The Political Economy of State Television

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Abstract

How does the presence of government-controlled media affect political outcomes? What happens when the state monopoly is broken by the introduction of commercial television? We develop a retrospective voting model in which voters are risk-averse and they are uncertain about the ability of politicians. In equilibrium the amount of effort that the incumbent exerts in favor of aparticular socio-economic group depends on the share of informed voters within that group. Ex ante the incumbent selects the intensity of television coverage for different socio-economic groups. If there is only state television, the incumbent provides non-zero news coverage for each group and he tends to equalize the share of informed voters across groups. The effect of introducing commercial television depends on the characteristics of voters' demand for news as opposed to televised entertainment. We examine evidence from Sweden and from the Eurobarometer.

Broadcasting is an exceptional industry. Unlike most other consumer goods and services, in most countries the state is still directly involved in the production of television programs. In the average Western European country about 50% of the five television channels with the largets audience are state-owned. This proportion increases to 70% in East Asia/Oceania, 85% in Africa, and 94% in the Middle East. The most notable exception is the United States in which the five largest channels are all privately owned (Djankov et al.).

The existing comparisons between state broadcasting and commercial broadcasting are based on the assumption that the former is managed by a benevolent planner.[1] But, as we shall argue briefly, in today's democracies

[1] Coase [3] argued that broadcasting is an inherently non-excludable good and it is likely to be underprovided by the private sector. A factor that Coase did not predict was the stunning growth of television advertising revenues, which potentially undermine the underprovision critique. Anderson and Coate [1] provide a comprehensive analysis of possible market failures in advertising-financed commercial broadcasting, and they show that there may be both underprovision and overprovision. They also discuss the effect of introducing technology that makes broadcasting excludable (pay television).

state broadcasting is to some degree under the control of elected governments. Moreover, mass media play an important role in ensuring government accountability. We thus face an interplay between elected politicians, an electorate that derives information from mass media, and a mass media industry that is in part government controlled. The present paper is a first step towards modeling this complex interplay with political economy tools.

To understand the relationship between government and government-owned broadcasting, it is instructive to examine the governance structure of the prototypical state television: the British Broadcasting Corporation (BBC). The BBC is overseen by a Board of Governors who: (1) Sets key objectives; (2) appoints the Director General and the members of the Executive Committee; (3) Approves strategy and monitors performance. The twelve BBC Governors are formally appointed by the Queen but they are in practice chosen by the government. The BBC is mostly financed through a television licence fee, which is paid by households. The fee level is set by the government.[2]

On the one hand, it is widely accepted that the BBC enjoys a high level of journalistic independence. It is often critical of goverment policy, sometimes in a harsh adversarial fashion (witness its recent reporting on the government's treatment of WMD evidence in Iraq). On the other hand, there is no doubt that the government, through the Board of Governors, has some control on what the BBC does. By setting the key objectives (and appointing people who agree with them), the Board influences the focus of BBC programming. A typical key objective is to increase the audience share in certain segments of the population. For instance, in 2001/2 the board asked the BBC to increase coverage for the young and for ethnic minorities. To comply with this key objective, the BBC has plans to launch a new channel aimed at a young audience (BBC3), a digital services targeting the black community and a digital service targeting the Asian community. At the risk of oversimplification, we can say that the British government has some ex ante control on BBC programming but no ex post control (BBC [**?**, p. 13]). They can decide what segments of the population the BBC should target and what types of program it should. But once the key objectives are in place, the government has no say on contents. In particular there is full journalistic freedom.

Our stylized BBC model is clearly not the only possible view of state broadcasting. One could assume that the government has also ex post control: it is able to suppress news after events occur. This more pessimistic take on the media is explored in Besley and Prat [**?**]. Here, we wish to analyze what is perhaps the best-case scenario of government-controlled television. [3]

[2] Information about the governance of the BBC is available on: http://www.bbc.co.uk/info/running/.

[3] Obviously, there could exist a state-owned television over which the government has

We shall take the stylized view of the BBC as our starting point. Television viewers are divided into socio-economic groups. Viewers in each group are interested in particular public goods. For instance, parents of young children are more affected by education, senior citizens are more interested in health care, etc. The government decides the amount of resources the state television should devote to covering news that affect a particular socio-economic group (*coverage*). The coverage level determines how much viewers know about provision of the public good that is relevant to their group. The government can only influence coverage. Once resources are in place, journalists will report freely even when their findings hurt the government.

We use a two-period retrospective voting model. In the first period, an incumbent is exogenously in power and there is uncertainty about the incumbent's ability. Ability, together with effort, determines the amount of public good that the incumbent provides to each socio-economic group. While ability is constant, the incumbent can differentiate effort exertion across groups (effort can be interpreted as avoiding rent extraction). In the beginning of the second period, there is an election in which voters choose between the incumbent and a challegner of unknown quality. Voters are risk averse (in the amount of public good they consume). Therefore, on average they prefer an incumbent of known quality to an unknown challenger.

A first set of results describes the political equilibrium for a given coverage. The higher the coverage in a certain socio-economic group, the more effort the incumbent will exert for that group, the higher the amount of public good provided. Overall, a higher share of informed voters also increases the ex ante probability that the incumbent is re-elected. Because of voter risk-aversion, an incumbent who does not know his type benefits from committing to revealing information about himself.

Given the results above, one can see what happens if there is only state television. The incumbent decides how much coverage to provide to every socio-economic group. By increasing coverage, the incumbent increases both his re-election probability and his effort exertion. Given a effort cost function with the usual properties, the incumbent chooses to provide partial coverage. Moreover, the incumbent tries to equalize information across socio-economic groups. If some groups are more informed for exogenous reasons, they receive less coverage from state television.

We can also predict what changes when the state monopoly is broken, as it happened in most European democracies in the 80's and 90's. Commercial television brings more news programs and more entertainment programs (the selfish incumbent has no reason to produce entertainment). The effect on voter information is ambiguous and it depends on whether voters are

no control. However, it is difficult to imagine who the management of such an organization would be accountable to. Would voters elect them directly? Would they be appointed by co-optation?

more interested in news or entertainment. With commercial broadcasting, socio-economic groups in which voters are more interested in entertainment receive less public good provision.

Empirical bit [TO DO]

Related Literature [TO DO]

The next two sections provide a theoretical analysis. Section 1 examines the political game for a given coverage vector. We construct and analyze a two-period retrospective voting model. We consider both sincere and pivotal voting. Section 2 endogenizes news provision. The incumbent chooses the coverage of state television. Commercial broadcasters maximize profit. We consider three scenarios: (1) only state television; (2) only commercial television; (3) both types of ownership. Section 3 considers the available evidence [TO DO]. Section 4 concludes [TO DO]

1 A Model of Retrospective Voting

In this section we introduce the voting model that will be used in the rest of the paper. It is a modification of a standard two-period retrospective voting setting (Persson-Tabellini chapter ?). The main feature is that the population is divided into various social groups which value public goods in a different way. The closest model is Lohmann (?).

1.1 Model

In this two-period retrospective voting models, there are: voters, an incumbent who is exogenously in power in the first period, a challenger who appears in second period. At the beginning of the second period voters decide whether to re-elect the incumbent or replace him with the challenger.

Voters are divided into M socio-economic groups. Group i has mass n_i. Total mass is $\sum n_i = 1$. All voters in group i have the same income y_i. Voters' payoffs are additive over the two periods and there is no discounting. In period 1 voter j belonging to group i receives utility

$$u(y_i) + v(x_{ij}),$$

where u and v are twice differentiable and concave. The two components y_i and x_{ij} capture respectively private and public consumption. As we shall see, private consumption plays no role in retrospective voting but it will be important later on when we examine demand for news. Public consumption is given by

$$x_{ij} = g_i + \beta_j + \eta,$$

where:

- g_i is the level of public good provision (to be discussed shortly);
- β_j is an idiosyncratic preference shock about the incumbent that affects the utility that voter j derives from the incumbent. It is independent across voters (and across voter groups) and it is uniformly ditributed on $\left[-\frac{1}{2}B, \frac{1}{2}B\right]$ where $B > 2$;
- η is a systematic preference shock about the incumbent that affects all voters in the same way. It is uniformally distributed on $\left[-\frac{1}{2}, \frac{1}{2}\right]$.

In period 2, voters payoffs depend on whether the voters have chosen the incumbent or the challenger. Income is unchanged. The payoff of voter i in group j is

$$u(y_i) + v(x_{ij2})$$

If the incumbent is re-elected, public consumption is

$$x_{ij2} = g_{i2} + \beta_j + \eta,$$

where g_{i2} will be discussed shortly and the preference shocks β_j and η are the same as in the first period. If the challenger is elected, public consumption is:

$$x_{ij2} = g_{i2}^c,$$

where g_{i2} will be discussed shortly. We assume that the challenger is not affected by preference shocks. This is a useful simplifying assumption which does not affect results in a qualitative way (more on this later).

The incumbent is characterized by type θ which is uniformly distributed on $\left[-\frac{1}{2}t, \frac{1}{2}t\right]$ with $t \in [0, \bar{t}]$. For technical reasons, we assume that $\bar{t} < \frac{1}{2} - T$, where T is the unique solution of $v(T) = E[v(\theta)]$ (this in turn imposes a bound on the curvature of v – the voter cannot be too risk-averse).

In the first period the incumbent chooses an effort vector $e = (e_1, ..., e_M)$ with $e_i \geq 0$. The effort, together with the innate ability, determine the level of public good provision for group i:

$$g_i = \theta + e_i.$$

If the incumbent is re-elected, in the second period she chooses another effort vector $e_2 = (e_{12}, ..., e_{M2})$ with $e_{i2} \geq 0$. The public good level for grouo i is

$$g_{i2} = \theta + e_{i2}.$$

The challenger has a type as well, θ^c, which has the same distribution as (but is independent of) θ. If elected, the challenger selects an effort vector $e_2^c = (e_{12}^c, ..., e_{M2}^c)$ and the public good level for group i is

$$g_{i2}^c = \theta^c + e_{i2}^c.$$

The incumbent's payoff is

$$\begin{cases} -\frac{c}{2}\sum_i n_i e_i^2 & \text{if he is not re-elected} \\ 1-\frac{c}{2}\sum_i n_i e_i^2 - \frac{c}{2}\sum_i n_i e_{i2}^2 & \text{if he is re-elected} \end{cases},$$

where c is a positive parameter that measures his dislike for effort. It is a dominant strategy for the incumbent to put no effort in the second period. In every equilibrium $e_{i2} = 1$ and $g_{i2} = \theta$. The challenger receives payoff zero if he is not elected and $1 - c\sum_i n_i e_{i2}^c$. Like the incumbent, also the challenger always exerts minimal effort, and $g_{i2}^c = \theta^c$.

In the beginning of the game, the ability type θ is unknown to everybody, including the incumbent. At the end of period 1, every voter j receives a signal $z_j = \beta_j + \eta$. The voter knows what his preference shock for the incumbent is but she cannot disentangle the idiosyncratic and the systemic component. In every group i a share s_i of voters also observe g_i. All s_i's are common knowledge among voters and candidates. The voters who only observe z_j are called *uninformed*, while the ones who know the public good level as well are called *informed*. Voters do not observe effort.

To summarize, timing is:

Period 1
- Nature selects θ, which remains unknown.
- Incumbent selects effort vector e. g_i is realized
- In every group i, a share $1-s_i$ of voters are uninformed and they observe only $\beta_j + \eta$. A share s_i of voters are informed and they observe g_i and $\beta_j + \eta$.

Period 2
- Voters vote for the incumbent or the challenger;
- If the incumbent wins, g_{i2} is realized. If the challenger wins, g_{i2}^c is realized.

1.2 Sincere voting

As there is a continuum of voters, there are multiple subgame perfect equilibria. We focus on two classes: sincere equilibria and pivotal equilibria. In a sincere equilibrium (also called naive equilibrium), each voter selects the candidate that provides her with the higher expected utility. In a pivotal equilibrium (also called sophisticated equilibrium), each voter selects the candidate that provides her with the higher expected utility *conditional on the event that the voter's ballot is pivotal on deciding the election.* In our model, the two equilibria turn out to be qualitatively similar but the sincere equilibrium is much simpler to compute and it yields a nice closed form solution. We study the sincere equilibrium in this section and we use it throughout the text. We discuss the pivotal equilibrium in the next subsection.

We prove:

Proposition 1 *In a pure-strategy sincere equilibrium, the incumbent selects effort*

$$e_i^* = \frac{s_i}{c}.$$

An informed voter j in group i votes for the incumbent if and only if

$$z_j \geq g_i - e_i^* - T.$$

An uninformed voter j re-elects the incumbent if and only if

$$z_j \geq 0.$$

The incumbent is re-elected with probability

$$P(e^*) = \frac{1}{2} + sT.$$

Proof. In a sincere equilibrium, voters vote for the politician who provides higher second period expected utility. An uninformed voter prefers the incumbent if

$$E\left[v\left(\theta + \beta_j + \eta\right)\right] \geq E\left[v\left(\theta^c\right)\right],$$

which implies

$$\beta_j + \eta \geq 0$$

as θ and θ^c have the same distribution.

Consinder now an informed voter in group i who believes that the incumbent's type is $\widehat{\theta}_i$. He prefers the incumbent if

$$v\left(\hat{\theta}_i + \beta_j + \eta\right) \geq E\left[v\left(\theta^c\right)\right],$$

or equivalently,

$$\hat{\theta}_i + z_j \geq \phi\left(E\left[v\left(\theta^c\right)\right]\right) \equiv -T < 0$$

where $\phi = v^{-1}$. Jensen's inequality guarantees that $T > 0$, which captures the *incumbency informational advantage.* For the same expected value, risk aversion make voters prefer the candidate they know to the one they do not know. We have assumed that there are no preference shocks on the challenger. If there were, the incumbency advantage would be higher.

An informed voter in i observes $g_i = \theta_i + \log e_i$. If the voter conjectures that the incumbent exerts effort $\widehat{e}_i$, her belief on θ_i is

$$\hat{\theta}_i = g_i - \log \widehat{e}_i = \theta + e_i - \widehat{e}_i.$$

She re-elects the incumbent if and only if

$$\beta_j + \eta \geq \log \widehat{e}_i - \theta - e_i - T.$$

Given $\hat{\theta}_i$ and η, the probability that an informed voter in i votes for the incumbent is

$$\begin{aligned} \Pr\left(z_j \geq -\hat{\theta}_i - T|\eta\right) &= \Pr\left(\beta_j \geq -\eta - \hat{\theta}_i - T\right) \\ &= \frac{1}{2} + \frac{1}{B}\left(\eta + \hat{\theta}_i + T\right) \end{aligned}$$

and the probability that an uninformed voter chooses the incumbent is

$$\Pr\left[\beta_j \geq \eta\right] = \frac{1}{2} + \frac{1}{B}\eta$$

The incumbent share of votes in group i is

$$S_i = \frac{1}{2} + \frac{1}{B}\eta + \frac{1}{B}s_i\left(\hat{\theta}_i + T\right)$$

The incumbent is elected if and only if $\sum_i n_i S_i \geq \frac{1}{2}$, which corresponds to

$$\frac{1}{B}\eta + \frac{1}{B}\sum_i n_i s_i\left(\hat{\theta}_i + T\right) \geq 0$$

or

$$\eta + \sum_i n_i s_i \hat{\theta}_i + sT \geq 0$$

Therefore, the probability that the incumbent is elected is

$$\begin{aligned} \Pr\left(\eta \geq -\sum_i n_i s_i \hat{\theta}_i - sT\right) &= \frac{1}{2} + \sum_i n_i s_i \hat{\theta}_i - sT \\ &= \frac{1}{2} + s\theta + \sum_i n_i s_i\left(\log e_i - \log \widehat{e}_i\right) - sT \end{aligned}$$

The incumbent does not know θ. Thus, the expected probability of winning given effort is

$$P(e) = \frac{1}{2} + \sum_i n_i s_i\left(e_i - \widehat{e}_i\right) - sT.$$

The incumbent solves

$$\max_e P(e) - \frac{c}{2}\sum_i n_i e_i^2$$

with first-order condition

$$e_i^* = \frac{s_i}{c}$$

In equilibrium it must be that $e^* = \hat{e}$. Then

$$P(e^*) = \frac{1}{2} + sT.$$

■

1.3 Pivotal voting

We now assume that voters choose the candidate they prefer (or they abstain/randomize) conditional on their vote being pivotal. Pivotal voting can have dramatic effects in models of voting under incomplete information. As Feddersen and Pesendorfer [4], pivotal voting can lead to perfect information aggregation, namely the outcome of the election if voters have private information is the same that would arise if the private information of all voters were revealed before the vote. Conditioning on being pivotal, provides voters with a sufficient statistics on other voters' information. That is why the resulting equilibrium aggreagets private information perfectly. Clearly, the possibility of information aggregation through voting is crucial in a model of mass communication. If that is possible, then perhaps it is sufficient to inform a small proportion of the electorate.

However, as we shall see, full information aggregation through voting is not possible here. As Feddersen and Pesendorfer [4] stress, their results are only valid if voters are uncertain over a one-dimensional variable, and here we have two dimensions: preference $\eta + \beta_j$ and ability θ. Pivotal voting works when the event of being pivotal provides a sufficient statistics on the information of the electorate, but that is not possible with multiple dimensions because being pivotal does not provide a sufficient statistics for the other voters information.

In this section we prove two statements. The first results is negative and general: there does not exist a pivotal equilibrium with full information aggregation. The second result is positive but, unfortunately, more specialized. If voters have linear utility, we can characterize the set of pivotal equilibria. Under certain conditions, the pivotal equilibrium is identical to the sincere equilibrium of Propostion 1.

We begin with the negative result. If voters are fully informed about the incumbent (and they vote optimally), they should re-elect the incumbent if and only the utility associated with the incumbent is at least as high as the expected utility associated with the challenger. We take this to be the outcome of a full information election and we show that it cannot be the outcome of our model under pivotal voting:

Proposition 2 *Assume pivotal voting. For any $s > 0$ and any $w \in (-\infty, \infty)$, there is no equilibrium in which the incumbent is elected if and only if*

$$\theta + \eta \geq E\left[v\left(\theta^c\right)\right].$$

Proof. Suppose that a pivotal equilibrium exists in which the incumbent is re-elected if and only if

$$\theta + \eta \geq E\left[v\left(\theta^c\right)\right].$$

Given the above condition, votes are pivotal when θ and η are such that

$$\theta + \eta = E\left[v\left(\theta^{c}\right)\right].$$

If $\theta + \eta = E\left[v\left(\theta^{c}\right)\right]$, an informed voter j who has observed θ and z_j votes for the incumbent if and only if

$$\theta + z_j \geq E\left[v\left(\theta^{c}\right)\right].$$

Substituting for $\theta + \eta = E\left[v\left(\theta^{c}\right)\right]$, this shows that voter j votes for the incumbent if and only if

$$\beta_j \geq 0.$$

As β_j is distributed symmetrcally around zero, informed voters are equally split between the incumbent and the challenger.

Conditional on being pivotal, an uninformed voter j who has observed z_j votes for the incumbent if and only if

$$E\left[\theta + \eta + \beta_j | \theta + \eta = E\left[v\left(\theta^{c}\right)\right], \eta + \beta_j = z_j\right] \geq E\left[v\left(\theta^{c}\right)\right].$$

But

$$\begin{aligned} & E\left[\theta + \eta + \beta_j | \theta + \eta = E\left[v\left(\theta^{c}\right)\right], \eta + \beta_j = z_j\right] \\ = \; & z_j + E\left[\theta | \theta + \eta = E\left[v\left(\theta^{c}\right)\right], \eta + \beta_j = z_j\right] \\ = \; & z_j + E\left[\theta | \theta + \eta = E\left[v\left(\theta^{c}\right)\right], \eta + \beta_j = z_j\right] \\ = \; & z_j + E\left[E\left[v\left(\theta^{c}\right)\right] - \eta | \eta + \beta_j = z_j\right] \\ = \; & z_j + E\left[v\left(\theta^{c}\right)\right] - E\left[\eta | \eta + \beta_j = z_j\right] \end{aligned}$$

Uninformed voter j votes for the incumbent if and only if

$$z_j \geq E\left[\eta | \eta + \beta_j = z_j\right]$$

But the latter condition is true if and only if $z_j \geq 0$.

To summarize: if votes are pivotal ($\theta + \eta = E\left[v\left(\theta^{c}\right)\right]$), then an informed voter selects the incumbent if and only if $\beta_j \geq 0$ and an uninformed voter selects the incumbent if and only if $\eta + \beta_j \geq 0$. But this leads to a contradiction: If $\eta \neq 0$, the vote share of the incumbent is not $\frac{1}{2}$ and therefore votes are not pivotal.

Informed voters are who vote The vote of an uninformed voter is pivotal if Suppose all uninformed voters abstain. Then, votes are pivotal if

$$\eta = -\theta$$

But in this case

$$E\left[\theta + \eta + \beta_j | \eta = -\theta, \eta + \beta_j = z_j\right] = E\left[\beta_j | \eta = -\theta, \eta + \beta_j = z_j\right]$$

which is strictly greater (smaller) than zero if and only if $z_j > (<) \, 0$. Then, for almost every z_j an uninformed pivotal voter strictly prefers voting to abstaining — contradiction. ■

Proposition 2 depends on the multidimensionality of voter information. If information is perfectly aggregated, votes are pivotal when θ and η are such that:

$$\theta + \eta = E\left[v\left(\theta^c\right)\right]. \tag{1}$$

Given (1), informed voters are split in half: those with a positive β_j prefer the incumbent, those with a negative β_j prefer the challenger. The problem is that uninformed voters are not split in half. Uninformed voter j knows (1) and knows that $\eta + \beta_j = z_j$. If $z_j > 0$, the uninformed voter computes (correctly)

$$E\left[\theta + \eta + \beta_j\right] > 0,$$

and she strictly prefers the incumbent. She therefore strictly prefers voting for the incumbent to any other voting strategy including abstention. Similarly, an uninformed voter with $z_j < 0$ strictly prefers to vote for the challenger. But z_j depends on the systemic shock η which is almost always different from zero. If $\eta > (<) 0$, a majority of uninformed voters observes $z_j > (<) 0$ and they vote for the incumbent (the challenger). This creates a contradiction because for almost every pair (θ, η) satisfying (1) votes are not split in half and therefore they are not pivotal.

If an uninformed voter observed β_j and η separately, she would be able to infer her payoff $\theta + \eta + \beta_j$ from the knowledge that her vote is pivotal. She would vote for the incumbent if and only if $\beta_j > 0$ and uninformed votes would wash out. But because she only observes z_j, she can only make partial inference.

Let us now turn to the positive, but less general, result. Suppose that v is linear.We can show that:

Proposition 3 *If v is linear and at least half of the voters are informed ($s > \frac{1}{2}$), the equilibrium with pivotal voting is identical to the equilibrium with sincere voting. In particular, an uninformed voter votes for the incumbent if and only if $z_j \geq 0$.*

Proof. An informed voter knows already everything and he learns nothing from the fact that he is pivotal. Therefore, he votes in the same way in the sincere and in the pivotal case. he votes for the incumbent if and only if

$$\beta_j + \eta \geq -\theta$$

(note that $T = 0$ when v is linear). Instead an uninformed voter learns from being pivotal that

$$\eta = -\theta \sum_i n_i s_i = -\theta s$$

or

$$\theta = -\frac{\eta}{s}$$

As $\theta \in \left[-\frac{1}{2}t, \frac{1}{2}t\right]$ this also implies $\eta \in \left[-\frac{1}{2}st, \frac{1}{2}st\right]$. As all the variables are uniformly distributed, the uninformed voter computes

$$\begin{aligned} E\left[\theta|\beta_j + \eta = z_j, \theta = -\frac{\eta}{s}\right] &= E\left[-\frac{\eta}{s}|\beta_j + \eta = z_j, \eta \in \left[-\frac{1}{2}st, \frac{1}{2}st\right]\right] \\ &= -\frac{1}{s}E\left[\eta|\beta_j + \eta = z_j, \eta \in \left[-\frac{1}{2}st, \frac{1}{2}st\right]\right] \end{aligned}$$

Note that

$$E\left[\eta|\beta_j + \eta = z_j, \eta \in \left[-\frac{1}{2}st, \frac{1}{2}st\right]\right] = \begin{cases} \frac{2z_j+B-st}{4} & \text{if } z_j \in \left[-\frac{1}{2}B - \frac{1}{2}st, -\frac{1}{2}B + \frac{1}{2}st\right] \\ 0 & \text{if } z_j \in \left[-\frac{1}{2}B + \frac{1}{2}st, \frac{1}{2}B - \frac{1}{2}st\right] \\ \frac{2z_j-B+st}{4} & \text{if } z_j \in \left[\frac{1}{2}B - \frac{1}{2}st, \frac{1}{2}B + \frac{1}{2}st\right] \end{cases}$$

Therefore, the uninformed voter who is pivotal prefers the incumbent if and only if

$$E\left[\theta|\beta_j + \eta = z_j, \theta = -\frac{\eta}{s}\right] + E\left[\beta_j + \eta|\beta_j + \eta = z_j, \theta = -\frac{\eta}{s}\right] \geq E\left[\theta_i^c\right]$$

which can be rewritten as

$$-\frac{1}{s}E\left[\eta|\beta_j + \eta = z_j, \eta \in \left[-\frac{1}{2}st, \frac{1}{2}st\right]\right] + z_j \geq 0$$

which in turn corresponds to

$$\begin{cases} z_j \geq \frac{1}{s}\frac{2z_j+B-st}{4} & \text{if } z_j \in \left[-\frac{1}{2}B - \frac{1}{2}st, -\frac{1}{2}B + \frac{1}{2}st\right] \\ z_j \geq 0 & \text{if } z_j \in \left[-\frac{1}{2}B + \frac{1}{2}st, \frac{1}{2}B - \frac{1}{2}st\right] \\ z_j \geq \frac{1}{s}\frac{2z_j-B+st}{4} & \text{if } z_j \in \left[\frac{1}{2}B - \frac{1}{2}st, \frac{1}{2}B + \frac{1}{2}st\right] \end{cases}$$

If $s > \frac{1}{2}$, we can write

$$\begin{cases} z_j \geq \frac{B-st}{2(2s-1)} & \text{if } z_j \in \left[-\frac{1}{2}B - \frac{1}{2}st, -\frac{1}{2}B + \frac{1}{2}st\right] \\ z_j \geq 0 & \text{if } z_j \in \left[-\frac{1}{2}B + \frac{1}{2}st, \frac{1}{2}B - \frac{1}{2}st\right] \\ z_j \geq \frac{-B+st}{2(2s-1)} & \text{if } z_j \in \left[\frac{1}{2}B - \frac{1}{2}st, \frac{1}{2}B + \frac{1}{2}st\right] \end{cases}$$

But $z_j \in \left[-\frac{1}{2}B - \frac{1}{2}st, -\frac{1}{2}B + \frac{1}{2}st\right]$ implies $z_j < \frac{B-st}{2(2s-1)}$ and $z_j \in \left[\frac{1}{2}B - \frac{1}{2}st, \frac{1}{2}B + \frac{1}{2}st\right]$ implies $z_j \geq \frac{-B+st}{2(2s-1)}$. Therefore, the necessary and sufficient condition for a pivotal uninformed voter to re-elect the incumbent collapses to

$$z_j \geq 0,$$

which proves the statement. ■

Suppose that an informed voter j votes for the incumbent if and only if $\beta_j + \eta \geq -\theta$, and an uninformed voter j votes for the incumbent if and only if $z_j \geq 0$. Votes are pivotal if θ and η are such that

$$\theta = -\frac{\eta}{s}.$$

Now, check whether the voting behavior is optimal under pivotal voting. Clearly, the informed voterss strategy is a best response because they are already choosing the candidate they prefer under full information. Instead, things are more complex for uninformed voters who try to infer θ from knowing z and from knowing that they are pivotal. As it turns out, if $s > \frac{1}{2}$,

$$E\left[\theta + \beta_j + \eta | \beta_j + \eta = z_j, \theta = -\frac{\eta}{s}\right] \geq 0$$

if and only if $z_j \geq 0$. Uninformed voter j votes for the incumbent if and only if $z_j \geq 0$. But then the voting strategy of both informed and uninformed corresponds to sincere voting.

If there are too many uninformed voters ($s < \frac{1}{2}$), it may not be a best response for uninformed voter j to vote for the incumbent if and only if $z_j \geq 0$. Some degree of rational abstention may be optimal. The resulting equilibria are hard to characterize but Proposition 2 gurantees that they cannot involve full abstention.

2 News Provision

We now consider several modes of news provision. The structure of the media is decided before the electoral game begins. In turn, the structure determines how many informed people there are in each socio-economic group.

Some voters receive information from other sources (lobbies, direct observation, other media, etc...). For every group i, let $\bar{s}_i \in [0, 1]$ denote the share of exogenously informed voters.

2.1 State news only

The incumbent chooses a coverage vector σ for the state television. Let $\sigma_i \in [0, 1]$ represent the probability that a viewer in group i watches state television. For simplicity, we assume that watching television is uncorrelated with having other information sources (the results do not change if we assume that there is correlation – positive or negative – but it is not perfect). The share of informed voters in group i is thus

$$s_i = \bar{s}_i + (1 - \bar{s}_i)\,\sigma_i.$$

Increasing coverage is costly. Some people may have less ineterst in television and they are only willing to watch it if quality is high. We assume that the cost necessary to reach coverage σ_i in group i is $\frac{1}{2}kn_i\sigma_i^2$ where $k_\sigma \geq 0$.

The game is as in the previous section except that we add a Period 0 in which the incumbent selects the vector σ. In period 1 and 2, the continuation equilibrium is the sincere equilibrium of Proposition 1. The expected payoff of the incumbent compute in period 0 is thus:

$$\pi(\sigma) = \frac{1}{2} + T\sum_i n_i s_i - \frac{c}{2}\sum_i n_i\left(e_i^*(s)\right)^2 - \frac{k}{2}\sum_i n_i\sigma_i^2.$$

We show

Proposition 4 *If there is only state television.*

$$\sigma_i^* = \max\left(0, \min\left(\frac{T - T\bar{s}_i - \bar{s}_i}{1 - \bar{s}_i + k}, 1\right)\right).$$

Coverage σ_i^* is increasing in T, and decreasing in k and $\bar{s}_i$.

Proof. Write

$$\pi(\sigma) = \frac{1}{2} + T\sum_i n_i\left(\bar{s}_i + (1 - \bar{s}_i)\,\sigma_i\right) - \frac{1}{2}\sum_i n_i\left(\bar{s}_i + (1 - \bar{s}_i)\,\sigma_i\right)^2 - \frac{k}{2}\sum_i n_i\sigma_i^2.$$

Take first-order conditions

$$T(1 - \bar{s}_i) - \left(\bar{s}_i + (1 - \bar{s}_i)\,\sigma_i\right) - k\sigma_i = 0.$$

■

To understand the result, begin by assuming that $\bar{s}_i = 0$ in every group and $k = 0$. Then, assuming $T \leq 1$,

$$\sigma_i^* = T \quad \text{for all } i.$$

Coverage is useful to the incumbent because it increases the incumbency advantage ST. In expectation, risk-averse voters are more likely to re-elect the incumbent if they know him better. If coverage cost k is zero, the incumbent still faces an indirect cost of incrteasing cost. The more likely voters are to observe g_i, the more incentive the incumbent has to put effort. The equilibrium cost of effort is

$$\frac{1}{2}c\sum_i n_i e_i^* = \frac{1}{2}\sum_i n_i s_i^2.$$

The convexity of the effort cost function menas that the incumbent wants to equalize effort, and hence coverage, across groups.

If some groups are exogenously informed (and still $k = 0$), the optimal coverage is

$$\sigma_i^* = \min\left(0, T - \frac{\bar{s}_i}{1-\bar{s}_i}\right).$$

The incumbent dislikes informational inequality is because it induces him to exert unequal effort in the continuation game. If $\bar{s}_i \leq T$, she can fully undo the exogenous informational inequality by providing less coverage to groups with a higher $\bar{s}_i$. This leads to:

$$s_i = \bar{s}_i + (1-\bar{s}_i)\left(T - \frac{\bar{s}_i}{1-\bar{s}_i}\right) = T.$$

If $\bar{s}_i > T$, there will be ex post inequality. Including a direct coverage cost ($k > 0$) only adds an additional reason to keep coverage low.

2.2 Commercial news only

We assume that there is one commercial news provider. Commercial television channels derive their revenues from advertising and/or subscription fees. In either case, it is likely that the amount of revenues is positively linked to disposable income. Let commercial coverage for group i be γ_i. Per-viewer revenue in group i is assumed to be

$$r_i = a y_i \gamma_i$$

where $a > 0$ is a parameter that denotes the strength of the c ommercial motive.

The commercial news station faces the same cost of the state television (for comparability). Thus, it solves

$$\max_s \sum_i n_i r_i - \frac{k}{2}\sum_i n_i \gamma_i^2.$$

The share of informed voters in group i is

$$s_i = \bar{s}_i + (1-\bar{s}_i)\,\gamma_i.$$

Thus,

Proposition 5 *If there is only commercial news,*

$$\gamma_i^* = \min\left(1, \frac{a}{k} y_i\right).$$

Proof. The first-order condition for the commercial station is

$$a y_i = k \gamma_i$$

■

Unless we make assumptions on the values of a and T, we cannot compare absolute coverage under commercial and state provision. However, we can say something about the differences among groups. Rich people will get more coverage, and therefore, they will also receive more public good provision

Proposition 6 *Let g_i^s and g_i^c denote public good provision for group i respectively with state news and with commercial news. If $\bar{s}_1 \leq \bar{s}_2 = \cdots \leq \bar{s}_M$ and $y_1 \leq y_2 \leq \cdots \leq y_M$, then there exists a group i^* such that, if $j < (>)\, i^*$, $g_j^c \geq (\leq)\, g_j^s$.*

Proof. We have:

$$\begin{aligned} g_i^s &= \theta + e_i^* = \theta + \frac{\bar{s}_i + (1 - \bar{s}_i)\, \sigma_i^*}{c} \\ g_i^c &= \theta + e_i^* = \theta + \frac{\bar{s}_i + (1 - \bar{s}_i)\, \gamma_i^*}{c} \end{aligned}$$

Then,

$$\begin{aligned} g_i^c - g_i^s &= \frac{1}{c}(1 - \bar{s}_i)(\gamma_i^* - \sigma_i^*) \\ &= \frac{1}{c}(1 - \bar{s}_i)\left(\min\left(1, \frac{a}{k} y_i\right) - \max\left(0, \min\left(\frac{T - T\bar{s}_i - \bar{s}_i}{1 - \bar{s}_i + k}, 1\right)\right)\right). \end{aligned}$$

Note that γ_i^* is nondecreasing in i and σ_i^* is nonincreasing over i, Thus $\gamma_i^* - \sigma_i^*$ is nondecreasing in i. ■

2.3 Introducing commercial television

We now see what happens when the state monopoly on broadcasting is broken. Commercial television provides news and entertainment. For simplicity, we assume that there are two commercial channels, one specializing in news and the other in entertainment.

The audience is divided in two groups: *entertainment viewers* and *news viewers*. People in the former group prefer entertainment. They watch news only if no entertainment program is available. People in the latter group derive no utility from entertainment. They only watch news. Let $h_i \in [0, 1]$ be the proportion of news viewers in socio-economic group i.

We view the competition between state and commercial broadcasting as a Stackelberg game in which the state has a first-mover adavantage. In this subsection, we look at the subgame in which commercial broadcasters move. We hold state coverage constant and we derive the equilibrium levels of commercial provision and of voter information. In the next section we examine the full equilibrium.

When a viewer turns on his television set, she may find state news, commercial news, and/or commercial broadcasting. Coverage is interpreted as the probability that a viewer finds a program of her liking. Let

- σ_i be probability that viewer in group i finds a state news broadcast;
- γ_i be the equivalent probability for commercial news;
- ε_i be the equivalent probability for entertainment.

We assume that the the three probabilities are independent.

The payoff of the commercial news broadcaster is:

$$\pi_\gamma = \left(h_i\left(1-\sigma_i^*\right)+\left(1-h_i\right)\left(1-\varepsilon_i\right)\left(1-\sigma_i^*\right)\right)a\gamma_i y_i - \frac{1}{2}k\gamma_i^2$$

The payoff of the entertainment broadcaster is:

$$\pi_\varepsilon = \left(1-h_i\right)a\varepsilon_i y_i - \frac{1}{2}k\varepsilon_i^2$$

We are mainly interested in the effect that the introdcution of commercial broadcasting has on voter information. To make this comparison in a simple setup, we see what happens as a moves from zero (commercial tv is not viable) to a positive but small a:

Proposition 7 *The introduction of commercial television increases (decreases) the proportion of informed voters s_i in group i if $h_i < (>)\bar{h}_i\left(\sigma_i^*\right)$, where*

$$\bar{h}_i\left(\sigma_i^*\right) = \frac{\sigma_i^* + 1 - \sqrt{4\left(\sigma_i^*\right)^3 - 7\left(\sigma_i^*\right)^2 + 2\sigma_i^* + 1}}{2\left(2-\sigma_i^*\right)\sigma_i^*}.$$

Proof. The first-order conditions yield:

$$\begin{aligned}
\gamma_i^* &= \frac{a}{k}\left(h_i\left(1-\sigma_i^*\right)+\left(1-h_i\right)\left(1-\varepsilon_i\right)\left(1-\sigma_i^*\right)\right)y_i \\
&= \frac{a}{k}\left(1-h_i\sigma_i^* - \frac{a}{k}\left(1-h_i\right)\left(1-\sigma_i^*\right)y_i\right)y_i \\
\varepsilon_i^* &= \frac{a}{k}\left(1-h_i\right)y_i
\end{aligned}$$

The share on informed voters in i is:

$$s_i = (h_i + (1 - h_i)(1 - \varepsilon_i^*))(\sigma_i^* + (1 - \sigma_i^*)\gamma_i^*).$$

Note that

$$\begin{aligned} \left.\frac{d}{da}\gamma_i^*\right|_{a=0} &= \frac{1}{k}\left(1 - h_i\sigma_i^* - \frac{a}{k}(1 - h_i)(1 - \sigma_i^*) y_i\right) y_i + \frac{a}{k}\frac{1}{k}(1 - h_i)(1 - \sigma_i^*) y_i^2 \\ &= \frac{1}{k}(1 - h_i\sigma_i^*) y_i; \end{aligned}$$

and

$$\left.\frac{d}{da}\varepsilon_i^*\right|_{a=0} = \frac{1}{k}(1 - h_i) y_i.$$

Hence,

$$\begin{aligned} \left.\frac{d}{da}s_i\right|_{a=0} &= -(1 - h_i)(\sigma_i^* + (1 - \sigma_i^*)\gamma_i^*)\left.\frac{d}{da}\varepsilon_i^*\right|_{a=0} + (h_i + (1 - h_i)(1 - \varepsilon_i^*))(1 - \sigma_i^*)\left.\frac{d}{da}\gamma_i^*\right|_{a=0} \\ &= -(1 - h_i)(\sigma_i^* + (1 - \sigma_i^*)\gamma_i^*)\frac{1}{k}(1 - h_i) y_i + (h_i + (1 - h_i)(1 - \varepsilon_i^*))(1 - \sigma_i^*)\frac{1}{k}(1 - h_i\sigma \\ &= -(1 - h_i) s_i \frac{1}{k}(1 - h_i) y_i + (h_i - h_i\varepsilon_i^*)(1 - \sigma_i^*)\frac{1}{k}(1 - h_i\sigma_i^*) y_i \\ &= -(1 - h_i)\sigma_i^*\frac{1}{k}(1 - h_i) y_i + h_i(1 - \sigma_i^*)\frac{1}{k}(1 - h_i\sigma_i^*) y_i \\ &= \left(-(1 - h_i)^2\sigma_i^* + h_i(1 - \sigma_i^*)(1 - h_i\sigma_i^*)\right)\frac{y_i}{k} \end{aligned}$$

The solution to

$$-(1 - h_i)^2 s + h_i(1 - s)(1 - h_i s) = 0$$

is

$$h_i < (>) \frac{\sigma_i^* + 1 - \sqrt{4(\sigma_i^*)^3 - 7(\sigma_i^*)^2 + 2\sigma_i^* + 1}}{2(2 - \sigma_i^*)\sigma_i^*}.$$

■

Starting from $a = 0$, an increase in a has marginal effect

$$\left.\frac{d}{da}s_i\right|_{a=0} = \left(-(1 - h_i)^2\sigma_i^* + h_i(1 - \sigma_i^*)(1 - h_i\sigma_i^*)\right)\frac{y_i}{k}.$$

The change in share s_i is the sum of a negative component and a positive component. The negative component is due to entertainment viewers switching from state television to entertainment television. The positive component is due to news viewers who were not served by state news but are now able to watch commercial news. The total effect on the share of informed voters can be positive or negative. As Proposition 7 shows, the higher h_i is the more likely that the overall effect is positive. If voters in group i are more ineterested in news than in entertainment, the introduction of commercial television is likely to increase their information.

Combining Proposition 7 with Proposition 1, we can predict how public good provision is affected by the introduction of commercial television:

Corollary 8 *If commercial television is introduced, the level of public good provided to group i increases (decreases) if* $h_i > (<) \bar{h}_i(\sigma_i^*)$.

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