation. Let the expected number of readers of newspaper A be $n^A = \sum_{i=1}^n G_i$, the total number of voters valuing the advertised good $n_a = \sum_{i=1}^n \beta_i$, the expected number of readers of newspaper A who value the advertised good $n_a^A = \sum_{i=1}^n \beta_i G_i$, the share of voters in group s who value the advertised good $\beta_s = \frac{1}{n_s} \sum_{i \in s} \beta_i$, the share of all voters who value the advertised good $\beta = \frac{1}{n} \sum_i \beta_i$, the average cost delivering a newspaper to a person in group s be $c_s = \frac{1}{n_s} \sum_{i \in s} c_i$, the average cost delivering a newspaper in the group of all voters $c = \frac{1}{n} \sum_{i \in s} c_i$, and the cost of producing one unit of advertisement space be c_a. The newspapers set prices and news coverage to maximize expected profits. The expected profit of newspaper A is

$$E\left[\pi^A\right] = p^A n^A + p_a^A q_a^A - C\left(\cdot\right).$$

The best reply function of newspaper A given newspapers B's behavior is characterized by the first order conditions:

$$\sum_{i \in s} g_i\left[.\right] v_s \left(p^A + q_a^\alpha \beta_i - c_i\right) q_s^{\alpha-1} - c_q = 0, \tag{3.12}$$

for $s = \{1, 2, ..., S, t\}$,

$$n^A \beta v_a q_a^{\alpha-1} + \alpha q_a^{\alpha-1} n_a^A - c_a = 0,$$

$$n^A - \sum_{i=1}^n g_i\left[.\right] \left(p^A + q_a^\alpha \beta_i - c_i\right) = 0.$$

In a symmetric equilibrium, the papers choose the same prices, and news and advertisement profiles. This equilibrium is characterized by evaluating the best response functions at $q^A = q^B$ and $p^A = p^B$ (as before, we assume that $g_i\left[0\right] = 1$).

Proposition 4. *A pair of strategies for the newspapers $((q^A, q_a, p^A), (q^B, q_a^B, p^B))$ that constitute a symmetric NE in the game of maximizing expected profits satisfy $(q^A, q_a, p^A) = (q^B, q_a^B, p^B)$, and*

$$q_a = \left(\frac{n_a \left(v_a + \alpha\right)}{2 c_a}\right)^{\frac{1}{1-\alpha}}, \tag{3.13}$$

$$q_s = \left(\frac{n_s v_s p_s}{c_q}\right)^{\frac{1}{1-\alpha}}, \tag{3.14}$$

where

$$p_s = \frac{1}{2} + q_a^{\alpha} (\beta_s - \beta) - (c_s - c), \qquad (3.15)$$

for all $s = \{1, 2, ..., S, t\}$.

The equilibrium price of the newspaper is

$$p = c + \frac{1}{2} - q_a^{\alpha} \beta,$$

which is a markup over average costs c, where the $\frac{1}{2}$ is due to the exogenous differentiation, and the second term arises because advertising and newspapers sales are complementary goods. It is assumed that parameter values are such that this price is positive.

Finally, in stage (i) the parties maximize expected votes. The new feature is that a group of tax payers has been introduced. Therefore, the best reply function of party L is characterized by

$$\sum_{i \in s} f_i (\Delta u_i) \rho (q_s) u_i' (z_s) = \lambda n_s,$$

for all s, and

$$\sum_{i \in t} f_i (\Delta u_i) \rho (q_t) = \lambda n_t,$$

for some $\lambda > 0$. For the same reasons as in Section 2, both parties must set the same platforms, $z^L = z^R$. Assuming again that $f_i(0) = 1$, these are characterized by the following proposition.

Proposition 5. *A pair of party strategies* (z^L, z^R) *that constitute a symmetric NE in the game of maximizing expected votes, must satisfy* $z^L = z^R = z^*$ *and*

$$\rho (q_s) u_s' (z_s^*) = \rho (q_t). \qquad (3.16)$$

Spending is increasing in the share of voters who are informed about campaign promises on issue s, relative to the share of voters who are informed about campaign promises on taxes.

Corollary 3. *A decrease in the cost,* c_i, *of delivering news to some voters,* $i \in s$, *of group s will increase news coverage on issues that concern people in this group,* q_s, *and decrease news coverage of other issues. This will increase per capita spending on program s,* z_s.

Proof: Changing the c_i's leaves advertising unaltered; see equation (3.13). A decrease in the cost, c_i, of delivering newspapers to some voters in group s will decrease the average costs of delivering newspapers to people in this group, c_s, as well as, to a lesser extent, the average cost of delivering newspapers to all voters, c. Thus $(c_s - c)$ decreases while $(c_t - c)$ and $(c_{s'} - c)$, $s' \neq s$ increase. This increases the news coverage of issue s and decreases the news coverage of taxes and all other issues $s' \neq s$ by equation (3.14). Therefore, $\rho(q_s)/\rho(q_t)$ increases. This implies that equilibrium spending on program s must increase by equation (3.16).

Corollary 4. *News coverage, q_s, and per capita spending, z_s, will be higher for groups s with a larger share of voters who value the advertised product, β_s, all else equal.*

Proof: Inserting equation (3.15) into equation (3.14), it becomes apparent that q_s is increasing in β_s. Since q_s is increasing in β_s while q_t is independent of β_s, $\rho(q_s)/\rho(q_t)$ is increasing in β_s. This implies that equilibrium spending on program s is increasing in β_s by equation (3.16).[19]

The main contributions of this section is to show that the earlier results are robust to endogenizing prices in the subscription and advertising market, and to characterize, p_s, the marginal profit increase per reader in group s. The variable p_s is higher for groups with a higher than average share of voters who will buy the advertised product when informed about it, $\beta_s > \beta$, and to whom it is less costly to deliver the newspaper than average, $c_s < c$. It is also shown that this makes politicians promise favorable policies to people in groups where β_s is high and c_s is low.

3.3. Radio and TV

This section discusses some possible effects of the rise of broadcast media (radio and TV) and the decline of newspapers as the main source of information

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[19]Proposition 4 characterizes necessary conditions for an interior solution of the newspapers' problem. The second-order condition requires that the Hessian of the newspapers profit function is negative definite. The second own-derivatives with respect to price are negative for all parameter values. Therefore the extremum point is either a local maximum or a saddle-point. However, because some cross-derivatives are non-zero (all cross derivatives between news coverage of different issues are zero while the others are not) it is not easy to characterize the range of parameters within which the problem is concave. Still, the large negative diagonal elements make the problem concave in most cases.

in society. These broadcast media had radically different cost structures than newspapers. Whereas newspapers were delivered physically, broadcast news were transmitted through radio waves. As a result, the average cost of delivering news to people in rural areas (c_s) fell sharply. Corollary 3 predicts that this should induce favorable government policies to these groups.

A problem with applying this model empirically is that neither the share of informed voters, ρ_s, nor news coverage, q_s, are easily observable. To get around this problem, Strömberg (2001) allows for an opportunity cost for using a mass media, so that some voters do not use any. In this model, the share of media users, $r_s(q_s^*)$, is increasing in news coverage q_s. The share of informed voters is now $r_s\rho_s$, the share of the members of group s who uses a media and finds the news on issue s. Government spending is again increasing in the share of informed voters; the condition characterizing equilibrium spending is

$$r_s\left(q_s^*\right)\rho_s\left(q_s^*\right)u_s'\left(z_s^*\right) = \lambda. \tag{3.17}$$

Since r_s, ρ_s and q_s move in the same direction, it is sufficient to look at changes in the share of media users, r_s, to ascertain who will gain from a change in c_s.

The hypothesis that government spending depends on the share of households who use a mass media, r_s, is investigated empirically in Strömberg (1999). This study uses a cross-sectional data set of approximately 3000 US counties. The main empirical finding is that counties where a large share of the households had radios were more successful in attracting government relief funds in the US of the 1930s. Further, radio's impact on government spending was significantly higher in rural than in urban counties. The estimates imply that radio significantly increased the ability of rural America to attract government transfers.

4. Final remarks

Academic research of mass media's role in politics has mainly been empirical and concerned with the effects on voting intentions and public opinion. This paper argues that mass media may well have significant effects on public policy without changing voting intentions or public opinion. Therefore the empirical findings of minimal effects on voting and public opinion are consistent with significant policy effects. The theoretical results may provide guidance for new empirical work on media's effect on public policy.

First, the paper argues that increasing-returns-to-scale will induce mass media to provide less news to small groups of voters. This news bias will translate into

a bias in public policy. Small groups will receive less favorable policies because of the provision of information by mass media firms.

Whether large groups gain from media's news provision could potentially be tested on policies for trade protection. In a world without mass media, trade policies might be expected to ignore dispersed consumer interests and favor special interests with highly concentrated benefits from trade barriers; see Olson (1965), and Lohmann (1998). In a country without mass media, it may be very difficult for a politician to advocate a reduction in trade barriers. Very few consumers have strong enough individual incentives to keep themselves informed of the politicians' position on this issue. Special interests will, however, surely keep themselves informed. Mass media may counter this bias, since they provide politicians with a megaphone that reaches exactly the large, dispersed consumer groups. Therefore, the expanding use of mass media may have had an impact, lowering the level of trade barriers. Today, we might test whether unusually high trade barriers remain in countries where a large share of the population does not have access to mass media, or where the existing mass media are tied to the same special interests which gain from the trade barriers.

In a similar vein, without mass media, we might expect policies to ignore dispersed tax-payer interests, and favor interests that have concentrated benefits from some small government program. Mass media might counter this bias since their cost structures makes it more profitable to cover parties' positions on taxes, than on small government programs. For this reason, we would expect the change from individual collection of information to mass media provision of information to lower taxes at the expense of small government programs.

The paper also argues that mass media introduce a bias in favor of groups that are valuable to advertisers, which might introduce a bias against the poor, and the old. If advertisers value readers with high purchasing power, then issues of interest to poor people should receive little coverage in newspapers. As a result, when politicians make campaign promises to the poor, only a small fraction of the poor will hear these promises and respond to them. This induces politicians to cater little to the needs of the poor. Advertisers may also value people who are easily influenced by advertising. Young people are considered more easily influenced than old, since they have not yet established brand loyalties or rigid purchasing patterns. Thus, this may produce a bias in favor of the young.

Finally, the paper argues that the decline of newspapers and the rise of broadcast media in the 1930s increased the proportion of rural media consumers. This should have caused an expansion in programs that benefit this group with the

largest momentum from 1930 to 1945. Strömberg (1999) finds that the expansion of the radio indeed increased the relative ability of rural America to attract government transfers. It would be interesting to see if the media effects on policy extend to the introduction of the television in the 1950s. Studies of media audiences show that people with low education and African Americans increased their use of mass media after the introduction of the television. This could have increased the political benefits from proposing the civil-rights legislation and the Great Society programs of the 1960s.

5. Appendix

5.1. Existence and uniqueness of equilibria in the basic model

Four conditions are sufficient for the existence of pure strategy equilibrium in zero-sum games: (1) compactness of the strategy sets, (2) convexity of the strategy sets, (3) continuity of the pay-off functions, and (4) concavity of the pay-off functions. The strategy set X is compact and convex. The pay-off functions $E\left[n^k \mid z^L, z^B\right]$, $k \in \{L, R\}$ are continuous. What remains to be shown is that the pay-off functions are concave. This is equivalent to showing that the Hessians of the pay-off functions are negative definite. Since the off-diagonal elements in the Hessian are zero, this is in turn equivalent to showing that each element along the diagonal is negative,

$$\frac{\partial^2 E\left[n^L \mid z^L, z^R\right]}{\partial \left(z_s^L\right)^2} \leq 0 \Leftrightarrow \sum_{i \in s} f_i\left(\Delta u_s\right) u_i''\left(z_s^L\right) + f_i'\left(\Delta u_s\right)\left(u_i'\left(z_s^L\right)\right)^2 \leq 0,$$

for $z_s^L, z_s^R \in (0, I)$, and similarly for R. A sufficient condition that implies the above and is easier to interpret is

$$\frac{\left|f_i'\left(\Delta u_s\right)\right|}{f_i\left(\Delta u_s\right)} \leq \frac{\left|u_s''\left(z_s^L\right)\right|}{\left(u_s'\left(z_s^L\right)\right)^2}, \tag{5.1}$$

for $z_s^L, z_s^R \in (0, I)$. The above is condition $C1$ in Lindbeck and Weibull (1987). The condition could be thought of as requiring the parties to be sufficiently uncertain about the voters' preferences for the exogenous characteristics, see Lindbeck and Weibull (1987).

Uniqueness in the media game follows directly from equation (2.5) and concavity of $w_i\left(q_s\right)$. The pay-off functions are concave if

$$\frac{\partial^2 E\left[\pi^A \mid q^A, q^B\right]}{\partial \left(q_s^A\right)^2} = \sum_{i \in s} g_i\left(\Delta w_s\right) w_i''\left(q_s^A\right) + g_i'\left(\Delta w_s\right)\left(w_i'\left(q_s^A\right)\right)^2 \leq 0,$$

for $q_s^A, q_s^B, \in \Re_+$, and similarly for B. A sufficient condition that implies the above and is easier to interpret is

$$\frac{\left|g_i'\left(\Delta w_s\right)\right|}{g_i\left(\Delta w_s\right)} \leq \frac{\left|w_s''\left(q_s\right)\right|}{\left(w_s'\left(q_s\right)\right)^2},$$

for $q_s^A, q_s^B, \in \Re_+$. Although the strategy sets are not compact, existence can be shown directly by means of the first-order condition, equation (2.5).

Uniqueness in the game of maximizing votes follows from the strict concavity of the utility functions. A solution to the first order conditions (2.7) and (2.8) consists of λ and z_s , $\forall s$. Assume that there are two solutions (z, λ), (z', λ'). If $\lambda = \lambda'$, then $z = z'$ since $u_i'(z_s)$ is strictly decreasing in z_s. If $\lambda > \lambda'$, then $z_s < z_s'$ since $u_i'(z_s)$ is strictly decreasing in z_s. Since this is true for all s, both z and z' cannot satisfy the budget constraint.

5.2. Proof of Corollary 2

Equation (3.6) implicitly defines $q_s = q_s(z_s, n_s)$ as a function of z_s and n_s. Differentiating this equation with respect to n_s yields:

$$p_s v_s(z_s) \rho'(q(z_s)) + n_s p v_s(z_s) \rho''(q(z_s)) \frac{\partial q_s(z_s, n_s)}{\partial n_s} = 0$$

$$\frac{\partial q_s(z_s, n_s)}{\partial n_s} = -\frac{p v_s(z_s) \rho'(q(z_s))}{n p v_s(z_s) \rho''(q(z_s))} > 0.$$

For any z_s, the function $q_s(z_s, n_s)$ is increasing in n_s. Define $g_s(z_s, n_s)$ by using equation (3.7):

$$\rho_s(q(z_s, n_s)) u_s'(z_s) = g_s(z_s, n_s) = \lambda$$

The stability condition is

$$\frac{\partial g_s(z_s, n_s)}{\partial z_s} < 0,$$

or, equivalently,

$$\frac{u''(z_s)}{u'(z_s)} \frac{\rho''(q_s(z_s, n_s))}{\rho'(q_s(z_s, n_s))} > \frac{v_s'(z_s)}{v_s(z_s)} \frac{\rho'(q_s(z_s, n_s))}{\rho(q_s(z_s, n_s))} \text{ for all } z_s \text{ and } n_s.$$

If condition $C1$ holds, the above condition automatically holds.

We will now compare two equilibria: (z, n, λ) and (z', n', λ'). In the first equilibrium, $g_j(z_j, n_j) = \lambda$, for all groups. Suppose that the size of group s increases, $n_s' > n_s$, while the other groups' sizes remain unchanged, $n_j' = n_j$, for all $j \neq s$. Evaluated at the original equilibrium z: $g_s(z_s, n_s') > \lambda = g_j(z_j, n_j')$ for all $j \neq s$. Because of the stability condition, in order to reach a new equilibrium where $g_s(z_s', n_s') = g(z_j', n_j') = \lambda'$, it must be the case that $z_s' > z_s$ and $z_j' < z_j$ for all $j \neq s$. To see this, suppose to the contrary that $z_s' \leq z_s$. Then, the budget constraint implies that $z_j' \geq z_j$ for at least one j. But then $g_s(z_s', n_s') > g_j(z_j', n_j')$, so this cannot be an equilibrium.

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