THE POLITICS OF PUBLIC SPENDING

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Chapter 1

Mass Media Competition, Political Competition, and Public Policy

> "The basis of our governments being the opinion of the people, the very first object should be to keep that right; and were it left to me to decide whether we should have a government without newspapers or newspapers without a government, I should not hesitate a moment to prefer the latter. But I should mean that every man should receive those papers and be capable of reading them."
>
> – Thomas Jefferson to E. Carrington, 1787.

1.1 Introduction

Ever since the days of Jefferson, mass media have occupied a central place in politics. This is for good reasons. The media play a unique role in transmitting information to mass audiences and supply most of the information people use in voting. 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].

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

However, the literature on the effects of media on politics is quite small. It seems that research in this area was discouraged by some influential papers in the early 1950's that found only minimal effects of mass media on voting behavior. In the words of Graber (1984): "The findings that media effects were minimal were so pervasive in early research that after an initial flurry in the 1940's and 1950's, social science research into mass media effects fell to a low ebb." Lately, there have been some signs that the tide may be changing, and it has been suggested that the minimal effects found in the early studies may be due to methodological difficulties. For example, both Iyengar & Kinder (1991), who investigated media effects in a laboratory environment, and Bartels (1993), who allowed for measurement error in his statistical analysis, found non-minimal effects of media coverage on public opinion. Still, it seems fair to say that there is no consensus on the impact of media in this emerging literature.

Instead of looking for evidence of the impact of mass media, this paper explores the following question: If mass media have a systematic influence on the political system, what should we expect this influence to be? The answer to this question makes it easier to design a test for the impact of mass media since it pin-points specific effects to look for. The paper also suggests an explanation of the minimal effects puzzle: few effects have been found because researchers have been looking in the wrong place. Specifically, previous studies have ignored the equilibrium responses of politicians to media coverage. The simultaneous responses of political parties to media coverage may keep voting intentions and public opinion relatively constant, while policies change considerably. If we are ultimately concerned with the welfare of citizens, then policy changes are of more interest than voting behavior or public opinion.

This paper focuses on mass media's impact on policy. It develops a formal model where mass media is the channel through which politicians convey campaign promises to the electorate. As media coverage of different issues changes, and as viewership or readership change, the efficiency with which politicians can reach different groups with campaign promises also changes. This alters the politicians' incentives to promise favorable policies to different groups. For example, assume that one specific area receives very little news coverage. If a party promises to raise spending in that area, only a small fraction of the voters who would benefit learns about it. As a consequence, this spending promise will not win many votes for the party. In equilibrium, there will be little spending in this area.

To analyze the impact of media, I first study the incentives facing the media. Newspapers and TV stations have goals quite distinct from that of producing information that maximizes the welfare of society. They are firms whose owners care about profits and perhaps other interests. When TV stations and newspapers are analyzed as firms, it becomes apparent that their cost and revenue structure biases news reporting in a way that helps some groups and hurts others.

First, large groups get much attention from mass media whereas minority groups are often neglected. This is a consequence of the fact that newspapers and TV broadcasting are increasing-returns-to-scale industries. 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 cost has been borne, the extra cost of selling additional newspapers is just the cost of printing and delivering[2]. Thus, newspapers try to find stories that attract the interest of large groups rather than small ones. As TV broadcasting has even more pronounced increasing returns, it caters even less to the tastes of minorities.

In contrast, this bias towards large groups is not a feature inherent to politics, if politicians compete for votes by increasing spending on publicly provided services. Suppose the number of voters who benefit from some service is larger than the number of voters benefiting from another, and that voters care about per capita spending on these services. On the one hand politicians want to appeal to the large group of voters, since the potential number of votes gained are proportional to the size of the group. But on the other hand, the cost of raising per capita spending is also proportional to the size of the group. These two effects tend to cancel each other.

If the news reported in mass media affects the political system, the bias in news

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

reporting may be transmitted into biased political decisions: large groups benefit while minorities suffer.

If this was the only aspect of news reporting, newspapers would never report on, for example, new operas whose audiences are a very small share of the population. Yet clearly they do. This brings us to a second point which has to do with the revenue structure of mass media. 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 newspapers and even more for TV broadcasts[3]. For advertisers, not only the size but also the 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 the newspaper industry, there are numerous examples of newspapers that have increased their sales only to see profits fall as a consequence of falling advertising revenue. One of the most cited examples involves the (London) Times. Michael Mander, Deputy Chief Executive of the Times in the late 1960's explains: "From 1967 to 1969 the Times ... sales shot up from 270,000 to 450,000 – a remarkable achievement. But its higher sales made it no more attractive as an advertisement medium ... adding to the readership just watered down the essential target group and increased the cost of reaching it. A reversal of policy changed the situation with a consequent dramatic improvement of profitability. The circulation is back down to 300,000."[5] A frequently cited case from American TV is the show Gunsmoke that was cancelled although it had high ratings. The show's audience was apparently too old and too rural to be worth much to advertisers[6].

To summarize, in mass media competition, viewers for whom advertisers pay more get more attention. If news reports affect public policy, then groups for whom

[3] See for example U.S. Department of Commerce, "1987 Census of Manufactures" or Dunnett (1988) and Dunnett (1990).
[4] Bagdikian, "The Media Monopoly", p. 116.
[5] See Mander (1978), p. 75.
[6] See Barnouw, "The Sponsor", p. 73.

advertisers are willing to pay more will benefit politically.

The model developed in this paper is also used to analyse some possible effects of two major changes in the mass media market during this century. One is the decline of newspapers and the rise of broadcast media as the main information source in society. The other is the continuing increase in the share of cities with only one daily newspaper. If mass media play an important role in politics, as is argued in this paper, then these changes should have had an impact on the allocation of public funds.

The model predicts that the expansion of broadcast media should have caused an expansion in programs that benefit rural voters, and voters with low income and low education. The reason is that the emergence of these media increased the proportion of rural, low-income, and low-education media consumers. This increase was due to a number of reasons: that it was less expensive to distribute radio-waves than newspapers to remote areas, that the above-mentioned groups preferred audible and visual entertainment and information to reading while people with high education and income preferred reading, that prices for radio and television receivers were falling and that real wages for low income earners were rising. The model predicts that this will make mass media increase news coverage on issues that concern rural, low-income, and low-education media consumers. The changes in the media market made it possible for politicians to more efficiently reach these segments of the population with campaign promises. The model predicts that this would cause an expansion in programs that benefit rural, low-income, and low- education voters. Historically, this shift should have had the largest momentum from 1935 to 1945 and from 1956 to 1964.

The model also predicts that spending on services used by poor groups will increase when a duopolistic newspaper market becomes a monopoly. The reason is that while the two newspapers in a duopoly mainly compete over people who will surely buy some newspaper, monopolies try to persuade those who don't buy any newspaper into buying. The latter group is on average poorer than the former, so the monopoly newspaper is more prone to produce news that interests the poor than are duopoly newspapers. As a consequence public spending on these issues will be higher with a monopoly newspaper.

The structure of the paper is as follows. In section 1.2 the model is developed, first for the media market, and then for the political market. For the purpose of the main points of this section, the cost and revenue structure of TV and radio are similar in the relevant aspects, and all mass media will be referred to as newspapers. Section 1.2 ends with a characterization of the media market and the political market. Section 1.3 analyzes the effects of changes in mass media market structure and mass media type on public spending. Section 1.4 discusses some additional extensions to the model. Section 1.5 concludes. Finally, it may be helpful to note that the appendix contains a list of variables used in the model.

1.2 The Basic Model

The timing of the game is the following. Two parties compete for votes by announcing how much they plan to spend on different publicly provided services. The parties' announcements, which are assumed to be binding, are covered in two newspapers. The newspapers choose how much space to devote to announcements in different policy areas. Voters read the newspapers and change their expectations of how much the parties will spend. Finally, the voters cast their ballots based on the information transmitted by the newspapers.

To make clear what biases are introduced by the media market and to simplify exposition, the same basic location model is used to describe both the political competition and the media competition. The model used is adapted from Lindbeck and Weibull (1987). The players and strategy spaces are presented below.

Two political parties, L and R, compete for votes by means of platforms for the provision of publicly provided services. There are $S > 2$ publicly-provided private services, indexed by s. The election platforms of the parties consists of S-dimensional vectors of spending levels: z^L, z^R. There are N voters. The voters may vote for party

L or party R; there is no abstention. Each voter benefits from exactly one service. Let n_s denote the number of voters benefiting from service s, with $\sum n_s = N$. The group of voters who benefit from service s will be called group s. The total budget is fixed at I. The set of feasible spending levels is $X = \left\{ z \in \Re^n_+ : \sum n_s z_s \leq I \right\}$.

Two newspapers, A and B, compete for readers by allocating quantities of space, q^A and q^B to news on the S announced platform spending levels. The N voters are also the newspaper readers. The voters buy newspaper A or newspaper B; every voter buys some newspaper. The total space for news on election platforms is assumed to be fixed at $\overline{q}$. The set of feasible news profiles for newspaper A is $Q = \left\{ q^A \in \Re^n_+ : \sum q^A_s = \overline{q} \right\}$, and similarly for newspaper B[7].

1.2.1 The Media Competition

In order to model the behavior of the newspapers, we must first have a theory of why voters choose to buy one newspaper or the other, and how this choice is affected by news on election platforms. There exists a number of theories of consumer choice of newspapers. The one that, according to Graber (1984) is the most widely accepted is the theory of "uses and gratifications". This theory basically says that individuals ignore personally irrelevant messages and choose to attend messages that will in some way help to satisfy their needs or are pleasurable.

There are different ways to apply this theory to news about public services. Voters use the information they gather in the press to make decisions about 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. There are many examples of such actions. In the case of health care, the elderly may want to use a more generous health care system before

[7] See appendix for a model where total space in the newspaper is not fixed, but where the cost of increasing total news space is convex.

the election if health care spending is expected to decrease, or wait if spending is expected to increase. And, in response to an increase in day care spending, parents may wish to change from part time to full time jobs. More precise news makes it more probable that the reader will make the right choice in these types of private decisions. This constitutes the value of the news.

Assume that all voters who use service s will read any article they find about z_s, while voters who do not use service s do not read articles about z_s[8]. This assumption is admittedly stylized, but the results would still hold as long as the share who read news about z_s is larger in group s than in other groups. Let the probability that a reader will spot some news in the newspaper be ρ. This probability is assumed to be 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.[9] That the share of the readers that spot a news story is increasing in news coverage is essential to the model. It implies that more extensive news coverage of campaign promises in a certain area will make more voters aware of these campaign promises and thus able to respond to them. The expected utility from a newspaper with newsprofile q to a reader using only service s, $w_s(q_s)$, equals the probability that the reader finds the article, $\rho(q_s)$, multiplied by the value of news on z_s for a person using service s, $\overline{v}_s : w_s(q_s) = \rho(q_s)\overline{v}_s$. This implies $w_s'(q_s) > 0$ and $w_s''(q_s) < 0$.

A reader's valuation of a newspaper also depends on other news, and also some characteristics that the newspapers cannot change by assumption. Other news is left out of the analysis[10]. The fixed characteristics include, for example, the paper's editorial stance, and the name and logotype of the newspaper. Individuals value these other aspects of the newspaper differently and these valuations are captured by the parameters a_i and b_i, where i is a voter index. The news profiles of newspaper A and

[8] See appendix for explicit modelling of value of news and who will choose to read it.

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

[10] If voters' utility from other news is additively separable from news on election platforms, then equation (1.3) below would still characterize the allocation of the subset of news on election platforms. Both newspapers would in equilibrium choose the same news coverage of other news, as well as news on election platforms.

B give utility $w_s\left(q_s^A\right)+a_i$ and $w_s\left(q_s^B\right)+b_i$ respectively to voter i using service s. 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

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

and newspaper B otherwise (everyone buys some newspaper.)

The newspapers maximize expected profits. They are uncertain about the utility they provide to the individual readers and assign a probability distribution G_i to the difference $b_i - a_i$. The probability the newspapers attach to individual i in group s reading newspaper A is $\Pr\left[b_i - a_i \leq \Delta w_s\right] = G_i\left(\Delta w_s\right)$. The probability density function of $G_i\left(\Delta w_s\right)$ will be denoted $g_i\left(\Delta w_s\right)$. The newspapers receive payments p_s per reader belonging to group s. This revenue, p_s, includes both the price of the newspaper and the per reader price that advertisers pay. Let π^j be the random profits of newspaper j, and $\pi = \sum p_s n_s$, be total industry profits, then $\pi^B = \pi - \pi^A$. The expected profit of newspaper A is

$$E\left[\pi^A\right] = \sum p_s n_s G_s\left[\Delta w_s\right]. \tag{1.1}$$

A Nash Equilibrium in the competition between the two newspapers is characterized by $E[\pi^A \mid q^A, q^{B*}] \leq E[\pi^A \mid q^{A*}, q^{B*}] \leq E[\pi^A \mid q^{A*}, q^B]$, 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 the appendix, the best reply function of newspaper A is then described by

$$n_s p_s g_s\left[\Delta w_s\right] w_s'\left(q_s^A\right) = \lambda \tag{1.2}$$

for all s and for some $\lambda > 0$. The newspapers adjust their news coverage to equalize marginal profits over all issues, s. The increase in marginal profits due to increased coverage of issue s is the change in the probability that a voter of group s will buy newspaper A, multiplied by the size of the group and the revenue per reader in this group. The corresponding condition for newspaper B is:

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

Thus the ratios,

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

are equal for all s. This, together with the constraint on total space allocation, implies that both newspapers must set the same news profiles, i.e. $q^A = q^B$. Proof of uniqueness and existence of equilibrium is given in the appendix. For simplicity, assume that $g_s[0] = 1$ for all groups s. We have proved the following proposition:

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 some $\lambda > 0$ and all s*

$$n_s p_s \overline{v}_s \rho' \left(q_s^*\right) = \lambda. \tag{1.3}$$

Equation (1.3) together with the constraint on total space in the newspaper implicitly defines equilibrium news coverage: $q_s^* = q^*\left(n_s, p_s, \overline{v}_s, \lambda\right)$. Newspapers will have more extensive coverage of issues that benefit large groups, groups that are valuable to the advertisers, and groups who have a high private value of news.

1.2.2 The political competition

The utility an individual i derives from the public services provided under the programs of parties L and R are represented by the utility functions $u_s(z_s^L) + l_i$ and $u_s(z_s^R) + r_i$, respectively. Differences in utility deriving from differences in spending levels by L and R are captured by the utility function $u_s(z_s)$. As in Lindbeck & Weibull (1987), l_i and r_i describe preferences for other fixed policies or personal characteristics of the candidates.[11]

[11] The parameters l_i and r_i can be determined endogenously in a model with citizen candidates (see section 4).

The voters are uncertain about the number of users of the services, n_s, and assign a probability distribution to n_s for all s. This makes them 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 part of the voters, for example about the probability distributions, F_s, that the parties assign (see below) and the size of the budget, I, could play the same role. A share ρ_s of the voters in each group s receive information from mass media about the parties' exact announced spending levels on service s, z_s^R and z_s^L.

Voter i votes for party L if his expected utility is higher under party L than under party R, that is if

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

and for party R otherwise (there is no abstention.)

The parties maximize expected votes[12]. They are uncertain about the utility they provide to the individual voters and assign a probability distribution F_i to the difference $r_i - l_i$. The probability that individual i votes for party L is $\Pr \left[r_i - l_i \leq \Delta u_i \right] = F_s \left[\Delta u_i \right]$. Let n^L be the random number of votes for party L, $n^R = N - n^L$. The expected number of votes for party L is

$$E \left[n^L \right] = \sum_i F_i \left[\Delta u_i \right].$$

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 spending level is always interior. The

[12]The same equation charaterizing equilibrium spending will be obtained if the parties maximize the probability of re-election; see appendix. The vote-maximization assumption is made in order to emphasize the similaritites between the political and the media competition.

best reply functions for party L are described by

$$\rho_s n_s f_s \left[\Delta u_s\right] u_s' \left(z_s^L\right) = \lambda n_s \tag{1.4}$$

for all s and some $\lambda > 0$. The parties adjust their platforms to equalize the marginal number of votes per dollar over all services. Only the share ρ_s of voters who are informed by mass media about the spending levels in the parties platforms will be responsive to changes in the platforms. The other voters will vote according to their priors, which are not affected by the promised spending levels. The increase in marginal votes due to promises of increased spending on service s is then the share of voters in this group who will read about the spending promise multiplied by the size of the group and the change in the probability that a voter who uses service s and hears the spending promise will vote for party L. The corresponding equation for party R is ($\mu > 0$):

$$\rho_s n_s f_s \left[\Delta u_s\right] u_s' \left(z_s^R\right) = \mu n_s. \tag{1.5}$$

Thus the ratios

$$\frac{u_s'\left(z_s^L\right)}{u_s'\left(z_s^R\right)} = \frac{\lambda}{\mu} \tag{1.6}$$

are equal for all s in equilibrium. This, together with the budget constraint, implies that both parties will set the same platform, i.e. $z^L = z^R$. Assume that $f_s[0] = 1$. This assumption is made for dispositional simplicity. 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 $\lambda > 0$*

$$n_s \rho\left(q_s^*\right) u_s'\left(z_s^*\right) = n_s \lambda. \tag{1.7}$$

The equilibrium spending levels equate marginal utilities weighted by the share of voters in the group who finds 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.

The voters who are not informed by the newspapers know the probability distribution from which $n_1, n_2, ..., n_S$ are drawn. This distribution maps into a distribution over equilibrium spending levels, $z^L = z^R = z$. So voters without information understand that in equilibrium both parties will choose the same spending levels, although they don't know exactly what level. Party L receives a share $F_s[0]$ of the votes from the voters using service s who have not been informed by the newspapers about z_s.

Corollary 3 *Equilibrium spending on service 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, $\overline{v}_s$.*

Proof: An increase in news coverage, q_s^*, will increase the share of readers who finds news about the platform spending levels, $\rho(q_s^*)$. By equation (1.7) this will decrease the marginal utility of group s, $u_s'(z_s^*)$, relative to the marginal utilities of all other groups. Given the budget constraint this implies that z_s^* must increase. Thus spending is increasing in news coverage. The size of the group n_s, and the revenue per reader p_s only affects spending via the media market. Since spending, z_s^*, is increasing in news coverage, q_s^*, and since q_s^* is increasing in n_s, p_s, and $\overline{v}_s$, z_s^* is increasing in n_s and p_s, and $\overline{v}_s$.

The above corollary says that increased news coverage on public service s will increase per capita spending on this service. The intuition is simple. More news coverage of campaign promises on an issue makes more voters aware of the politicians' promises on that issue. Thus a larger share of the voters using that service will respond by changing their votes if one party promises to spend more than the other party on that service. In equilibrium, the increased sensitivity of voters to spending promises attracts more spending. Since news coverage is increasing in the size of the group and the value attached by advertisers to members of this group, spending will be higher to large groups and groups which advertisers value highly.

To illustrate the bias in spending induced by the mass media, consider the following simple example. Let the utility from publicly provided services be described by a logarithmic utility function: $u_s(z_s) = \ln(z_s)$. The equilibrium condition, equation

(1.7) will then be $\rho_s/z_s^* = \lambda$. Let $\overline{\rho}$ be the mean of the ρ_s over all s. Using the budget constraint, the solution for z^* is

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

Under full information, all voters will learn about the parties platform promises, and $\rho_s = 1$ for all groups s. In this case all groups will receive an equal share $z_s^* = \frac{I}{S}$ of the budget. The bias introduced by mass media is the difference between the spending under full information, z^f, and the spending when mass media provides information. This bias is

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

Groups where a higher than average share of the voters learns about the parties' campaign promises will receive higher spending when mass media provides the information in the election than under full information. The share of voters who hears the parties campaign promise in one area is increasing in news coverage of these promises, $q_s^*(n_s, p_s, \overline{v}_s)$. News coverage is in turn increasing in the number of voters who use the service, the payment per reader in this group and the private value of information in this group. Therefore groups who are larger than average, who are found valuable to advertisers, and who have larger private value of information than average will benefit from mass media provision of news, while groups who are smaller than average, who are not found valuable to advertisers, and who have a low private value of news will suffer.

1.2.3 Discussion

Comparing equation (1.7) with equation (1.3) 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, the politicians want to attract larger groups because there are more votes to gain on the margin. This is seen in equation (1.7), 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. Once a newspaper has gathered information, the extra cost of selling it to an additional reader is low. Since the cost of attracting large groups is no larger than the cost of attracting small groups, the newspaper tries to attract the former. Thus, unlike in political competition, there is a bias towards large groups in the newspaper market.

The assumption that the service is a private good is not essential for this result. To see this, take the example of a fully public service. The equation describing the political equilibrium, equation (1.7), then takes the form $\rho_s n_s u_s' (z_s^*) = \lambda$. Disregarding the influence of mass media, ρ_s, the equilibrium spending levels would equate the sum of the n_s marginal utilities to the shadow price λ. This is the usual condition for efficient supply of a public good. Mass media will introduce an additional bias towards large groups via more news and higher values of ρ_s to large groups.

A second difference between political and newspaper competition is the weight given to different individuals by parties and newspapers respectively. In political competition, every person has one vote. In newspaper competition, readers who have higher value to advertisers, p_s, get more attention.

In short, if the information that mass media provides makes a difference in the election, then any bias in the media market will translate into a bias in the political outcome. In this model these biases are represented by p_s and n_s. Since the readers, newspapers and advertisers do not consider effects on political allocations, the effects via p_s and n_s are externalities from the consumption and production of news.

Which readers would advertisers value more? In almost any model of advertising, three features would make readers more valuable: first, that the readers have high purchasing power; second, that they are easily influenced by advertising to change their purchasing behavior; and third, that they have a preference for the type of good that the advertisers carry. The first and second of these features can easily be associated with observable characteristics, whereas the third cannot. Purchasing power is highly related to household income. Young people are considered more easily influenced than old, since they have not yet established brand loyalties or rigid purchasing patterns. However, the variety of goods advertised in local newspapers is so wide that a preference for these goods does not point to any specific group.

From a Swedish perspective, it is worrying that advertisers may place a low value on old readers. Swedish municipal spending goes mainly to day-care, to education and to health care to elderly, i.e. to groups polarized at both ends of the age distribution. The above reasoning clearly implies that health care to elderly should be an issue neglected by newspapers, or at least covered much less than day-care and education. This is consistent with a quick look at the number of stories in 50 local Swedish newspapers in 1991. In these newspapers there were more than twice as many stories on day-care than on health care to elderly – 878 to 396[13] – although the number of users of the two services, and the amount of spending on the two services are roughly of the same size. This bias in news coverage might induce politicians to spend less on health care.

The second prediction is that issues that interest poor people will receive little coverage in newspapers. As a result, when politicians make campaign promises to 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. This paper thus provides one reason why the rich are more politically influential than the poor. An empirical implication would be that in places where, for example, the old are richer, they will be able to get better quality of health care at the expense of day-care and schooling.

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. Previous research has assumed that the political effects of mass media must go through changes in voting behavior or public opinion. In search of media effects on politics, researchers have studied the effects of media coverage on voting intentions

[13] Source: Uppsala University Press Archives.

and on 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 may respond directly to changes in media coverage, because these changes affects the efficiency by which politicians can reach different groups with campaign promises.

1.3 Effects of media type and market structure on public spending

This section explores some possible implications for public spending of two major changes in the media market: the rise of broadcast media and the decline of newspapers as the main source of information in society; and the decrease of the share of American cities with competing daily newspapers. The model must now be extended to allow for the possibility that voters may choose not to buy a newspaper. This extension maintains the main points of the simple model and adds some new aspects.

1.3.1 Media type: from newspapers to television

Model The model in this section will be applied both to competition between two newspapers and to competition between a newspaper and a broadcast media. As in the basic model, there are two media, A and B, that select their respective news profiles, q. The news profiles of media A and B result in private utilities

$$w_s\left(q_s^A\right) + a_i,$$
$$w_s\left(q_s^B\right) + b_i.$$

Let o_i be the utility the voter i foregoes by using the media (opportunity cost). For newspapers, o_i would be the price of the newspaper and the time cost of reading it. For television, o_i would be the price of the television and the time cost of watching it. The media do not know the voters' exact opportunity costs, but assign distribution H_i to o_i.

Assume that the voter first chooses whether to use any media based on what news he expects that the media will cover, and then chooses which of the two media to use based on news content[14]. The voters understand the game and are able to solve for the equilibrium news coverage given knowledge of the exogenous parameters. The distribution the voters assign to the number of users of the services, n_s, now maps into a distribution over levels of equilibrium news coverage, on which the expected news coverage, q_s^e, is based.

In the first choice, media are only used by those voters for whom

$$w\left(q_s^e\right) + \max\left(a_i, b_i\right) \geq o_i.$$

Media users thus constitute a share $R_s\left(w\left(q_s^e\right)\right) = \int H\left(w\left(q_s^e\right) + \max\left(a_i, b_i\right)\right) f\left(a_i\right) f\left(b_i\right) da_i db_i$ of the voters. Among the $n_s R_s$ media users in group s, those will choose media A for whom

$$w_s\left(q_s^A\right) + a_i \geq w_s\left(q_s^B\right) + b_i.$$

The expected profit of media A is

$$E\left[\pi^A\right] = \sum p_s n_s R_s G_s\left[\Delta w_s\right].$$

The only difference between this expression and the earlier expression for expected profits, equation (1.1), is the R_s term denoting the share of readers of group s who are using the media. Since R_s is already fixed when the news profiles are chosen, $n_s R_s$ is the fixed number of readers/viewers that the media are competing for in group s. The new equation characterizing the equilibrium in the news market is

[14] This assumption makes the media disregard the effects on the total number of people who use media when they select their news profile. This assumption was made for simplicity. A model in which the choice of whether to use media and what media to use are made simultaneously can be given on request by the author. All results below hold in this model.

obtained simply by replacing n_s by $n_s R_s$ in equation (1.3).

Proposition 4 *A pair of strategies* $\left(q^A, q^B\right)$ *that constitute a NE in the game of maximizing expected profits must satisfy* $q^A = q^B = q^*$, *and for some* $\lambda > 0$, *for all* s

$$n_s p_s \overline{v}_s R_s \rho' \left(q_s^*\right) = \lambda. \tag{1.8}$$

Equation (1.8) replaces (1.3) as the equation that characterizes news coverage. The new feature is that news coverage is increasing in the share of the members of one group that actually buys a newspaper or watches TV.

How will spending be determined under this extension? Only those who use the media may find news on election platforms. This is a share R_s of the members of group s. Of these members, a share ρ_s actually finds the news on the election platforms. Thus the share of the members of group s who buys a newspaper and finds the news on issue s is $R_s \rho_s$. The new political equilibrium is described by the proposition below.

Proposition 5 *A pair of strategies for the parties* $\left(z^L, z^R\right)$ *that constitute a NE in the game of maximizing expected votes with some uninformed voters must satisfy* $z^L = z^R = z^*$, *and for some* $\lambda > 0$

$$\rho_s \left(q_s^*\right) R_s u_s' \left(z_s^*\right) = \lambda. \tag{1.9}$$

Equation (1.9) thus replaces (1.7) as the equation that characterizes public spending. Note that the implied spending levels equate marginal utilities weighted by $\rho_s R_s$. As before, spending is increasing in news coverage, since the share of readers who notices the news, ρ_s, is increasing in the amount of news, q_s. The new feature is that spending is also increasing in the share of the voters of group s that uses mass media, R_s.

Discussion The model can now be used to discuss broadcast media's overtaking of newspapers as the main information source in national elections. From equation

(1.9) it is clear that the two media variables that affect public spending are news coverage, q_s^*, via the proportion of informed voters, $\rho(q_s^*)$, and the share of voters in group s who use the media, R_s.

However, these two variables will always move in the same direction in response to changing opportunity costs such as falling prices. This is true because the media direct more news coverage to groups with a large share of media users. This can be seen in equation (1.8), that equates $\rho'(q_s^*)$ of all groups s, weighted by $n_s p_s \overline{v}_s R_s$. As R_s increases in response to an exogenous change in opportunity costs, $\rho'(q_s^*)$ decreases relative to $\rho'\left(q_{s_1}^*\right)$ for all other groups s_1. Given the restraint on total news space in the media, this implies that news to group s, q_s^*, must increase. Since a larger share of media users in a group will increase news coverage that interests this group, it is sufficient to look at changes in the share of media users, R_s, to ascertain who will gain from a change opportunity costs.

The decline of newspaper importance started when radio became affordable in the 1920s. In 1925, 10 percent of American households had a radio receiver; by 1935, the share had risen to 67 percent, and by 1945 to 88 percent[15]. Media studies claim that, during the late 1930s, radio became the main information provider to low-education groups and to rural listeners who had less ready access to daily newspapers than people living in cities[16]. The decline of newspapers accelerated after World War II with the increased use of television. Between 1950 and 1960, the share of households with televisions increased from 9 to 87 percent. A study by McCombs (1968) shows that, from 1952 to 1964, newspaper and television use increased among people with less than high-school education, and decreased among people with high-school education or more. Strikingly, the group of low media users among blacks with less than high-school education *decreased* from 79 to 49 percent, while the group of low media users among whites with high-school education or more *increased* from 16 to 38 percent.

The cited studies give a number of explanations for these changes. It was less

[15] Sterling and Haight, The Mass Media.
[16] Bogart (1956)

expensive to distribute radio-waves than newspapers to remote areas, and people with little education and low income preferred audible and visual entertainment and information to reading, while people with high education and income preferred reading newspapers. Given this background, falling prices for radio and television receivers and rising real wages for low income earners provided an impetus for the change.

The empirical evidence suggests that the share of media users, R_s, of rural, low-education groups increased during the 1930s, and that R_s among low-income, low-education groups increased between 1952 and 1964. The model predicts that this change should have led to more news coverage on issues that concern these groups (see equation (1.8)). The model further predicts that the simultaneous change in news coverage and the composition of the group of media users should have affected public spending (see equation (1.9)).

In other words, the changes in the media market made it easier for politicians in the late 1930s to make campaign promises to rural areas and groups with low education and income. Similarly, the introduction of television in the late 1950s made it easier to give campaign promises to voters with low education and low income. The model predicts that this would lead to a shift towards public policy programs that benefited the rural population in the late 1930s and a shift towards groups with low education and income in the late 1950s.

1.3.2 Market type: from newspaper duopolies to newspaper monopolies

Model Suppose newspaper B exits the market, leaving newspaper A with a monopoly position. The problem of newspaper A is now to attract non-readers into buying a newspaper.

A reader will buy the monopoly newspaper if his utility from doing so is higher than the opportunity cost of buying a newspaper, that is if

$$w\left(q_s\right) + a_i \geq o_i.$$

Thus a share $R_s^m(q_s) = \int H(w(q_s) + a_i) f(a_i) da_i$ of the voters in group s will read the monopoly newspaper.

The monopoly newspaper's objective is to choose news coverage to maximize profits

$$\max_q \pi = \sum_s n_s p_s R_s^m(q_s)$$

subject to

$$\sum q_s = \overline{q}.$$

The first order condition of the maximization problem is

$$n_s p_s R_s^{m\prime} w'(q_s^*) = \lambda.$$

Under assumptions to ensure concavity of the profit function, this implies the following.

Proposition 6 *A strategy $q \in Q$ that maximizes a newspaper monopoly's expected profits must satisfy, for all s and for some $\lambda > 0$,*

$$n_s p_s \overline{v}_s R_s^{m\prime}(q_s^*) \rho'(q_s^*) = \lambda. \tag{1.10}$$

Note how the incentives for the monopoly differ from those of a duopolistic newspaper. As is seen in the equation above, a monopoly tries to attract the marginal readers $R_s^{m\prime}(q_s^*)$ who are just indifferent between buying a newspaper and not buying any paper. To this end, it concentrates its coverage on issues that concern groups with many such marginal readers. In contrast, duopolies compete fiercely over groups of readers who surely will buy some newspaper. This can be seen in equation (1.8) where equilibrium news coverage is increasing in the share of readers R_s.

To explore what groups gain from a switch from duopoly to monopoly, first assume that the individual preference parameters a_i and b_i are small compared to that of opportunity costs o_i, so that $o_i + \max(a_i, b_i) \approx o_i + a_i \approx o_i$. In this case $R_s \approx R_s^m$. Superscript m is used for the equilibrium with monopoly news media

(z^m, q^m). Variables without superscripts denote equilibrium values with duopoly news media (z, q). As before, equation (1.9) characterizes the political outcome. Let the distributions of opportunity costs of the different groups be translates of some distribution $H_s(w(q_s^*)) = H(w(q_s^*) - t_s)$. A higher t_s implies higher opportunity costs.

Proposition 7 *Assume that $h'(w(q_s^*) - t_s) < 0$. For any $n_s p_s$, there exists a $\bar{t}$ such that $z_s < z_s^m$ for all groups with $t_s > \bar{t}$ and $z_s > z_s^m$ for all groups with $t_s < \bar{t}$.*

Proof: See appendix.

The assumption $h' < 0$ states that the density function is decreasing. This means that there are fewer marginal readers to be attracted in groups who already have a large share of readers.

The proposition states that, comparing groups with a specific advertisement value, $n_s p_s$, all groups with opportunity costs higher than a specific value will receive higher per capita spending when a monopoly media is providing information than when a duopoly media is providing that information. This will be more easily discussed once the function h is characterized below.

The proposition will hold also in a model where duopoly care about attracting non-readers. The reason is that while the monopoly only care about producing news that attract the marginal readers with high opportunity cost, the duopoly care both about this group and readers with low opportunity costs who will buy a newspaper for sure. The monopoly newspaper still care more about low opportunity costs voters and produce more news that interests this group than the duopoly.

Discussion The trend from a competitive newspaper market to a monopolistic newspaper market in many US. cities has been of considerable concern to political scientists, who worry about the effects on democracy of decreasing newspaper competition. In particular, there have been fears that decreasing competition will decrease message diversity.

However, empirical work does not support the hypothesis that competing newspapers present different news. Rather they appear to be "rivals in conformity"

(Bigman, 1948). Willoughby (1955) found that 80 percent of the local political news was carried in both competing dailies. More recently McCombs (1981) noted 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." This lack of diversity has been attributed to traditions of journalism regarding news values and ethical standards, such as objectivity and fairness.

The analysis here suggests another explanation. There are strong economic forces that drive newspapers to cover the same news, even if their readerships have very different characteristics. The reason is that the newspapers are competing for the same marginal readers. For example, assume that because of differences in their editorial pages, one newspaper attracts more liberals and the other more conservatives. People who have a strong political ideology are already in the pocket of one or the other of the newspaper and competition over those will not be a main priority of either newspaper. Instead both newspapers will steer news coverage to attract the marginal readers with weak political preferences. One newspaper's loss is a gain for the other and the incentives of the two newspapers are exactly the same. Thus profit maximization will drive two competing newspapers with different reader stocks to the same news profile.

Even though duopoly media do not create diversity, they do produce different news from monopoly media. These differences in news coverage benefit different groups politically. The key to an understanding of these differences is to understand the different incentives for monopolies and duopolies. These differences were discussed above: duopolies compete fiercely over groups of readers who surely will buy some newspaper; monopolies try to attract marginal readers who are just indifferent between buying a newspaper and not buying a newspaper.

Who are the marginal readers? A survey by Krantz and Weibull (1991) found that the by far most common reason given for considering the termination of a newspaper subscription is the price. With concave preferences, the utility gain of spending the last dollars of income on some alternative good is decreasing in income. So the opportunity cost of buying a newspaper is decreasing in income, and the distribution of opportunity costs can be derived from the income distribution. This hypothesis is consistent with the fact that a larger share of high income earners than low income earners buy newspapers.

In Sweden, household coverage is around 90 percent. This means that people who are close to being indifferent should mainly be found in bottom first and second decile of the income distribution. Thus, monopoly newspapers should cover issues that concern groups with many people in this part of the income distribution. By comparison, duopoly newspapers should ignore issues that concern people who are in the lowest two income deciles. Of course, both monopolies and duopolies may put a high weight on people who are reasonably well off because of their higher value to advertisers. The above argument is an argument about the *relative* focus of monopolies and duopolies.

These differences in news coverage should according to the model translate into differences in public spending. Proposition 7 in section 1.3 shows that services used by voters with high mean income will receive smaller allocations after the shift from duopoly to monopoly. Conversely, services used by voters with low mean incomes will receive more spending under monopoly than under duopoly. Thus a shift from duopoly to monopoly newspaper provision increases the political power of the poor.

Historically, fall in the number of American cities with competing newspapers was particularly marked between 1915 and 1945. In 1915 the share of cities with only one daily was 50 percent; in 1945 this share had risen to 92 percent. The model implies that this shift should have led to an expansion in local government programs benefiting the poor.

1.4 Further extensions of the model

To make the exposition clearer, the model has been kept as simple as possible. It is possible to remove some of these simplifications. Instead of following a voting rule, voters may vote strategically. Instead of maximizing the expected number of votes, the parties may care about policies. And, instead of fixed parameters, l_i and r_i

describe preferences for other fixed policies or personal characteristics of the candidates that are determined endogenous. The extensions of the model are done in the appendix thus merging some aspects of the models of Besley and Coate (1997) and Lindbeck and Weibull (1987).

This exercise sheds some additional light on the effects of mass media on politics. Mass media have different effects depending on the nature of the policies covered. When media cover dimensions which are not strongly ideological, they influence policy but have no affect on voting behavior, as before. When media cover dimensions which are strongly ideological, or personal characteristics of political candidates, they instead influence voting behavior, although the effects are small. On these issues, media have no short run effect on policy. In the long run, policy is affected by media coverage via candidate self-selection. The model also predicts on average larger effects on voting behavior when there are strong ideological differences between the candidates.

An interesting extension of this model would be to study the incentives of news media to cover different candidates in the election.

1.5 Conclusions and empirical suggestions

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 theoretical paper focuses on the effects of mass media on public policy. It argues that mass media may well have significant effects on public policy without changing either voting intentions or public opinion. This means that mass media may be very important for politics despite empirical findings of minimal effects of mass media on voting and public opinion.

Given that mass media has an affect on public policy, one can analyze who will gain and who will loose from the provision of information by mass media firms. The paper argues that economic incentives will force mass media to provide less news to small groups of voters – because of increasing-returns-to-scale – and voters who are not valuable to advertisers. This news bias will translate into a bias in public policy. Small groups and groups that are not valuable to advertisers will receive less favorable policies.

The possible effects of two major changes in the mass media market during this century are also analyzed. One is the decline of newspapers and the rise of broadcast media as the main information source in society. This change increased the proportion of rural, low-income, and low-education media consumers. The model predicts this should have caused an expansion in programs that benefit these groups. Historically, this shift should have had the largest momentum from 1935 to 1945 and from 1956 to 1964. The other change in the media market is the continuing increase in the share of cities with only one daily newspaper. The model predicts that spending on services used by poor groups will increase when a duopolistic newspaper market becomes a monopoly.

The first empirical question to be asked should be whether media coverage and access to news media affect public spending. For example, using panel data, it could be tested whether the increase in spending on agricultural programs in the 1930s can be explained by the increased use of radio receivers in different rural areas, suitably instrumented. The coincidence in time between the expansion of TV and of civil-rights legislation and programs may also be worth investigating. The prediction that minorities generally suffer from mass-media provision of news could also be tested. A positive indication would be if local authorities spend more on programs directed to small groups where newspaper coverage of local politics is very sparse than where coverage is extensive. Finally, it could be tested whether monopoly newspapers produce more news on government programs that benefit the poor, and whether this leads to increased spending on these programs. A panel data study of municipalities during a time period in which many newspaper duopolies turned into monopolies might be suitable.

It may be worth investigating, theoretically and empirically, the effects of mass media on government corruption, or more generally inefficiencies in the public sector. For example, the model in appendix 6.3 predicts that mass media will monitor politics more closely in a duopolistic than in a monopolistic media market. A feasible empirical project would be to relate some measure of government inefficiency to media market structure. It may also be valuable to expand the model describing increasing importance of broadcast media and let two newspapers compete with two broadcast media. Each media would care about attracting consumers from the other firm within the same industry, from the media firms in the other industry, and from the pool of people who don't use any media. This extension of the model would lead to some additional insights on differences in news coverage of different news industries.

1.6 Appendix

1.6.1 Existence and uniqueness of equilibria

Uniqueness in the game of maximizing votes follows from the strict concavity of the utility functions. A solution to the first order conditions (1.4) and (1.5) consists of λ and $z_s^L = z_s^R = z_s$, $\forall s$. Assume 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.

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[17]. 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 show 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 $z_s^L \in (0, I)$, $\Delta u_s \in \left(u_s(0) - u_s(I), u_s(I) - u_s(0)\right)$, and similarly for R. A sufficient condition that implies the above and is easier to interpret is

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

for $\Delta u_s \in \left(u_s(0) - u_s(I), u_s(I) - u_s(0)\right)$, $z_s \in (0, I)$. The above is condition $C1$ in Lindbeck and Weibull (1987). This condition sets an upper limit to the maximum proportional increase in the density function relative to the concavity of the utility function. The condition could be thought of as requiring the parties to be sufficiently

[17]See for example Theorem 1 in Rosen (1965).

uncertain about the voters preferences for the exogenous characteristics, see Lindbeck and Weibull (1987).

The proof for uniqueness in the media game follows the same lines as in the political game. The concavity condition sufficient for existence of equilibrium in the media game is

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

for $q_s^A \in (0, \overline{q})$, $\Delta w_s \in (w_s(0) - w_s(\overline{q}), w_s(\overline{q}) - w_s(0))$, 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 $q_s \in (0, \overline{q})$, $\Delta w_s \in (w_s(0) - w_s(\overline{q}), w_s(\overline{q}) - w_s(0))$.

1.6.2 Value of news

Assume that the utility of the private action is positive in some states of the world, and negative otherwise. Assume further that the expected value of the action is negative for voters who are not informed by mass media. Thus voters who have not been informed by mass media will not take this private action. The expected value of news is then the value of taking the action in the states of the world where it yields positive utility. This expected value of news will be denoted $\overline{v}_s$. Note that since the voters know that in equilibrium both parties will choose the same allocation, they do not need to know the election probabilities to compute the ex ante value of news.

A signal on z_s also has some value to voters that use another publicly provided service j. It says that the rest of the components $z_j, j \neq s$ lie in the $n-1$ dimensional space $\Omega_{-s} = \{z_{-s} \in \Re_+^{n-1} : \sum_{j \neq s} z_j = I - z_s\}$. This restriction together with the original probabilities for z implies new updated probabilities for the components z_j for every z_s. This information is less precise than information about the exact spending level z_j.

Assume that the value of news on the platform spending levels on service s is larger than the cost of the time it takes to read the article for readers using service s, but smaller than this time cost for all readers using any other service. Then only voters who use service s will choose to read articles about spending on service s.

1.6.3 Increasing returns

The bias in news coverage in favor of large groups is driven by the increasing returns to scale feature of news production. By modelling the cost structure in more detail, this section clarifies what type of increasing returns will induce the bias.

The media competition is the same as in section 1.2. There are two newspapers A and B that cover public spending platforms. However, now the total space in the newspaper is not exogenously determined. Rather it is assumed that it is costly to cover news stories and that this cost is described by a cost function, C, that is increasing in news coverage of any issue, q_s, and in the total number of readers of the newspaper, n: $C[q,n]$, $C_{q_s} > 0, C_n > 0, C_{qq} > 0$. The superscripts – A or B – on readership and news space have been suppressed.
Newspaper A chooses news profile to maximize profits

$$\max_q E[\pi(q)] = \sum p_s n_s G(\Delta w_s) - C(q,n)$$

subject to the constraint that the total number of newspaper readers of one newspaper, n, equals

$$n = \sum n_s G(\Delta w_s).$$

The best reply function evaluated at the symmetric equilibrium, $q^A = q^B = q^*$, is such that

$$\frac{\partial \pi}{\partial q_s}(q^*) = 0,$$

which implies

$$n_s (p_s - C_{n_s}) g_s(0) w'(q_s^*) - C_{q_s} = 0.$$

The firm increases news coverage on issue s until the marginal cost of including more news in the paper C_{q_s} equals the marginal benefit of increasing sales, minus the marginal increase in distribution costs C_{n_s}. The reason large groups receive more news coverage is that the revenue is proportional to the size of the group whereas the cost has one part, the cost of including more news in the paper, which is independent of group size.

The bias towards large groups would be smaller if issues that concern only a small group of people are simpler to explain than issues that concern a large part of the population. This would make $C_{n_s q_s} > 0$. It could also be that the marginal cost of printing and distributing news to a certain group is increasing in news coverage to this group. This would make $C_{q_s n_s} > 0$. This could be true for newspapers that target groups with special newspaper editions. This targeting of news will lead to a smaller bias towards large groups than TV. A high, but constant, cost of distributing the information does not imply that bias will be diminished.

In this model, duopolies will in general produce more news than monopolies. The reason is that whereas duopolies may attract readers from both non-readers and readers of the other paper, the monopoly may only attract non-readers. At any level of news production, the marginal costs of the duopolies and the monopoly are the same, but the marginal revenues from increased news production is higher for the duopolies. This result runs contrary to the common wisdom in the literature: a shift from duopoly to monopoly may decrease or increase news production since competitive pressure will decrease, but so will marginal costs. While the latter is true for increasing return to quantity, $C_{nn} < 0$, it is not true in this model with increasing returns to quality. Empirical work, such as Rosse (1970), indicate that $C_{nn} = 0$ in the newspaper industry. The model further implies that the drop in news production should be extra large in rich communities where most people read newspapers and few marginal readers can be attracted by increasing news production.

In connection to this point, an extension of this paper would be to study the relationship between media market structure and inefficiencies in the public sector. For example, one could test if there are differences in local government efficiency in places where there is no local newspaper, where there is a local newspaper monopoly, or where there is a local newspaper duopoly.

1.6.4 Proof of proposition 7

(i) If $h'\left(w\left(q_s^*\right)-t_s\right)<0$ then an increase in opportunity costs will increase news coverage: $\frac{\partial q_s^m}{\partial t_s}>0$.

This follows since, for a monopoly,

$$\frac{\partial q_s^m}{\partial t_s}=\frac{\partial^2 \pi}{\partial t_s \partial q_s^m}/\left|\frac{\partial^2 \pi}{\left(\partial q_s^m\right)^2}\right|,$$

and

$$\frac{\partial^2 \pi}{\partial t_s \partial q_s^m}=-n_s p_s h'\left(w\left(q_s^m\right)-t_s\right) w'\left(q_s^*\right).$$

Thus

$$h'\left(w\left(q_s^m\right)-t_s\right)<0 \Rightarrow \frac{\partial q_s}{\partial t_s}>0.$$

(ii) For duopolistic newspapers, an increase in opportunity costs will decrease news coverage: $\frac{\partial q_s^m}{\partial t_s}<0$.

A state of the world is a vector of users of the different services, $n \sim F_n$. Equilibrium news coverage, $q_s^*(n, p, \bar{v}, t)$, is determined by, for all s, and for all states of the world, n,

$$\left(\frac{\partial \pi}{\partial q_s}\right)_{q^A=q^B=q^*}=n_s p_s H\left(w_s\left(q_s^e\right)-t_s\right) w_s'\left(q_s^*\right)=\lambda,$$

$$q_s^e=\int q_s^*(n) f_n(n)\, dn.$$

Assume that

$$\left(\frac{\partial^2 \pi}{\partial q_s^e \partial q_s}\right)_{q^A=q^B=q} \frac{d q_s^e}{d t_s}/\frac{d q_s^*}{d t_s}<\left(\frac{\partial^2 \pi}{\partial q_s^e \partial q_s}\right)_{q^A=q^B=q}$$

An increase in opportunity cost changes the news coverage in all states of the world q_s^*, and expected news coverage, q_s^e. An increase in expected news coverage increases the marginal profits on issue s by increasing the number of readers in group s. An increase in actual news coverage decreases marginal profits by decreasing the marginal utility of news to users of service s. The assumption says that the first effect is dominated by the latter and is a stability condition[18]. If the assumption was not made then an increase in opportunity cost would increase news coverage which would increase the share of readers to the extent that the marginal gain from raising news coverage would be larger than before.

Take the derivative w.r.t. t_s of the equilibrium condition equalizing marginal profits over all services s and j, $j \neq s$:

$$\frac{1}{dt_s}\left(\frac{\partial \pi}{\partial q_s} = \frac{\partial \pi}{\partial q_j}\right)_{q^A=q^B=q^*}$$

which implies

$$\underbrace{\frac{\partial^2 \pi}{dt_s \partial q_s}}_{<0} + \underbrace{\left(\left(\frac{\partial^2 \pi}{\partial q_s^e \partial q_s}\right)_{q^A=q^B=q} \frac{dq_s^e}{dt_s} \Big/ \frac{dq_s^*}{dt_s} - \left(\frac{\partial^2 \pi}{\partial q_s^e \partial q_s}\right)_{q^A=q^B=q}\right)}_{<0} \frac{dq_s^*}{dt_s} -$$

$$\underbrace{\left(\left(\frac{\partial^2 \pi}{\partial q_j^e \partial q_j}\right)_{q^A=q^B=q} \frac{dq_j^e}{dt_s} \Big/ \frac{dq_j^*}{dt_s} - \left(\frac{\partial^2 \pi}{\partial q_j^e \partial q_j}\right)_{q^A=q^B=q}\right)}_{<0} \frac{dq_j^*}{dt_s} = 0.$$

Assume that $\frac{dq_s^*}{dt_s} > 0.$ Then, because of the budget constraint, $\frac{dq_j^*}{dt_s} < 0$ for some $j \neq s$. But for this j, the above equation can not be satisfied. This implies that $\frac{dq_s^*}{dt_s} < 0$. To characterize the above assumption, note that

$$\left(\frac{\partial^2 \pi}{\partial q_s^e \partial q_s}\right)_{q^A=q^B=q} \frac{dq_s^e}{dt_s} - \left(\frac{\partial^2 \pi}{\partial q_s^e \partial q_s}\right)_{q^A=q^B=q} \frac{dq_s^*}{dt_s} < 0$$

implies

$$h\left(w_s\left(q_s^e\right) - t_s\right) w_s'\left(q_s^*\right) w_s'\left(q_s^e\right) \frac{dq_s^e}{dt_s} - H\left(w_s\left(q_s^e\right) - t_s\right) \left|w_s''\left(q_s^*\right)\right| \frac{dq_s^*}{dt_s} < 0.$$

[18] If the share of readers is not based on expected but actual news coverage, then the above condition is needed to prove the existence of an equilibrium.

The above inequality can be rearranged as

$$\frac{h\left(w_s\left(q_s^e\right)-t_s\right)}{H\left(w_s\left(q_s^e\right)-t_s\right)}\frac{dq_s^e}{dt_s}/\frac{dq_s^*}{dt_s}<\frac{\left|w_s''\left(q_s^*\right)\right|}{w_s'\left(q_s^*\right)w_s'\left(q_s^e\right)}.$$

The ratio of the change in expectation to the change in actual news coverage in any state of the world, n, will be smaller than the ratio of the largest and the smallest change over all states

$$\frac{dq_s^e}{dt_s}/\frac{dq_s^*\left(n\right)}{dt_s}<\left|dq_s^*\left(n^1\right)/dq_s^*\left(n^2\right)\right|=a$$

$$n^1=\arg\max_n\left|dq_s^*\left(n\right)\right|,\ n^2=\arg\min_n\left|dq_s^*\left(n\right)\right|$$

Since $dq_s^*\left(n\right)$ is a continuous function, a will approach 1 as n^1 approach n^2. In other words, as uncertainty about the states of the world decreases, the change in expected news coverage will be closer and closer to the change in the actual news coverage, and a can be thought of as a measure of uncertainty of the number of users of services.

A sufficient condition for the above inequality to hold is

$$a\max\frac{h\left(x\right)}{H\left(x\right)}<\min\frac{\left|w''\left(q_s\right)\right|}{w'\left(q_s\right)w'\left(q_{s'}\right)},$$

for all $x\in\left(w_s\left(\overline{q}\right)-t_{\min},w_s\left(0\right)-t_{\max}\right),\ q_s,q_{s'}\in\left(0,\overline{q}\right)$. This condition will be fulfilled if the concavity of the utility of news is sufficiently high and the distribution of opportunity costs is sufficiently dispersed.

Equation (1.9) characterizes the political equilibrium with some uninformed voters.

$$\rho_sR_sf_su'\left(z_s\right)=\rho_jR_jf_ju'\left(z_j\right)=\lambda,$$

$$\rho_s^mR_s^mf_su'\left(z_s^m\right)=\rho_j^mR_j^mf_j^mu'\left(z_j^m\right)=\mu,$$

and $z_s\gtreqless z_s^m\Leftrightarrow u'\left(z_s^m\right)\lesseqgtr u'\left(z_s\right)$ which implies

$$\frac{\rho_sR_s}{\rho_s^mR_s^m}\gtreqless\frac{\lambda}{\mu}.$$

We will now show that $\frac{\rho_s R_s}{\rho_s^m R_s^m}$ is monotonically decreasing in t_s. First, since $\frac{\partial q_s}{\partial t_s} < 0$, $\frac{\partial q_s^m}{\partial t_s} > 0$, and $\rho_s'(q_s) > 0$, $\frac{\partial}{\partial t_s} \frac{\rho_s(q_s)}{\rho_s^m(q_s^m)} < 0$. Second, $\frac{\partial}{\partial t_s} \frac{R_s}{R_s^m} < 0 \Leftrightarrow$

$$\frac{\partial}{\partial t_s} \ln \left[\frac{H(w(q_s) - t_s)}{H(w(q_s^m) - t_s)} \right] = \frac{h}{H} \left(w'(q_s) \frac{\partial q_s}{\partial t_s} - 1 \right) - \frac{h^m}{H^m} \left(w'(q_s^m) \frac{\partial q_s^m}{\partial t_s} - 1 \right) < 0$$

$$\Leftrightarrow$$

$$\frac{h}{H} / \frac{h^m}{H^m} > \frac{1 - w'(q_s^m) \frac{\partial q_s^m}{\partial t_s}}{1 + w'(q_s) \left| \frac{\partial q_s}{\partial t_s} \right|}$$

The RHS is smaller than 1. If the LHS is larger than one then the above equality will hold. Now $w(q_s) - t_s < w(q_s^m) - t_s$ since $q_s < q_s^m$. But $\frac{h(x)}{H(x)}$ is decreasing in x since $h' < 0$. Thus

$$w(q_s) - t_s < w(q_s^m) - t_s \Rightarrow \frac{h(w(q_s) - t_s)}{H(w(q_s) - t_s)} / \frac{h(w(q_s^m) - t_s)}{H(w(q_s^m) - t_s)} > 1$$

which implies $\frac{\partial}{\partial t_s} \frac{R_s}{R_s^m} < 0$. Since $\frac{\rho_s R_s}{\rho_s^m R_s^m}$ is monotonically decreasing in t_t, there exists a $\bar{t}$ such that $\frac{\rho_s R_s}{\rho_s^m R_s^m}(\bar{t}) = \frac{\lambda}{\mu} \Rightarrow z_s^m = z_s$. Thus $t_s > \bar{t} \Rightarrow z_s^m > z_s$. Further since $\frac{\rho_s R_s}{\rho_s^m R_s^m}$ is monotonically decreasing in t_s it follows that $\frac{u'(z_s^m)}{u'(z_s)}$ is monotonically decreasing in t_s.

1.6.5 Citizen candidates

In this section, the extended model with endogenous candidate referred to in section 1.4 is developed. The set of players are now the set N of citizens; there are no a priori parties. Suppose that there is an issue, such as abortion, that does not require spending and that all citizens care about. This issue will be indexed by zero and citizen i's blisspoint in this policy space will be denoted z_0^i.

In stage zero of the game, nature draws the citizens blisspoints on issue zero from a known continuous probability distribution, and each citizen receives a signal containing his private blisspoint. In stage one of the game, the candidates declare themselves and mass media informs all readers/viewers of the candidates' identities and ideological blisspoints. In stage two, the candidates announce election platforms, and, as before, these announcements are covered by the mass media and observed only by a fraction of the voters using mass media. In the third stage, the citizens choose for whom to vote among the declared candidates. In stage four the winning candidate implements his platform.

I will study the properties of two-candidate equilibria where both candidates have fixed policy positions only in the ideological dimension. In other words, the candidates do not themselves benefit from any type of public spending and are therefore able to credibly promise any spending levels. It is assumed that some citizens do not benefit from any of the public services. The citizens understand that a candidate will act according to his own preferences on all issues after the election. Where he is indifferent he will follow his announced platform.

The platform of a candidate, l, now consists of a policy position in the ideological policy dimension and proposed spending levels on the publicly provided services $z^l = (z_0^l, z_1^l, ..., z_S^l)$. Given a candidate set C, the set of platforms will be denoted $Z = \left(z^i\right)_{i \in C \cup \{0\}}$.

Citizen i's preferences for candidate l's announced platform is described by the utility function $v_{il} = u_s\left(z_s^l\right) + v\left(\left|z_0^i - z_0^l\right|\right)$,where citizen i uses service s. The function v is an increasing function and $v\left(\left|z_0^i - z_0^l\right|\right)$ is what was previously called l_i or r_i. The citizens face a cost δ of running for office.

The game is solved backwards, so first we solve for the voting equilibrium. Given a candidate set $C \subset N$, and associated platforms, each citizen may decide to vote for any candidate in C or abstain. Let $\vartheta_j \in C \cup \{0\}$ denote citizen j's decision. If $\vartheta_j = i$, then j casts his vote for candidate i while if $\vartheta_j = 0$, he abstains. A vector of voting decisions are denoted $\vartheta = (\vartheta_1, ..., \vartheta_N)$. The probability that candidate i wins, i.e. receives the most votes, is denoted $P^i\left(Z, \vartheta\right)$.

Citizens correctly anticipate the policies that would be chosen by each candidate and vote strategically. A voting equilibrium is a vector of voting decisions ϑ^* such that for each citizen $j \in N$ (i) ϑ_j^* is a best response to ϑ_{-j}^* i.e.

$$\vartheta_j^* \in \arg\max \left\{ \sum_{i \in C} P^i\left(Z, \left(\vartheta_j, \vartheta_j^*\right)\right) v_{ji} \mid \vartheta_j \in C \cup \{0\} \right\}$$

(ii) ϑ_j^* is not a weakly dominated voting strategy. Ruling out the use of weakly dominated strategies implies sincere voting in two-candidate elections.

Assume that a subset $R \subset N$ has been informed by the media about the election platforms of the candidates. The share of voters using service s who are informed is, as before, determined by equation (1.8). The uninformed voters N/R knows neither the candidates position on the ideological issue, nor their proposed spending levels.

The next step is to determine what platforms the candidates will select. In a two-candidate election, voting is sincere. The probability that individual i, using service s, will vote for candidate L is

$$u_s\left(z_s^L\right) - u_s\left(z_s^R\right) \geq v\left(\left|z_0^R - z_0^i\right|\right) - v\left(\left|z_0^L - z_0^i\right|\right) = r_i - l_i$$

Candidates R and L correctly assign the probability distribution F to $r_i - l_i$. Thus the probability that individual i will vote for candidate L is $F\left[u_s\left(z_s^L\right) - u_s\left(z_s^R\right)\right].$ Under these assumptions, the solution to the game of maximizing votes is the same as the solution to the game of maximizing the probability of election. This is a slight generalization of theorem 5 of Lindbeck and Weibull (1987) and is shown below.

Proposition 8 *Suppose that there are two candidates, that the number of non-abstaining voters is odd, and that $r_i - l_i$ are independently and identically distributed for all voters. Then 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 some $\lambda_0 > 0$*

$$R_s \rho_s n_s u_s'\left(z_s\right) = n_s \lambda_0 \tag{1.11}$$

Since the equation above is the same as equation (1.9), and since news coverage is still determined by equation (1.8) all previous results concerning public spending will remain intact.

Were three candidates to run for election, parties R and L would choose the same election platforms as in the two candidate race while the third candidate might choose any platform. The reason is that under the conditions for a two-candidate equilibrium, no voter will change his vote in comparison to the two-candidate election since doing so will reduce the probability of the candidate he supports among R and L of winning, while the third candidate will still lose the election for sure (see below).

The final step is to determine what citizens will enter as candidates. Only pure strategies will be considered. Each citizen must decide whether or not to run for office. Citizen i's pure strategy is $s^i \in \{0,1\}$, where $s^i = 1$ denotes entry, and a pure strategy profile is $s = \left(s^1, ..., s^N\right)$. Given s, the set of candidates is $C(s) = \left\{i \mid s^i = 1\right\}$. Let $\vartheta(Z)$ denote the voting decisions when the candidate set is C with associated platforms Z. Since the other voters' blisspoints are not known, the citizens assign a probability distribution to the voting vector and the election outcome.

Proposition 9 *Suppose that a political equilibrium exists in which citizens R and L run against each other. Then*

(i) $P^R(v_{RR} - v_{RL}) \geq \delta$, and $P^L(v_{LL} - v_{LR}) \geq \delta$,

(ii) if for all possible outcomes of $\left(z_0^j\right)_{j \in I_N}$, $\#N_0 + 1 < \max(\#N_R, \#N_L)$ *these conditions are sufficient for a political equilibrium to exist in which R and L run against each other.*

The first condition guarantees that it is worthwhile for the candidates to stay in the race and pay the cost δ rather than drop out and let the other candidate win for sure. This means both that the utility differences between the candidates must be sufficiently large, and that the probability of winning must be sufficiently large for both candidates.

Due to the lack of uncertainty in Besley & Coate (1997), the probability of election must be exactly $1/2$ for any candidate to enter. Thus in a one dimensional model with euclidean preferences, candidate platforms must be on equal and opposite distance from the median in the electorate. In this model, this is not exactly true, but the candidates must move closer and closer to equal and opposite positions as the electorate increases.

The second condition guarantees that a third candidate cannot win the election. Since a potential candidate cannot affect equilibrium spending levels, and can only change the election outcome to increase the election probabilities of his least preferred candidate outcome, no citizen will choose to enter as a third candidate.

In sum this section endogenizes the ideological preference differences, r_i and l_i. In doing so, it turns out that all previous results remain intact. However, now the voting preferences of uninformed and informed voters may differ. While the uninformed will vote 50/50 for each candidate or abstain, the informed will vote with a probability that may be different from 50 percent for each candidate. The allowed difference depends on how far apart the candidates platforms are. If their platforms are far apart, a candidate may stay in the race even though his probability of winning the election is low. In this sense media coverage will affect voting, although these effects are likely to be small.

1.6.6 Platform selection with two parties maximizing the probability of election

This section provides a slight generalization of theorem 5 in Lindbeck and Weibull (1987). In this theorem, the groups who benefit from spending can only consist of one member. Here they can be of any size. For every voter, let e_i be a random variable that indicates whether individual i votes for party L,in which case $e_i = 1$, or party R,in which case $e_i = 0$. Then the probability that party L wins the election is $P^L = \Pr\left(\sum e_i > n/2\right)$, and $P^R = 1 - P^L$. A pure strategy equilibrium in the game of maximizing the election probability is characterized by $P^L\left(z^L, z^{R*}\right) \leq P^L\left(z^{L*}, z^{R*}\right) \leq P^L\left(z^{L*}, z^{R*}\right)$ for all $z^L \in X$ and all $z^R \in X$. Assume that there is an odd number voters. Focusing on voter i, one can write the probability that party L wins the election as the sum of the probability that the voters excluding i gives party L a plurality and the probability that i is pivotal in the election.

$$P^L = \Pr\left(\sum_{j\neq i} e_i > n/2\right) + \Pr\left(\sum_{j\neq i} e_i = (n-1)/2\right) p_i.$$

If a pair (z^R, z^L) is a Nash equilibrium, then there exists λ, μ such that

$$\rho_s \sum_{i \in I_s} \Pr\left(\sum_{j \neq i} e_i = (n-1)/2\right) f(\Delta u_s) u'\left(z_s^L\right) = n_s \lambda$$

$$\rho_s \sum_{i \in I_s} \Pr\left(\sum_{j \neq i} e_i = (n-1)/2\right) f(\Delta u_s) u'\left(z_s^R\right) = n_s \mu$$

By the same arguments as in the proof of proposition 1.3, this implies $z^L = z^R$. Further since the prior voting probabilities $F(0)$ are the same for all individuals, the probability that any voter is pivotal is identical. Let $\lambda_0 = \lambda / \Pr\left(\sum_{j \neq i} e_i = (n-1)/2\right) f(0)$. Then equation (1.3) follows.

1.6.7 Platform selection in three candidate competition

Given the candidate set C, with an associated set of platforms $Z = \left(z^i\right)_{i \in C \cup \{0\}}$, a partition of the electorate, $(N_i)_{i \in C \cup \{0\}}$ is said to be *sincere* if and only if (i) $k \in N_i$ implies that $v_{ki} \geq v_{kj}$ for all $j \in C$, $k \in N_0$ implies that $v_{ki} = v_{kj}$ for all $i, j \in C$. Now, $v_{ki} = v_{kj}$ implies $v\left(\left|x_k - x^i\right|\right) - v\left(\left|x_k - x^j\right|\right) = u_s\left(z_s^j\right) - u_s\left(z_s^i\right)$. Note that since the blisspoints x_k are drawn from a continuous distribution then the $E[\#N_0] = 0$.

In a three-candidate elections. The following voting strategy supports the equilibrium. Let (N_R, N_L, N_0) be a (stochastic) sincere partition given the candidate set $C = \{R, L\}$ and announced platforms $Z = \left(z^L, z^R\right)$, and (stochastic) preferences $(x_j)_{j \in I_N}$. Let $\widehat{\vartheta}$ be the sincere strategies, $\widehat{\vartheta}_j(C) = R$ if $j \in N_R$, $\vartheta_j(C) = L$ if $j \in N_L$, and $\vartheta_j(C) = 0$ if $j \in N_0$. For two candidates, L and R, $\widehat{\vartheta}(C, Z)$ is the equilibrium described by equation (1.11).

Second, for all citizens $k \in N_0 / \{R, L\}$, let $\overline{N}_k = \{j \in N \mid v_{jk} > v_{jR} = v_{jL}\}$, $\underline{N}_k = \{j \in N \mid v_{jk} < v_{jR} = v_{jL}\}$. Now if $v_{kL} > v_{kR}$, let $\vartheta\left(\{L, R, k\}, \left(z^L, z^R, z^k\right)\right)$ be the vector of voting decisions generated by the partition $\left(N_L, N_R \cup \underline{N}_k, \overline{N}^k, N_0/(\underline{N}_k \cup \overline{N}^k)\right)$. Similarly, if $v_{kL} < v_{kR}$, let $\vartheta\left(\{L, R, k\}, \left(z^L, z^R, z^k\right)\right)$ be the vector of voting decisions generated by the partition $\left(N_L \cup \underline{N}_k, N_R, \overline{N}^k, N_0/(\underline{N}_k \cup \overline{N}^k)\right)$. Since $\#\overline{N}^k < \#N_0 + 1 < \max(\#N_L, \#N_R)$ for all possible outcomes of $(x_j)_{j\in I_N}$, candidate k will never win the election. Further since $E[\#N_0] = E\left[\#\overline{N}^k\right] = E[\#\underline{N}_k] = 0$, P^L and P^R are the same whether or not citizen k is a candidate, the equilibrium spending levels are the same, namely those described by equation (1.11).

1.6.8 Note to proposition 9

In order to understand proposition 9, note that the number of votes is a sum of independent and identically distributed Bernoulli random variables, and that the series $\sum_{i=1}^{\infty} p_i q_i$ is divergent. By the Central limit theorem, this implies that

$$\lim_{n\to\infty} \Pr\left(\frac{\sum_{i=1}^{n} e_i - \sum_{i=1}^{n} p_i}{\left(\sum_{i=1}^{n} p_i q_i\right)^{\frac{1}{2}}} \leq x\right) = \Phi(x)$$

where $\Phi(x)$ is the standard normal distribution. The probability that candidate L wins the election is thus

$$P^L = \Phi\left(\sqrt{n}\frac{p-\frac{1}{2}}{\sqrt{p(1-p)}}\right)$$

where $p = F(0)$. Condition (i) says that the probability for both candidates to stay in the race is that they both have a sufficiently high probability of winning the election. Clearly the above condition implies that as n increases, p must lie closer and closer to 1/2 for both candidates to stay in the race. Since F is the distribution of $v(|x_l - x_i|) - v(|x_r - x_i|)$, $F = 1/2$ means that x_l and x_r are on equal distance from the median, x_m, in the electorate. Thus condition (i) says that the difference in $|x_l - x_m| - |x_r - x_m|$ is decreasing in the number of voters in the electorate.

1.6.9 List of variables

Endogenous variables

q_s^A, q_s^B : news space devoted to issue s

z^L, z^R : platform spending levels

n^L, n^R : the number of votes of party L and R respectively

π^A, π^B : profits of newspaper A and B respectively

R_s : share of the voters who use service s who use mass media

R_s^m : share of the voters who use service s who use the monopoly mass media

$\rho(q_s)$: the probability that a reader will spot news on issue s

$u_s(z_s)$: utility of using service s when spending per capita is z_s

$w_s(q_s) = \rho(q_s)\,\overline{v}_s$: the expected utility from a newspaper with newsprofile q to a reader using only service s.

$\Delta u_i = E_i\left[u_s\left(z_s^L\right) - u_s\left(z_s^R\right)\right]$

$\Delta w_s = w_s\left(q_s^A\right) - w_s\left(q_s^B\right)$

Exogenous parameters, sets, and functions

a_i, b_i : voter i's valuation of the fixed characteristics of newspaper A and B respectively.

l_i , r_i : voter i's valuation of the fixed characteristics of party L and R respectively

o_i : the opportunity cost of voter i of using the media

t_s : shift parameter of the distribution of opportunity costs

p_s : payment per reader belonging to group s from newspaper sales and advertising

N : number of voters

S : number of services

n_s : number of voters using service s

I : total budget

$\overline{q}$: total space in the newspaper

$\overline{v}_s$: exogenous private value of news.

Q : set of feasible news profiles

X : set of feasible spending levels

F_i : probability distribution of the difference $r_i - l_i$

G_i : probability distribution of the difference $b_i - a_i$

H_i : distribution of o_i.

Indices

A, B : newspaper indices

L R : party indices

i : voter index

s : service index.

Bibliography

[1] Alesina, Alberto, "Macroeconomic Policy in a Two Party System as a Repeated Game", Quarterly Journal of Economics, 1987, 102, 651-78.

[2] Bartels, Larry M., "Messages Received: The Political Impact of Media Exposure", American Political Science Review, 1993, Vol. 87, No.2, 267-284.

[3] Becker, Gary S., "A Theory of Competition Among Pressure Groups for Political Influence", Quarterly Journal of Economics, 98, 371-400.

[4] Bogart, Leo, "A study of the viewing habits and impact of television on American life", New York, Ungar Publishing Co., 1956.

[5] Coughlin, Peter J., "Elections and income redistribution", Public Choice, 1986, 50, 27-91.

[6] Dunnett, Peter J. S., "The World Newspaper Industry".

[7] Dunnett, Peter J. S., "The World Television Industry".

[8] Ferejohn, John, "Incumbent performance and electoral control", Public Choice, 1986, 50 (1-3), 5-25.

[9] Graber, Doris A., "Mass Media and American Politics", 1984, Washington DC: Congressional Quarterly.

[10] Harrington, Joseph E., "Economic Performance, and Elections", American Economic Review, March 1993, 83, 27-42.

[11] Hinich, Melvin J., John O. Ledyard, Peter C. Ordeshook, ”A theory of Electoral Equilibrium: A Spatial Analysis Based on the Theory of Games”, The Journal of Politics, 1973, 35, 154-193.

[12] Holmström, Bengt, and Paul Milgrom, ”Multitaks Principal-Agent Analysis: Incentive Contracts, Asset Ownership, and Job Design”, Journal of Law, Economics and Organization, 1991, 7, 24-52.

[13] Lindbeck, A., Jörgen W. Weibull, ”Balanced-budget redistribution as the outcome of political competition”, Public Choice, 1987, 52, 273-97.

[14] Iyengar, Shanto, and Donald R. Kinder, ”News That Matters: Television and American Opinion”, 1991, University of Chicago Presss.

[15] Litman, Barry, ”Microeconomic Foundations”, in Picard, Winter, McCombs and Lacy (editors) ”Press Concentration and Monopoly”, 1988, 17-34.

[16] Lohmann, Susanne, ”Electoral Incentive, Political Intransparency and the Policy Bis Toward Special Interests”, UCLA, 1994.

[17] Mander M., 1978, ”The Integration of Advertising and Circulation Sales Policies”, in H. Henry (ed.), 1978, ”Behind the Headlines: The business of the British Press: Readings in the Economics of the Press”, Associated Business Press, London, 72-80.

[18] Masson, Robert T., Ram Mudambi, and Robert J. Reynolds, ”Oligopoly in advertiser supported media”, Quarterly Review of Economics and Business, 1990, 30, 3-16.

[19] McCombs, Maxwell E., ”Negro Use of Television and Newpapers for Political Information, 1952-1964”, Journal of Broadcasting, 1968 Vol. XII, No. 3, 261-266.

[20] Olson, Mancur, ”The Logic of Collective Action”, Cambridge: Harvard University Press.

[21] de Palma, A., V. Ginsburgh, Y.Y. Papageorgiou, and J.-F. Thisse, "The Principle of Minimum Differentiation Holds under Sufficient Heterogeneity", Econometrica, July, 1985, 53, 767-81.

[22] Persson, Torsten, and Guido Tabellini, "Macroeconomic Policy, Credibility and Politics", 1990, Chur: Harwood Academic Publishers.

[23] Princeton Survey Research Associates, 1996, [Opinion poll asking respondents how they got most of their news about the presidential election campaign], Public Opinion Online, Available: Nexis; Library: Market; File:Rpoll; Accession number: 0268658.

[24] Rogoff, Kenneth, "Equilibirum Political Budget Cycles", American Economic Review, march 1990, 80, 21-36.

[25] Roper, Burns W., "Trends in Public Attitudes toward Television and Other Mass Media 1959-1974", New York: Television Information Office, 1975.

[26] Rosen, J.B., "Existence and Uniqueness of Equilibrium Points for Concave N-Person Games", Econometrica, 1965, Vol. 33, No. 3, 520-534.

[27] Rosse, James N., "Estimating Cost Function Parameters Without Using Cost Data: Illustrated Methodology", Econometrica, Vol. 38, No. 2, March 1970, 256-275.

[28] Rosse, James N., and James N. Dertouzos. "The Evolution of One Newspaper Cities." In Federal Trade Commission, Proceedings of the Symposium on Media Concentration, Volume 2, pp 429-471. Washington, DC: Government Printing Office, 1979.

[29] Spence, Michael, and Bruce Owen, "Television programming, monopolistic competition and welfare", Quarterly Journal of Economics, 1977, 91, 103-126.

[30] Steiner, Peter O., "Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting" Quarterly Journal of Economics, 1952, 66, 194-223.

[31] Sterling, Christopher H., and Timothy R. Haight, "The Mass Media: Aspen Institute Guide to Communcation Industry Trends", New York: Prager, 1978.

[32] Thompson, R.S., "Circulation Versus Advertiser Appeal in the Newspaper Industry: An Empirical Investigation", The Journal of Industrial Economics, Vol. 37, March 1989, p259-271.