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COMMERCIAL TELEVISION AND VOTER INFORMATION

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ABSTRACT

Commercial Television and Voter Information*

What is the effect of liberalizing a country's broadcasting system on the level of information of its citizens? To analyse this question, we first construct a model of state monopoly broadcasting where the government selects the amount of television news coverage of different public policy outcomes, and then sets public policy and political rents. Voters vote retrospectively given the news provided. In equilibrium, the incumbent provides some news coverage, and more so to groups for which reducing policy uncertainty is more important. We then introduce a profit-maximizing commercial channel. It provides more news coverage to groups of voters valuable to advertisers or underprovided by the state monopoly.

We test our predictions on a panel of individuals interviewed in the elections before and after the entry of commercial TV in Sweden. We find that people who start watching commercial TV news increase their level of political knowledge more than those who do not. They also increase their political participation more. The positive informational effects are particularly valuable since commercial TV news attracts *ex ante* uniformed voters.

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Commercial Television and Voter Information*

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Abstract

What is the effect of liberalizing a country's broadcasting system on the level of information of its citizens? To analyze this question, we first construct a model of state monopoly broadcasting where the government selects the amount of television news coverage of different public policy outcomes, and then sets public policy and political rents. Voters vote retrospectively given the news provided. In equilibrium, the incumbent provides some news coverage, and more so to groups for which reducing policy uncertainty is more important. We then introduce a profit-maximizing commercial channel. It provides more news coverage to groups of voters valuable to advertisers or underprovided by the state monopoly.

We test our predictions on a panel of individuals interviewed in the elections before and after the entry of commercial TV in Sweden. We find that people who start watching commercial TV news increase their level of political knowledge more than those who do not. They also increase their political participation more. The positive informational effects are particularly valuable since commercial TV news attracts ex ante uninformed voters.

In most countries the state is the dominant provider of television programs. The most notable exception is the United States in which the five largest channels are all privately owned (Djankov et al. [7]). While state television plays an important, it is not as important as it was in the past. In 1980 all European countries had state TV monopolies, except for Britain and Italy (with dual systems) and Luxembourg (all commercial). There were seven times as many public channels as private. By 1997 the balance was reversed: only three countries had purely public national channels (Austria, Ireland, and Switzerland), and commercial channels outnumbered public.

*We thank Tim Besley, Jordi Blanes, Peter Davis, Torsten Persson, Justin Wolfers, and audiences at Bristol (Political Economy Workshop), the LSE, Penn (IGIER-PIER Conference on Political Economics), Stanford (Conference on the Media and Economic Performance), and Toulouse (Conference on the Regulation of Media Markets) for useful comments.

The change in media structure may have important implications for public policy. Strömberg (1999, 2004) and Besley and Burgess [4] present evidence that citizens with better access to mass media receive more favorable public policies. Information is also necessary for voters to punish corrupt or “shirking” politicians. Djankov et al.[7] analyze cross country evidence which suggests that ownership matters for mass media conduct. Besley and Prat [5] construct a model of media ownership and political capture. Gentzkow et al. [9] provide evidence that the transformation that the US newspaper industry underwent between 1870 and 1920 was one of the causes of the decline of political corruption in that period. Mullainathan and Shleifer [13] and Gentzkow and Shapiro [10] study how the structure of the media industry determines the bias in information provided by the media to citizens.

The increased commercialization in broadcasting around the world has caused a heated policy debate. Opponents have voiced fears that entertainment programs marginalize informational content, leading to an impoverished public sphere. There are also fears that commercialization reduces diversity in programming. At particular risk would be the interest of segments of the poorly placed segments of the population: the poor, the less informed, children, elderly, etc. (Blumler, 1992).

In particular, there seems to be a consensus among political scientists and media scholars that viewers receive more political information from public service broadcasters than from their commercial counterparts. This is based on cross-sectional analyses, such as Holtz-Bacha and Norris [12], that find that people who watch relatively more commercial television are less informed about public affairs.¹

However, to our knowledge, there has been no attempt to undertake more systematic research on this key topic in media policy. The goal of the present paper is to begin to fill this gap in two ways. We first build a theoretical model of state TV, and subsequent commercial entry. This will provide predictions regarding the programming choices of state and commercial TV, the consequent channel selection of individuals, and the impact on individuals’ knowledge. We then test the predictions using a Swedish survey that interviewed the same respondents in two consecutive elections, before and after the entry of commercial TV. This way, we can identify the ex ante characteristics of those who select into private and public TV, and hopefully isolate the effect of commercial TV.

We begin with a brief description of the conceptual set-up we use. The existing theoretical comparisons between state broadcasting and commercial

¹In this debate, American commercial TV is seen as a discouraging example. This is not completely ungrounded, the conventional wisdom (among political scientists and media scholars) is that citizens learn nothing about politics from television in the US. This is backed up by consistent survey evidence that reported TV news watching is not correlated with knowledge (see for example Delli Carpini and Keeter, 1996).

broadcasting are based on the assumption that the former is managed by a benevolent planner.² But in today's democracies 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.

In this paper, we shall assume that the state broadcaster had full journalistic independence. The government is unable to control specific news content. Instead, we allow the government to influence the amount of resources that are available to the state broadcaster and whether the broadcaster should tailor its news coverage to specific socio-economic groups (e.g. women, rural voters, senior citizens). As we argue in the text, we feel that this is an acceptable representation of the structure of the prototypical public-service broadcaster, the BBC.

We first see what happens when the broadcasting system is a state monopoly. We use a retrospective voting model, in which voters have incomplete information on the politicians' ability. The incumbent politician allocates resources to the broadcaster and decides its news coverage in order to maximize his chances of re-election. Voters who know the incumbent's type are able to forecast his future policies and can make better personal decisions. Hence, voters have a direct value for information. However, information is also beneficial because it allows voters to replace bad politicians. In equilibrium, the incumbent trades off the electoral benefit of providing more information (informed voters are more likely to re-elect him because of the personal benefits) with the discipline cost (public scrutiny makes it harder for the politician to appropriate public resources). If groups are heterogenous in terms of personal benefits, the incumbent provides more coverage to groups with a higher stake.

We then examine what happens when the state monopoly is broken by the entry of a commercial rival. The new broadcaster maximizes advertising revenues. Certain groups (e.g. the rich and the young) have greater per capita advertising potential. Also the new entrant sets a coverage level for every socio-economic group.

We also construct a model of viewer's choice (inspired by discrete consumer choice). Viewers choose to watch commercial television based on their

²Coase [6] 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).

personal characteristics and the coverage that the new channel offers to their socio-economic group. The arrival of commercial news may also reduce information levels by deviating attention from state news. While one cannot say whether the overall information level goes up or down, we show that more information is provided to: (1) groups with high advertising potential; (2) groups who had less information under state monopoly.

Predictions based on (1) and (2) are then tested using unique panel survey data from the Swedish Election Studies. This data contains interviews with over 1000 individuals in the two general elections immediately prior to (1988) and after (1991) the entry of commercial TV in Sweden.³ The respondents answer a series of questions testing their objective knowledge of Swedish politics. We also use another dataset to infer the relative value of different socio-economic groups to advertisers.

We find that commercial TV news attracted viewers previously undersupplied with information and contributed both to increased voter information and political participation. Those who started watching commercial news increased their level of political knowledge and participation significantly more than those who did not, and this effect is largest among the young and the previously not well informed.

It is interesting to note that our data confirms the cross-sectional results found by Holtz-Bacha and Norris [12, p. 15]. Commercial television is watched by people who are on average less informed. However, our panel evidence sheds a completely different light on such cross-sectional results. The pessimistic conclusion by that the commercialization of broadcasting worsens the average level of information and increases the information divide is refuted, at least for Sweden. The worries that certain groups would lose from commercial entry (the poor, the less informed, children, and the elderly) seem largely unwarranted. First, we find that the poor did not lose, or rather that they lose under both systems and therefore are not much affected by the change. They are neither a target audience of commercial TV, nor of state TV. Second, we find that the less informed and the young are the big winners of the shift to commercial TV. Finally, the elderly may lose from the liberalization, being a key target audience for state, but not for commercial, TV.

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 first consider a scenario in which only the state channel is active. Then,

³Before 1990 Sweden had a state monopoly in broadcasting. The state network (SVT) was consciously modelled after the BBC. In 1990, the government granted a license to a commercial channel (TV4).

we analyze what happens when commercial news and commercial entertainment are introduced. Section 3 considers evidence from Sweden. Section 4 concludes.

1 A Political Model

We use a relatively standard retrospective voting model (Persson and Tabellini [14, Chapter 4]). There are n socio-economic groups of equal size $\frac{1}{n}$: $i = 1, \dots, n$. Voters' payoffs are additive over the two periods and there is no discounting. In period 1, voter j in group i receives utility

$$g_i + \beta_j + \eta.$$

where:

- g_i is the level of public good provision targeted to group i (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 distributed on $[-\frac{1}{2}B, \frac{1}{2}B]$ where $B > 2$;
- η is a systematic preference shock about the incumbent that affects all voters in the same way. It is uniformly distributed on $[-\frac{1}{2}, \frac{1}{2}]$.

Public consumption for voters in group i is given by

$$g_i = \theta_i + e_i$$

where θ_i is the innate ability (type) of the incumbent to provide worthy public goods for group i . The θ_i 's are mutually independent and they are drawn from a uniform distribution on $[-\frac{1}{2}\bar{\theta}, \frac{1}{2}\bar{\theta}]$, where $\bar{\theta} \leq \frac{1}{2}$. The variable e_i is the amount of government resources the incumbent spends on group i .⁴

In period 2, voters' payoffs depend on whether the voters have chosen the incumbent or the challenger. Under the incumbent, the payoff of voter j of group i is

$$g_{i2} + \beta_j + \eta + T_i I(a_j = g_{i2}).$$

The last term captures the value of news about the incumbent's policies. Voters would like to know future in order to adapt to these. News about present policies will help the voter deduce the type of the politician and guess his future policies. Formally, knowing the incumbent's type will enable

⁴The assumption that θ_i is independently distributed is not necessary. One could re-do the present analysis assuming that θ_i is correlated. Indeed, a previous version of the model assumed that θ_i was the same across all groups.

individual j to take an action a_j which increases his or her utility by T_i if $a_j = g_{i2}$. Here T_i is a positive parameter which is smaller than $\frac{1}{4}$, and $I(a_j = g_{i2})$ is an indicator function which takes the value 1 if $a_j = g_{i2}$ and zero otherwise. Under the challenger, the payoff of voter j is $g_{i2}^c + \beta_j + \eta + T_i I(a_j = g_{i2}^c)$.

The incumbent has a fixed budget B in each period. This can be spent on the public goods, to increase e_i at the cost $\frac{1}{2} \frac{1}{n} e_i^2$. The incumbent keeps the residual funds, $r = B - \frac{1}{2} \frac{1}{n} \sum e_i^2$. The incumbent's payoff is

$$\begin{cases} B - \frac{1}{2} \frac{1}{n} \sum e_i^2 & \text{if he is not re-elected} \\ 2B - \frac{1}{2} \frac{1}{n} \sum e_i^2 - \frac{1}{2} \frac{1}{n} \sum e_{i2}^2 & \text{if he is re-elected} \end{cases}.$$

It is a dominant strategy for the incumbent to keep all resources in the second period. In every equilibrium $e_2 = 0$ and $g_{i2} = \theta_i$. The challenger receives payoff $B - \frac{1}{2} \frac{1}{n} \sum (e_{i2}^c)^2$ if he is elected and zero otherwise. Like the incumbent, also the challenger always exerts minimal effort, and $g_2^c = \theta_i^c$.

Timing is:

- Period 1
 - Nature selects $\{\theta_i\}_{i=1,\dots,n}$, which remains unknown.
 - Incumbent selects effort vector e . g is realized
 - A share $1-s_i$ of voters in group i are uninformed and they observe only $\beta_j + \eta$. A share s_i of voters are informed and they observe g_i and $\beta_j + \eta$.
 - Voters select the action a .
- Period 2
 - Voters vote for the incumbent or the challenger.
 - If the incumbent won, g_{i2} is realized. If the challenger wins, g_{i2}^c is realized.

As there is a continuum of voters, this electoral game has multiple equilibria. The literature usually focuses on two classes of equilibria: sincere voting (in which each voter picks the candidate who provides the higher expected utility) and pivotal voting (each voter picks the candidate who provides the higher expected utility, *conditional* on that voter being pivotal in the election). It is important to emphasize that the equilibria we find are all perfect Bayesian equilibria. Whether one prefers sincere voting or pivotal voting is therefore mostly a matter of one's views on which one is more plausible.

While we offer a full characterization of sincere voting, we can only provide incomplete results in pivotal voting. However, on the key dimension of information aggregation the findings are not dissimilar in the two cases.

1.1 Sincere Voting

We prove:

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

$$e_i^* = Bs_i,$$

for all $i = 1, 2, \dots, n$. An informed voter j has belief $\hat{\theta}_i = g_i - e_i^*$ and she votes for the incumbent if and only if

$$\hat{\theta}_i + \beta_j + \eta \geq -T_i,$$

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

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

The incumbent is re-elected with probability

$$P(e^*) = \frac{1}{2} + \frac{\sum_i s_i T_i}{n}.$$

Proof. Assume there exists a pure-strategy sincere equilibrium. Voters vote for the politician who provides higher second period expected utility. An uninformed voter prefers the incumbent if

$$E[g_{i2} + \beta_j + \eta] \geq E[g_{i2}^c],$$

which implies

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

as θ_i and θ_i^c have the same distribution ($g_2 = \theta_i$ and $g_2^c = \theta_i^c$).

Consider now an informed voter in group i who believes that the incumbent's i -type is $\hat{\theta}_i$. The voter will select the action $a_j = \hat{\theta}_i$. This will give the benefit T_i if the incumbent wins and is of type $\hat{\theta}_i$. In a pure-strategy equilibrium, the voters' belief is correct on the equilibrium path and the informed voter receives T_i with certainty if the incumbent is re-elected ($E[I(\hat{\theta}_i = \theta_i)] = 1$). Any other action gives zero expected benefits since the distribution of θ_i is continuous. The informed voter prefers the incumbent if

$$\hat{\theta}_i + \beta_j + \eta + T_i \geq E[g_2^c].$$

As $E[g_2^c] = 0$, the probability that an informed voter in i votes for the incumbent is

$$\Pr(\beta_j \geq -\eta - \hat{\theta}_i - T_i) = \frac{1}{2} + \frac{1}{B}(\eta + \hat{\theta}_i + T_i),$$

and the probability that an uninformed voter chooses the incumbent is

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

By the Law of Large Numbers, the incumbent's share of votes in group i is

$$\frac{1}{2} + \frac{1}{B}\eta + \frac{1}{B}s_i(\hat{\theta}_i + T_i),$$

and her total vote share is

$$S = \frac{1}{n} \sum_i \left(\frac{1}{2} + \frac{1}{B}\eta + \frac{1}{B}s_i(\hat{\theta}_i + T_i) \right).$$

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

$$\eta + \frac{1}{n} \sum_i s_i(\hat{\theta}_i + T_i) \geq 0.$$

Therefore, the probability that the incumbent is elected, conditional on $(\hat{\theta}_1, \hat{\theta}_2, \dots, \hat{\theta}_n)$, is

$$\Pr \left(\eta \geq -\frac{1}{n} \sum_i s_i(\hat{\theta}_i + T_i) \right) = \frac{1}{2} + \frac{1}{n} \sum_i s_i(\hat{\theta}_i + T_i).$$

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

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

Thus, since $E[\theta_i] = 0$, the unconditional probability of winning given effort is

$$P(e) = \frac{1}{2} + \frac{1}{n} \sum_i s_i((e_i - \hat{e}_i) + T_i).$$

The incumbent solves

$$\max_e BP(e) - \frac{1}{2} \frac{1}{n} \sum_i e_i^2$$

with first-order condition

$$e_i^* = Bs_i$$

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

$$P(e^*) = \frac{1}{2} + \frac{1}{n} \sum_i s_i T_i.$$

■

Proposition 1 is analogous to several results in the literature on career concerns (Holmstrom [11]). Informed voters cannot tell whether a certain level of public good provision is due to innate ability or extra resources.

However, in equilibrium they know the level of extra resources that the incumbent chooses ($e_i^* = Bs_i$). The incumbent sets this level by equating his marginal benefit of “fooling” informed voters into thinking that he is of higher quality ($\frac{Bs_i}{n}$) and the marginal cost of devoting resources to public goods instead of private rent ($\frac{d}{de_i} \frac{1}{2} \frac{1}{n} e_i^2 = \frac{1}{n} e_i$). As in other career concerns model, the more informed voters are, the more effort the incumbent exerts. If voters of group i have a higher s_i , the incumbent will provide a higher e_i^* .

If T_i were zero in every group, the incumbent would be re-elected half of the time. However, if some T_i 's are positive, there is a certain degree of incumbency advantage. Informed voters receive private benefits from knowing the type of the incumbent and are more likely to vote for her. The extent of the incumbency advantage depends on the share of informed voters. As we shall see in the next section, this creates an incentive for the incumbent to provide voters with some information.

1.2 Pivotal Voting

We now assume that voters choose the candidate they prefer (or they abstain/randomize) conditional on their vote being pivotal. As Feddersen and Pesendorfer [8] show, pivotal voting can have dramatic effects in models of voting under incomplete information. Information aggregation is a key ingredient of our model, and we need to check that our results are robust to sophisticated voting.

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. Namely, he votes for the incumbent if and only if

$$\hat{\theta}_i + \beta_j + \eta \geq -T_i.$$

Things may change for the uninformed. Recall that uninformed vote j observes signal $z_j = \beta_j + \eta$. It is easy to see that in equilibrium the voter follows a threshold strategy of the form: vote for the incumbent if and only if

$$z_j \geq -t_i, \tag{1}$$

where t_i is some number (which may differ across groups). As there is a continuum of voters, the election is tied if

$$\eta + \frac{1}{n} \sum_i (1 - s_i) t_i + \frac{1}{n} \sum_i s_i (\theta_i + T_i) = 0. \tag{2}$$

A pivotal uninformed voter possesses two pieces of information: that condition (2) holds and that $\beta_j + \eta = z_j$ (where z_j is the value of the signal she observes on the candidate's preference shock). She will vote for the incumbent if and only if her expected utility conditional on both pieces

of information is greater for the incumbent than for the challenger. This determines the equilibrium threshold t_i .

In general, determining the threshold t_i involves solving a complex fixed point problem (because the threshold level influences the information that the uninformed voter receives). The voter also has to solve a signal extraction problem, to understand what (2) implies in terms of both θ_i and η . However, as the number of groups n increases, the signal extraction problem simplifies, and we can state the following:

Proposition 2 *When $n \rightarrow \infty$, $t_i \rightarrow 0$ and the electoral outcome under pivotal voting converges to the electoral outcome under sincere voting.*

Proof. The uninformed voter re-elects the incumbent if and only if

$$E [\theta_i + \beta_j + \eta | (2), \beta_j + \eta = z_j] \geq 0.$$

Note that

$$E [\beta_j + \eta | (2), \beta_j + \eta = z_j] = z_j.$$

The threshold strategy (1) implies that in equilibrium the voting strategies of uninformed voters are solutions of the following system of equations:

$$t_i = E [\theta_i | (2), \beta_j + \eta = z_j] \quad \forall i$$

However, as the θ_i 's are mutually independent, (2) provides less and less information about θ_i as the number of groups n increases. In the limit, the expected value equals the prior:

$$\lim_{n \rightarrow \infty} E [\theta_i | (2), \beta_j + \eta = z_j].$$

For a sufficiently large number of groups n , the threshold t_i is close to zero, and uninformed voters use the same strategy (vote for the incumbent if $z_j \geq 0$) in both pivotal voting and sincere voting ■

As Feddersen and Pesendorfer [8] 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 leads to full aggregation 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 particular case, being pivotal provides less and less information about θ_i as the number of groups grows, and this leads to the proposition we have just proved.

After analyzing pivotal voting, we shall focus on the sincere voting equilibrium of Proposition 1 in the remaining of the paper.

2 Endogenous Information Provision

We now endogenize the vector of voter information. We first study the behavior of a state monopolist and then we see what happens when the monopoly is broken by the entry of a profit-driven competitor.

2.1 The BBC Model

To understand the relationship between government and government-owned broadcasting, it is instructive to examine the governance structure of the British Broadcasting Corporation (BBC). Being the first state-owned broadcaster and one of the most respected, the BBC model has represented a blueprint for state television across the world. 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.⁵

On the one hand, it is widely accepted that the BBC enjoys a high level of journalistic independence. It is often critical of government policy, sometimes in a harsh adversarial fashion – witness its recent reporting on evidence of weapons of mass destruction 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 (BBC [2, p. 13]).

At the risk of oversimplification, we will define the BBC model of state television as one in which the government has some ex ante control on resource allocation but no ex post control on news production. The government has a say on total budget and on how different segments of the population should be covered. But once the key objectives are in place, 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 ex post control as well: it is able to suppress news after events occur. This more pessimistic take on the media is explored in Besley and

⁵Information about the governance of the BBC is available on: <http://www.bbc.co.uk/info/running/>.

Prat [5]. Here, we wish to analyze what is perhaps the best-case scenario of government-controlled television.⁶

2.2 State Monopoly

We begin by assuming that there is only state broadcasting. Everybody watches state news. News is financed as part of the budget. The cost of informing a share s_i in group i is $\frac{1}{2} \frac{1}{n} p_s s_i^2$. As before, the budget is of size B , and the politician gets to keep the residual funds

$$r = B - \frac{1}{2} \frac{1}{n} \sum e_i^2 - \frac{1}{2} \frac{1}{n} \sum p_s s_i^2.$$

The timing is now the following:

- Period 1
- The incumbent selects vector s , which everyone observes.
 - Nature selects $\{\theta_i\}_{i=1,\dots,n}$, which remains unknown.
 - Incumbent selects effort vector e . g is realized
 - A share $1 - s_i$ of voters in group i are uninformed and they observe only $\beta_j + \eta$. A share s_i of voters are informed and they observe g_i and $\beta_j + \eta$.
 - Voters select the action a .
- Period 2
- Voters vote for the incumbent or the challenger.
 - If the incumbent won, g_{i2} is realized. If the challenger wins, g_{i2}^c is realized.

We assume that in period 2 there is no information. It is clear that no period-2 incumbent would spend money on providing information.

The subgame beginning with the incumbent choosing first-period effort is identical to the game analyzed in the previous section. From Proposition 1, we know that an incumbent who chooses vector s is elected with probability

$$P = \frac{1}{2} + \frac{1}{n} \sum_i s_i T_i.$$

In the first-period, the incumbent maximizes

$$\max_{e,s} PB + r \tag{3}$$

From the first-order condition, the following is immediate:

⁶Obviously, there could exist a state-owned television over which the government has 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?

Proposition 3 *A monopoly state television provides the level of coverage*

$$\hat{s}_i = \frac{B}{p_s + B^2} T_i.$$

The above formula shows how the incumbent weighs the pros and cons of news. On the benefit side, increased publicity makes voters better acquainted with the politician and this reduced uncertainty about the politicians type creates an electoral advantage (an incumbency advantage). This effect is larger for groups for which reducing policy uncertainty is very important (high T_i). On the cost side, more news makes it more electorally costly for the incumbent to extract rents (B^2), and there is a direct cost of producing news p_s .

2.3 Introducing Commercial Television

We now study what happens when the state monopoly is broken by the entry of commercial broadcasting. For simplicity, we assume that the coverage chosen by the state monopoly is not affected. This describes a situation in which: (i) the state broadcaster did not predict the entry of a commercial competitor; (ii) coverage cannot be modified, at least in the short-medium term. While these assumptions have no general validity, we feel that they are a reasonable approximation to what happened in Sweden in the period under consideration.⁷

We thus hold constant the \hat{s}_i 's that we found above, and we consider the choice of viewers and of the commercial entrant. If viewer j in group i keeps watching state news only, he still receives expected utility

$$u_{ij}^s = \hat{s}_i \hat{P} T_i.$$

where \hat{P} is the probability that the incumbent is re-elected in equilibrium. If the voter also watches commercial news, the probability that he becomes informed about T_i is

$$\hat{s}_i + (1 - \hat{s}_i) \gamma_i - k \hat{s}_i \gamma_i$$

where $(1 - \hat{s}_i) \gamma_i$ represents the probability that he becomes informed by commercial television (if he had not become informed by state news). By introducing the factor $k \in (0, 1)$ we allow for the possibility that watching two news broadcasts decreases the viewer's attention to each news. The total expected utility of viewer j in group i , if he also watches commercial news, is

$$u_{ij}^c = (\hat{s}_i + (1 - (1 + k) \hat{s}_i) \gamma_i - \delta_j) \hat{P} T_i - t,$$

⁷One of the dimensions on which broadcasters could compete is an ideological one (Baron [3], Gentzkow and Shapiro [10], Mullainathan and Shleifer [13]). While it would be desirable to model this element as well, we believe that ideological bias has played a distinctly secondary role in the case of Swedish broadcasting.

where δ_j represents an idiosyncratic preference for public television (distaste for commercial tv), uniformly distributed on $[0, 1]$, and t is a time cost of watching.⁸

A viewer j in group i starts watching commercial news if and only if $u_{ij}^c \geq u_{ij}^s$. That is,

$$(1 - (1 + k) \hat{s}_i) \gamma_i - \delta_j - \frac{t}{\hat{P}T_i} \geq 0.$$

The share of “switchers” in group i is

$$\begin{aligned} S_i &= \Pr \left(\delta_j \leq (1 - (1 + k) \hat{s}_i) \gamma_i - \frac{t}{\hat{P}T_i} \right) \\ &= \max \left((1 - (1 + k) \hat{s}_i) \gamma_i - \frac{t}{\hat{P}T_i}, 0 \right) \end{aligned}$$

We have worked under the implicit assumption that voter j takes the probability that the incumbent is re-elected (\hat{P}) as given. However, a fully rational voter should realize that a change in γ_i can affect the equilibrium probability that the incumbent is elected. Taking this into account will greatly complicate the analysis, without changing the nature of the comparative statics that is of interest. We assume that \hat{P} is fixed (at the level that corresponds to the equilibrium value $\hat{\gamma}_i$): any deviation of γ_i from $\hat{\gamma}_i$ does not cause \hat{P} to vary. Note that if γ_i and ε_i are small enough (even when $t = 0$) voters behave in an approximately similar way even if they realize that \hat{P} is endogenous.

Given viewer behavior, how should the entrant choose its news coverage? We assume that the commercial broadcaster faces a production cost $\frac{1}{2}p_c\gamma_i^2$. It receives revenue a_i for every viewer it attracts. The profit maximization problem is

$$\max_{\gamma_i, \varepsilon_i} \sum_i \left(a_i S_i - \frac{1}{2} p_c \gamma_i^2 \right).$$

The first-order conditions are

$$\hat{\gamma}_i = \frac{a_i (1 - (1 + k) \hat{s}_i)}{p_c}.$$

The commercial channel’s targets audience are viewers with high value to advertisers a_i and low T_i . The latter is true since the low T_i viewers are neglected by state TV and cheaper to attract on the margin. We summarize the key comparative on the behavior of commercial television as follows:

⁸We assume that the idiosyncratic preference for public television is multiplied by T_i . This is done to simplify analysis. The results would be qualitatively similar if δ_j were introduced in an additive manner.

Proposition 4 *A commercial channel that breaks state monopoly chooses coverage $\hat{\gamma}_i$ that is increasing in the commercial attractiveness of that group (a_i) and decreasing in the state news coverage (\hat{s}_i) that the group receives.*

Given the equilibrium behavior of the entrant and of viewers (and recalling from Proposition 3 that we can write $T_i = \frac{p_s + B^2}{B} \hat{s}_i$, the share of switchers in group i is

$$\hat{S}_i = \max \left(\frac{a_i (1 - (1 + k) \hat{s}_i)^2}{p_c} - \frac{t}{\hat{P} \frac{p_s + B^2}{B} \hat{s}_i}, 0 \right). \quad (4)$$

The share of switchers in group i is an increasing function of the commercial appeal of that group: a_i . This is unsurprising because the commercial entrant offers better programming to lucrative audience groups.

Instead, the effect of \hat{s}_i on the share of switchers is ambiguous. On the one hand, viewers in groups with high \hat{s}_i , who are already well-served by state television, are less appealing to the commercial entrant. This effect, which we label the *target audience effect*, is captured by the first addend in expression (4). On the other hand, the state broadcaster is providing better coverage to groups with large political stakes (high T_i). Viewers in those groups are also keen to increase their information by watching commercial news. This *news specialist effect* is captured by the second addend in expression (4).

We thus have the following predictions with regards to switching:

- A1 Selection and \hat{s}_i . Theory does not tell whether the *target audience effect* dominates the *news specialist effect*. We must use empirics to determine the relationships between \hat{s}_i and \hat{S}_i .
- A2 Selection and a_i . Having high value to advertisers is positively correlated with watching commercial news.

Finally, we should ask how a viewer who switches to commercial television fares in terms of information when compared to a viewer who stays with state television. A viewer in group i who switches experiences a change in her information level given by

$$(1 - (1 + k) \hat{s}_i) \hat{\gamma}_i = \frac{a_i (1 - (1 + k) \hat{s}_i)^2}{p_c}$$

This can be positive or negative. As one would expect, the effect is increasing in a_i and decreasing in k and \hat{s}_i . To summarize:

- I1 Average effect of watching commercial TV news. People who start watching commercial TV news increase their information unless k large.

- I2 Heterogenous effects of watching commercial TV across groups. The target audience of commercial news (high a_i , low \hat{s}_i) will have a larger increase in their knowledge about politics than other groups.

3 Empirics

We will now investigate empirically the implications above, in the case of the entry of the commercial channel TV4 in Sweden. Prior to this entry, television in Sweden was run by a public service TV-monopoly, presently named Swedish Television (SVT). The organization is similar to that of the BBC, in that the majority of the board is appointed by the government and that and that the programming choice is independent of direct government involvement. In 1991 a concession was given to the privately owned station TV4 to start commercial terrestrial broadcasts. After its introduction, TV4 has carried less informational content than the public broadcasters SVT. For example, in 1995, news and documentaries was 16 percent of the programming time in SVT and 7 percent of the programming time in TV4.⁹

We will mainly rely on data from the Swedish Election Studies (SES). This survey asks respondents which news channels they watch, a number of knowledge question, and questions about political behavior. For summary statistics and variable definitions, please see the Appendix.

Fortunately for our purposes, the SES is a rotating panel where respondents are interviewed in two consecutive elections. This enables us to study the 1045 individuals who were surveyed both before the entry of TV4 (1988) and in the first election after the entry of TV4 (1991). These individuals are split into two groups. The 687 individuals who only watch SVT news both in 1988 and 1991 are called *SVT viewers*. The 358 individuals who only watched SVT news in 1988, but who started watching TV4 news in 1991 are called *TV4 viewers*.

	1988	1991	N
<i>TV4 viewers</i>	watched only SVT news	watched TV4 news	(358)
<i>SVT viewers</i>	watched only SVT news	watched only SVT news	(687)

We will use this data to test predictions on who selected into each group, based on implications A1 and A2 above. We will then test predictions on the effect of starting to watch TV4 news, contained in I1-I3.

3.1 Audience composition

Whether individuals chose to watch TV4 news depends both on the programming choice of TV4 and SVT, and on individual heterogeneity in the

⁹Source Svenskt TV-utbud 1996. Granskningsnämnden för radio och tv.

valuation of news. This section will first identify the demographic characteristics of the target audiences of TV4 and SVT, and then set up and test the predictions on audience choice based on the two factors mentioned above.

To empirically identify the target audiences of state and commercial TV, we need to find identifiable characteristics related to a_j and s_i . We first identify demographic characteristics correlated with high advertising potential, a_j . We find that in Sweden, advertising revenues are larger for newspapers with a younger and richer audience, see Appendix. This is consistent with the common claim that advertisers pay more for audiences with many young, rich, and women. The reason being that the rich have higher purchasing power, that the young have not yet formed rigid purchasing patterns, and that women carry out a large share of the household purchases. Regarding s_i , we observe the share of correct answers to questions regarding politics in 1988, s_j , which we take as a proxy for s_i . We find that being well informed in 1988 is positively related to being rich and negatively related to being young, see Appendix.¹⁰

Hence, the target audience of SVT are old, rich, and the target audience of commercial TV are young (perhaps rich). To sum up, we have

	young	rich
a_j	+	+
s_j	-	+
Commercial TV target audience, $\hat{\gamma}_i = \hat{\gamma}_i(a_i, s_i)$	+	?
State TV target audience, s_i	-	+

We will now use the SES data to study the characteristics of those who watched commercial TV in 1991. We will use a linear specification of the form:

$$watchTV4_{1991} = c_0 + \gamma_{young}young + \gamma_{rich}rich + \beta s_j.$$

Here, $watchTV4_{1991}$ is a dummy variable for whether the respondent watched TV4 news in 1991. The right-hand side variables are respondent characteristics in 1988: *young* is a dummy variable for people aged 18-35; *rich* is a dummy variable for respondents with income above SEK 115 000 in 1988 (23 percent of the sample); and s_j is the share correct answers to a set of political knowledge questions.

We use the model to interpret the result. If $\beta < 0$ then there is a negative correlation between being previously informed and being a TV4 viewers. The interpretation is that the *target audience* effect dominates. This implies that being a TV4 viewer should be positively correlated with

¹⁰ T_j is positively correlated with being male. We do not have gender information in our advertising data. However, if the common claim that advertisers value women more, then women would be a target audience of commercial TV and men would be a target audience of public TV.

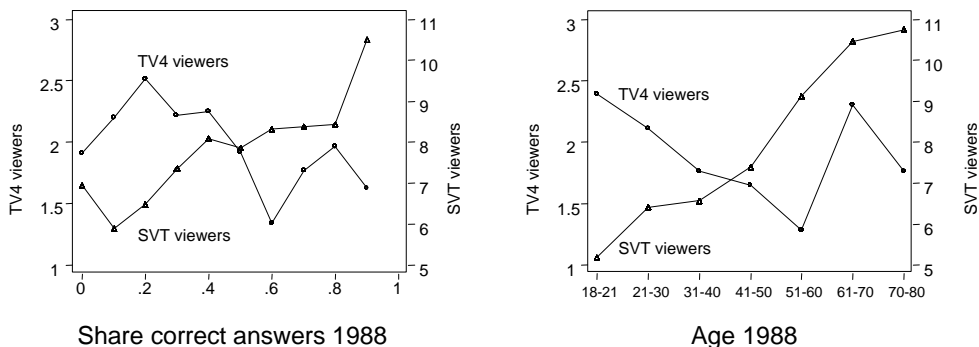


Figure 1: Hours news watching 1991 by respondent characteristics 1988

being young and female. If we find that $\beta > 0$ then the interpretation is that the *news specialist* effect dominates. In this case we have no predictions on the other coefficients. For example, the young have a_j and low s_j . If both a_j and s_j are positively related to watching TV4 news, then we do not have a prediction.

The results are shown in Table 1, column 2. We find that β is significantly negative. So it was not the previously well informed news specialists who started watching commercial TV news. Rather TV4 news attracted the previously uninformed. Consistent with the target audience effect dominating, the young are also significantly over represented among TV4 news viewers.

The same picture appears in the simple group means shown in Table 2 and Figure 1 below. The number of hours watching SVT news in 1991 is positively correlated with respondent knowledge (left graph) and age (right graph). The number of hours watching TV4 news in 1991 is negatively correlated with the share correct answers and age in 1988.

In light of the model, the correlation between watching TV4 and being young results from the young being a key target group for TV4 but not for SVT. Therefore, news are not tailored to the young in SVT, but they are in TV4. The opposite holds for the previously well informed. In consequence, knowledge in 1988 is negatively related to watching TV4 news. It is not the case that the news specialists started watching TV4 news.

3.2 Effects of watching commercial news

These results on audience choice highlights the problems with cross-sectional analysis. A number of studies use cross sections to measure the impact on voter knowledge or other outcome variables. Holz-Bacha and Norris (2001) find that people with a preference for public TV are better informed than those preferring commercial TV. A number of studies in the US find that

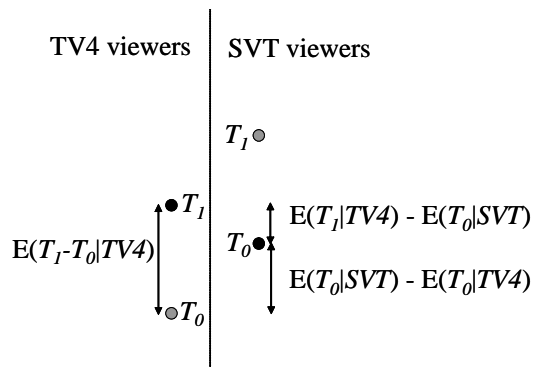


Figure 2: News viewing and knowledge

the number of hours watching (commercial) TV news is insignificantly or negatively related to knowledge. That the interpretation of these correlations is unclear is starkly displayed in our panel data. The number of hours commercial news watched in 1991 is negatively correlated with knowledge in 1988. But this is clearly not measuring the effect of watching commercial TV news on knowledge since commercial TV did not exist in 1988.

To discuss this problem a bit more formally, let s (knowledge) be the outcome variable of interest. Let s_0 denote the knowledge level a person had before watching TV4 news and s_1 the knowledge the person has after having watched TV4 news. We would like to measure the average effect of watching TV4 news on knowledge in the population, $E[s_1 - s_0]$, or perhaps among the TV4 viewers. Now let the dummy variable $TV4 = 1$ for TV4 viewers, and 0 otherwise, and let $SVT = 1 - TV4$. The basic problem in cross sectional analysis is that s_1 is only observed for TV4 viewers news, and s_0 is only observed for SVT viewers. The variable we observe is

$$s = s_1 TV4 + s_0 SVT.$$

We measure the difference in knowledge between TV4 viewers and SVT viewers,

$$\begin{aligned} & E[s | TV4] - E[s | SVT] \\ &= E[s_1 - s_0 | TV4] + E[s_0 | TV4] - E[s_0 | SVT]. \end{aligned} \tag{5}$$

However, this difference contains the effect of watching TV4 on the TV4 viewers, plus the difference in initial knowledge between TV4 viewers and SVT viewers. Figure 2 displays the argument graphically. The solid dots are what we observe and the grey dots are unobserved.

To identify the effect of watching commercial TV news on knowledge, one must assume that, conditional on observables, the average initial knowledge

of TV4 viewers and SVT viewers is the same. Let X denote a vector of observable covariates, then one must assume

$$E[s_0 | TV4, X] = E[s_0 | SVT, X]. \quad (6)$$

However, the model and the data shows that this is unlikely to be satisfied. Individuals' decisions to watch TV4 will depend directly on their initial level of information, s_j . This problem is endemic to all studies of cross-sectional effects of media use on voter information. It may be addressed by instrumental variables or panel data.

Fortunately, we have the SES panel of voters. This allows us to get a measure of the initial level of information before the entry of TV4 (s_0), and thus identify the effect of watching TV4 news without making the assumption in equation (6). From Table 2, the share correct answers for the TV4 viewers prior to watching TV4 news ($E[s_0 | TV4]$) is 0.44 and the corresponding figure for the SVT viewers ($E[s_0 | SVT]$) is 0.51. So we can plug these numbers into equation (5) and identify the effect of watching TV4.

To do this more formally, we compare the changes in knowledge among people who started to watch TV4 with the change in knowledge among those who stayed with SVT. We will use the specification

$$\Delta s = \alpha TV4viewer + \beta X + \varepsilon,$$

where X contains a set of control variables. This is the same econometric specification as a difference-in-difference (DD) estimator, but our design is weaker than the typical DD because selection is based on individual decisions rather than a law or rule.

Two assumptions are needed for the validity of this estimator: that being a TV4 viewer is uncorrelated with time-varying unobservables that affect political knowledge; and that the composition of the group of TV4 viewers remains stable before and after the introduction of TV4 (see for example Blundell and McCurdy, 1999). The latter assumption is automatically fulfilled since we are studying a panel of individuals. However, the former assumption is particularly sensitive in our case because selection is based on individual decisions. Reformulated for our case, the assumption is that the change in knowledge would have been the same among TV4 viewers and SVT viewers, had TV4 not been introduced.

We start by investigating whether SVT news watching was affected by the entry of TV4. In the model we made the assumption that this was not the case. In the data this is true. Basically everyone watches SVT, a total of 6 respondents reported not watching SVT news in 1991, none of these watched TV4 news. Regarding hours of news watched, it seems that TV4 news viewing was just added to pre-existing news watching. From 1988 to 1991, TV4 viewers increased their average reported hours of news watching per week from 8.0 to 9.6, while their hours of SVT news watching only fell

from 8.0 to 7.7. Among SVT viewers news watching was roughly constant (it went from 7.8 to 7.9 hours a week).

The increase in total news hours among TV4 viewers remains basically the same, and significant at one percent level when controlling for age, income, sex and residence location; see Table 3, column 1. More precisely, the regressions include a complete set of dummy variables for ages 18,19,...,80. There are three dummy variables for income: below the 33 percentile (*incomed1*), between the 33rd and 66th percentile (*incomed2*), and above the 66 percentile (*incomed3*, excluded). A dummy variable for gender (*sex*), which takes the value 1 if the respondent is female is included. Finally, four dummy variables indicate whether the respondent lives in a rural area (*locd1*), a small town (*locd2*), a towns or city (*locd3*), or Stockholm, Göteborg or Malmö (*locd4*, excluded).

Next, we study prediction I1, that people who started watching TV4 became better informed. Between 1988 and 1991, respondents who started watching TV4 news increased their average number of correct answers from 44 to 52 percent, while the respondents who stayed with SVT did not improve their scores at all (51 percent correct in both years). Including controls, being a TV4 viewer is associated with a 3 percent higher increase in correct answers relative to the SVT viewers. The difference is significant at the 5 percent level, see Table 3, Column 2.

As an additional test, we examine whether political participation was also influenced by the start of TV4. Voter turnout may be increasing in the amount of information about politics that the respondent has. The direct measure of information provided by the SES is admittedly coarse, by also studying how watching TV-news correlates with voter turnout, we hope to capture a deeper knowledge about politics and perhaps interest in politics which is not captured by the direct measure of information. This also interesting in its own right since it directly addresses the concern that commercial TV may decrease participation in politics. The dependent variable used is whether the respondent voted in the election. The data are from official vote registers and not based on the respondents survey answers. From 1988 to 1991, the share TV4 viewers who voted increased from 89 to 93 percent, while the share SVT viewers increased from 91 to 92 percent. After including controls in a linear probability model of vote choice (OLS), TV4 viewers are estimated to have increased their voter turnout probability by 5 percent relative to that of the SVT viewers. The difference is significant at the 5 percent level, see Table 3, Column 3.

Finally, we will test the hypothesis stated in I2 that watching TV4 has the largest impact on knowledge for high a_i low s_i individuals. To test this we generate two dummy variables for respondents who had a less than average share correct number and were younger than 35 in 1988, respectively. Let the vector containing these dummy variables be x and let \bar{x} be the sample mean of this vector. We run the regression

$$\Delta s = \alpha TV4viewer + \gamma TV4viewer (x - \bar{x}) + \beta X + \varepsilon,$$

where X now also contains the variables in x . The result is presented in Table 4 columns 1 and 2. The effect was significantly larger for the previously uninformed but not for the young. The effect on voting is significantly different from zero only among the uninformed.

4 Conclusions and discussion

Following the entry of commercial TV stations in Europe, there has been a heated debate. People have worried that entertainment will crowd out information and that diversity will be lost. Previous evidence based on cross-sectional data supports these conclusions as people watching commercial TV are less informed.

This paper addresses the obvious selection problem acknowledged in this debate. First, we build a model to understand the programming choices of state and commercial TV, and the resulting selection of individuals in what channels to watch. We find that state TV should target viewers for whom information about policy is valuable, commercial TV should target an audience valuable to advertisers, and uninformed viewers not targeted by the state TV. Theoretically, it is unclear whether the audience of commercial TV news will consist of its target audience, or also of information experts.

Next we study a panel of individuals before and after commercial TV entry. This allows us to determine the characteristics of commercial news viewers before they start watching commercial news, and hopefully measure the impact of commercial TV news. We study the case of Sweden where the commercial TV provider TV4 entered into the state TV monopoly in 1991. We also find that commercial TV news did not attract news specialists. Rather being ex ante well informed is negatively correlated with watching commercial TV news. Further, we find that the young are overrepresented among the commercial TV viewers. We interpret this as a consequence of the young being a key target group of commercial TV since they are highly valued audience to advertisers.

Regarding information, we find that those who started watching commercial news increased their level of political knowledge significantly more than those who did not. We also find that the increase in knowledge from watching commercial news is highest among the target audience of commercial TV, the young and the previously not well informed. We interpret this as a consequence commercial TV news providing material of interest to these target groups.

In response to the worries stated above, we find that information may have been marginalized by entertainment in the commercial channels. However, commercial TV has attracted groups previously undersupplied with

information and contributed both to increased voter information and political participation.

We also find that the worries about decreased diversity are not supported by our evidence. The worries were in particular that certain groups would lose from commercial entry: poor, the less informed, children, and the elderly. First, we find that the poor did not lose, or rather that they lose under both systems and therefore are not much affected by the change. They are not a target audience of commercial TV, but they are also not a target audience of state TV. Second, we find that the ex ante less informed in fact are one of the big winners of the shift to commercial TV. Third, we find that the young are the other winner in the shift to commercial TV.

The obvious limitation of the empirical part of our study is that it applies to a certain country at a certain time. It would be of great interest to see what has happened in all the other countries that have liberalized their television market. In some sense, Sweden is an extreme case because the public service broadcast has always had high standards of journalistic independence. Besley and Prat's [5] would predict that breaking up the state monopoly would have an even more positive effect in countries where government has a more direct influence on the news production process. The other limitation of our study is that it only considers one dimension of the effects of broadcasting commercialization, namely voter information. Further research should use micro data to study other important dimensions, such as change in social values (acceptance of violence, gender roles, nationalism, etc.) and the intellectual development of children.

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5 Appendix

This appendix studies how value to advertisers and prior knowledge vary with demographic characteristics. We first study how the advertisement revenues per reader in Swedish local newspapers vary with the characteristics of their readers. The data on advertising revenues contains 99 Swedish local newspapers advertising revenues in 1994. This is merged with data on newspaper reader characteristics provided by Orvesto. This data is used by the newspapers when selling advertisements. Their original sample contains around 20 000 individuals aged between 17 and 80. We do not have access to the individual level data, but only the share respondents who said they read newspaper A and had personal income B , etc. Unfortunately, the data available to us does not include gender although this is part of the original data set.

A regression of advertisement revenue per reader on reader demographics is shown below. The dependent variable, a_j , is the log advertisement revenue per reader of newspaper j . The set of demographic variables, x_j , contains a constant, the share readers aged 17-35, *young*, a group which comprises 31 percent of the sample, and the share readers with household income above SEK 300 000, *rich*, a group which comprises 36 percent of the sample. We estimate

$$a_j = 5.5 + 5.5 \textit{young} + 3.2 \textit{rich}, \quad N = 99.$$

(0.8) (1.7) (1.6)

We find advertising revenues per reader to be higher for newspapers with a younger and richer audience.

To identify groups with higher levels of value of information, we assume that these the ones who were well informed prior to the introduction of commercial TV. The measure of knowledge we use is the number of correct answers to questions regarding politicians and policy, in the Swedish Election Study. One type of question asks the respondents to identify the party of particular politicians. The 1988 SES contained 5 such questions and the 1991 SES contained 6. The other type are true/false questions such as "Today's sick benefit is 90 percent of income for most people." (true) and "The rate of unemployment in Sweden today is less than 5 percent." (true). The 1988 survey contained 5 such questions and the 1991 contained 7. The questions are listed in the data appendix. Let T_j be the share of correct answers individual i gives in 1988. We regress this on the a similar set of demographic variables, x_j , as in the advertisement case. It contains a constant, the a dummy variable for people aged 18-35, *young*, and a dummy variable for respondents with income above SEK 115 000, *rich*, a group which comprises 23 percent of the sample. The estimation yields

$$T_j = .53 - .11 \textit{young} + .08 \textit{rich} - .05, \quad N = 1045.$$

(.01) (.01) (.02) (.01)

Young and female respondents are less, and rich respondents more, knowledgeable.

Appendix 1: Definitions of Variables

Variable	Definition
tv4view	1 if viewer watched TV4 in second interview(election), but not in first , 0 otherwise
stview	1 if viewer exclusively watched SVT news in both interviews (elections), 0 otherwise
knowl	see below
voted	1 if voted in national election, 0 otherwise
tnews	total hours reported news watching per week
income	personal income in SEK
sex	1 if female, 0 if male
birth	year of birth
incomed1	income below 33 rd percentile
incomed2	income between 33 rd and 66 th percentile
incomed3	income above 66 th percentile
locd1	resident in rural area
locd2	resident in smaller town
locd3	resident in town or city
locd4	resident in Stockholm, Göteborg, or Malmö (omitted)
aj	newspaper advertisement revenue per reader (SEK 1000)

* Original source: Registret för totalbefolkningen.

** Original source: Official voting registers.

Knowledge index

In 1988, the respondents were asked to identify the party of Birgit Friggebo (fp), Thage G. Pettersson (s), Karl Erik Olsson (c), Lars Tobisson (m) and Eva Goes (g). In 1991 they were asked to identify the party of Birgit Friggebo (fp), Göran Persson (s), Karl Erik Olsson (c), Lars Tobisson (m), Eva Goes (g), and Gudrun Schyman (v).

In 1988 the respondents were asked to respond to the following true/false questions

- A. Today's sick benefit is 90 percent of income for most people. (true)
- B. There is a wage earners' fund in each county. (false)
- C. The rate of unemployment in Sweden today is less than 5 percent. (true)
- D. Price incases (inflation) have so far in 1988 been over 9 percent. (false)
- E. It has been decided in parliament that the most toxic radio-active waste from the Swedish nuclear power plants shall be stored abroad. (false)

In 1991 the respondents were asked the following true/false questions.

- A. Today's sick benefit is 90 percnet of the income for most people. (true)
- B. There is a wage earners' fund in each county. (false)
- C. The Swedish Parliament has 349 members. (true)
- D. The ratio of unemployment in Sweden is at the moment less than 5 percent. (true)
- E. Last year, Sweden accepted more than 50 000 refugees from other countries. (false)
- F. It has been decided in Parliament that the most toxic radio-active waste from the Swedish nuclear power plants shall be stored abroad. (false)
- G. Denmark is a member of the EC. (true)

Appendix 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
stview	2090	.6574163	.4746872	0	1
tv4view	2090	.3425837	.4746872	0	1
knowl2	2090	.492039	.2124404	0	.9230769
voted	2090	.9124402	.2827213	0	1
tnews	2052	8.191764	3.788843	0	19.5
sex	2090	.4516746	.4977783	0	1
locd1	2022	.1790307	.3834728	0	1
locd2	2022	.235905	.4246682	0	1
locd3	2022	.4371909	.496162	0	1
locd4	2022	.1478734	.3550622	0	1
incomed1	2090	.1956938	.3968288	0	1
incomed2	2090	.4851675	.4998996	0	1
incomed3	2090	.3191388	.4662545	0	1
incomedd	2090	.4397129	.4964709	0	1
birth	2090	44.66986	16.15107	11	70

Table 1. Audience characteristics

dependent variable	knowledge	TV4viewer
<i>young</i>	-.10** (.01)	.09** (.03)
<i>rich</i>	.0.10** (.02)	-.00 (.04)
knowledge index		-.26** (.07)
constant	.50** (.01)	.44** (.04)
R2	.11	.03
# observations	1045	1045

OLS estimates. Standard errors in parenthesis.

**Denotes significance at 1 percent level. *Denotes significance at 5 percent level.

Table 2. Audience characteristics

	age	knowledge	income	sex	voted
TV4 viewers	40.1 (0.9)	0.44 (0.01)	99000 (3000)	0.45 (0.03)	0.89 (0.02)
SVT viewers	44.9 (0.6)	0.51 (0.01)	105000 (2000)	0.45 0.02	0.91 (0.01)
p-value, same means	0	0	0.10	0.87	0.34

(Standard errors in parenthesis.)

Table 3.**Dependent variable: Changes in newswatching, knowledge and turnout 1988-1991**

dependent variable	Δ newswatching	Δ knowledge	Δ voted
<i>TV4 viewer</i>	1.40** (.25)	.031* (.013)	.0475* (.023)
sex	-.26 (.23)	-.008 (.012)	-.023 (.022)
locd1	-.42 (.40)	-.039 (.020)	.048 (.036)
locd2	-.16 (.37)	-.056** (.019)	.034 (.034)
locd3	-.15 (.33)	-.024 (-.016)	.014 (.030)
incomed1	.42 (.32)	.033** (.016)	-.052 (.029)
incomed2	.40 (.27)	-.006 (.013)	-.046 (.025)
constant	.20 (.33)	.030 (.017)	.024 (.030)
age dummy variables	yes	yes	yes
R2	0.09	0.10	0.09
# observations	1008	1045	1045

OLS estimates. Standard errors in parenthesis.

*Denotes significance at 1 percent level. **Denotes significance at 5 percent level.

Table 4. Heterogenous effects

dependent variable	Δ knowledge	Δ voted
<i>TV4 viewer</i>	.024* (.011)	.043 (.23)
<i>TV4 viewer*uninformed</i>	.085** (.022)	.070 (.044)
<i>TV4 viewer*young</i>	.01 (.023)	.020 (.022)
controls	yes	yes
R2	0.24	.10
# observations	1038	1038