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**Broadcasting, advertising finance and
the rationale for public broadcasting**

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CASE - Centre for Advanced Studies in Economics

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Broadcasting, Advertising finance and the Rationale for Public Broadcasting

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Abstract

A fundamental drawback with the business model of advertising-financed broadcasting is that the incentive to deliver viewers of desirable demographics to advertisers can cause excessive competition for certain viewer groups to the exclusion of others. A public TV channel has a clear role to play in providing programming to the groups who would otherwise be disenfranchised in the market system. The public broadcaster performs best when it has detailed information on the disutility of ads from different viewer segments and on advertiser valuations.

Keywords: Two-sided markets, public broadcasting, advertising-finance, media economics

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1   Introduction

The rationale for public broadcasting and its role in a commercial broadcasting system depends on the market failures inherent to a private enterprise system for broadcasting (see Anderson and Gabszewicz, 2006, for a review). The basic business model of commercial broadcasting is quite different from the industrial organization of standard markets since it involves a two-sided market structure. It thus deserves a dedicated and particular analysis.

One main worry is that the industrial organization of the broadcasting market may not adequately represent certain viewer groups. In particular, advertisers are most keen on communicating with demographic groups who are most responsive to the advertising messages. Broadcasters will then compete by choosing programming formats that deliver the attractive demographics. While the favored groups are well served by the competitive process, those groups the advertisers are not interested in will find themselves without program service (unless they happen to like program types similar to the favored ones).

In this paper we show this by setting up a simple model of advertising-financed broadcasters and indicate some basic weaknesses of the advertising-finance business model. This naturally leads to considering the role of a public broadcaster in ameliorating the market performance.

2   The Duplication Principle

The basic problem of the advertising-finance business model is that the profit motive can cause excessive competition for certain viewer groups to the exclusion of others. We start by illustrating the basic point and then elaborate.

2.1 Duplication a la Steiner

The starting point is the analysis of Steiner (1952). To set the stage, suppose there are just two groups of viewers. The first group comprises 700,000 individuals who prefer to watch a game show. The second group comprises 300,000 people who prefer to watch opera. The programming is ultimately paid for by advertisers, and suppose that individuals of each type are equally valuable to them.

If there is only one TV station, it will cater to the larger group and broadcast a game show. A second TV station though would also air a game show because half the large audience is worth more than the small audience. In that sense, competition is wasteful because it entails duplication of existing programming rather than broaching new genres. The minority individuals are unserved in the market system because they are insufficiently valuable. Another intriguing feature of the example is that a monopoly broadcaster with two channels would cater to both audience demographics. This point was also made by Steiner (1952): monopoly ownership may be welfare superior to competition.

2.2 A public broadcaster's role

There is a clear role for the public broadcaster of one of the channels. If the private station shows the game show, the public broadcaster should cater to the minority group to ensure full market coverage and proper representation of the minority's tastes. Notice the public broadcaster here should not succumb to the political pressure to serve the majority. If it does so, the private station will still serve up the game show. Even though the public broadcaster ostensibly is serving up what the public wants, it is also not correcting the market failure. It needs to stick to its mandate of providing the minority programming: even though it may be criticized on the grounds that it is using public money to cater to a small minority and not providing programming that caters to the mainstream tastes.

The examples above can be pushed in several directions. They are pertinent to

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many markets (e.g., local radio markets) because typically there are spectrum restrictions and few broadcasters. For another illustration, suppose the viewer groups are in proportions 70, 20, 10 (say rock music, country, and opera). Then if there are three or fewer stations, all will provide rock programming. Only when there are 4 or more stations will country be provided, and opera is only guaranteed when there are 10 stations in the marketplace. Needless to say, even when the market does provide opera, there is substantial wastage through duplication of the popular formats. A public broadcaster might provide opera at a much lower threshold (i.e., in a smaller market).

2.3   Value to advertisers

The examples above have obscured a fundamental concern with the market allocation because they have taken all viewers to be equally valuable to advertisers. In practice, advertisers are greatly concerned with the demographics of the audience composition. Younger demographic groups (especially those in the 20-30 year old range) tend to have recently come into an increased flow of income and their spending patterns have not yet been finalized. These features make them especially attractive to advertisers – they have disposable income and spending patterns that are decided now may last a long time. These factors lead to strong demand from advertisers for the channels through which they can communicate with these groups, stereotypically Young Urban Professionals (Yuppies) or 20- and 30-somethings. Males are even more valuable than females in such groups because they tend to be harder to reach.[1]

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[1]See Wilbur (2005) or Mooney (2007) for evidence on the value of different demographics to advertisers.

2.4   The problem of the disenfranchised viewers

Because the advertisers have a strong willingness to pay for certain demographics the pressure is on the broadcasters to deliver them. This means that there is competition by program type delivering what these types want. While this per se sounds like an efficient competition, reflecting the principle of consumer sovereignty, the flip side is the problem of the viewers who are not desired by the advertisers. Insofar as they are not desired, there is little economic benefit to delivering them. Their economic weight is then low in the broadcaster's calculus, and they become essentially a disenfranchised class. This problem arises in fullest force when program preferences are strongly correlated with desirability of advertisers to contact the viewer base.

Suppose then that there are two groups of viewers, 20-somethings and senior citizens, and two program types, sitcoms and nature programs. 51% of viewers are 20-somethings who prefer sitcoms; the 49% of senior citizens prefer nature programs. Each 20-something is worth 3 times to an advertiser what a senior citizen is worth. Then if there are 3 commercial channels, they will all air sitcoms and cater to 17% of the viewers each, so covering all the 20-something segment but nothing for the senior citizens. This is true no matter what the entertainment value of the nature programming is worth to the senior citizens. If one of the commercial channels is made public, it can broadcast a nature program. The 20-somethings are no worse off. Interestingly, neither are the advertisers. They can reach the full 20-something audience by placing ads on the two commercial channels (instead of on each of 3). Moreover, they can now air ads on the nature program too if the public station accepts ads, and in that way get a broader coverage of viewers too!

In a similar manner, if say 35% of the audience were each worth twice what a member of the other 65% were worth, then a commercial system with just 2 channels would cater solely to the minority viewers and leave disenfranchised the majority 65%. The basic principle governing programming choice is thus the economic size of market segments, with the economic size being the weight to advertisers times

the market segment size in terms of viewers. The basic problem of what is provided to whom is obviously more complex when viewers' tastes are heterogenous and the problem is combinatorial, but the basic problem in market provision remains. Matters are also more intricate when viewers' tastes include second or third preferences, and when the same viewer can be delivered by different channels.

2.5   The Lowest Common Denominator

The analysis above has supposed that viewers will watch their first choice only and was first framed by Steiner (1952). Beebe (1977) uncovered another possible market failure when there is market power, that of catering to Lowest Common Denominator (LCD) tastes. This is usually proposed as a counter-view to Steiner's proposition that a monopoly may give a better coverage than competition. In Beebe (1977) viewers have diverse first preferences, but no group gets their first choice and the market provides the Lowest Common Denominator. To see this, consider three groups; where groups 1 and 2 are of equal size and together comprise 67 percent of the market whilst group 2 makes up the remaining 33 percent. Group preferences range over Game Show (GS), Sport (S), News (N), and Documentary (D) as follows

Group	First choice	Second choice
1	S	GS
2	N	GS
3	D	GS

If there are two competing commercial channels, each will air a Game Show (GS). The channels cater to the Lowest Common Denominator and, in addition, we get duplication as in Steiner, except now at a lower level. Again there is a clear role for a public broadcaster of one of the channels. If the private channel shows the Game Show, the public station should either air Sport or Documentary, thus catering to the first choice of either group 1 or 3.

The difference in market structures becomes more pronounced if we change the first preference of group 3's first choice to Sport. The rewritten table is now

Group	First choice	Second choice
1	S	GS
2	N	GS
3	S	GS

Two competing channels will air Sports programming, each catering to 33.5% of the market and leaving group 2's demand unserved. With one public and one private channel, the private channel will broadcast Sport, thus serving the first choices of groups 1 and 3. The public channel will broadcast News and all first choices are served. The private channel gets a larger audience than in the competitive setting and, generally, everyone is better off.

3   Advertising Nuisance

The models above have assumed that the level of advertising is fixed across channels. In practice, channels choose how many ads to air (though they may end up constrained by regulatory caps on ad levels). We here allow for endogenous choice of ad levels.

3.1   Market equilibrium ad levels

Assume that viewers have an intrinsic distaste for advertising (or else the broadcaster's problem becomes trivially to air the profit-maximizing level of ads). At the margin, extra ads may cause some viewers to switch off, and so the broadcaster no longer can deliver those viewers to advertisers. This is the interesting trade-off

in this two-sided market interaction; delivering the right mix on both sides of the market.

Retaining the set-up of Steiner, that viewers will watch either their most-preferred program type, or else not at all, we allow all parameters to (potentially) differ across market groups. Index the groups by $i = 1, ..., K$. Suppose then that group i viewers have an ad disutility γ_i per ad screened, and that a_i ads are screened on their preferred channel: assume for the moment that the channel type is provided by a single broadcaster. The viewers' valuations vary uniformly between 0 and R_i, and the group size is N_i.[2] Hence the number of viewers if a_i ads are screened is given by the demand expression

$$D_i = \left(1 - \frac{\gamma_i a_i}{R_i}\right) N_i, \qquad\qquad i = 1, ..., K, \qquad (1)$$

so that all N_i potential viewers watch if there are no ads, while none watch if there are R_i/γ_i ads (or more). From (1) it follows that the consumer surplus for group i can be expressed as

$$CS_i = \frac{(R_i - \gamma_i a_i)^2}{2} \frac{N_i}{R_i}, \qquad\qquad i = 1, ..., K.$$

On the advertiser side of the market, let the value per advertiser per viewer reached be v_i, the same for all advertisers contacting viewers in group i. Then the advertising revenue is $v_i a_i$ per viewer delivered by the broadcaster, leading to a broadcaster profit of

$$\pi_i = v_i a_i D_i, \qquad\qquad i = 1, ..., K.$$

The profit maximizing choice of ad level under monopoly (superscript M) is

$$a_i^M = \frac{R_i}{2\gamma_i}, \qquad\qquad i = 1, ..., K, \qquad (2)$$

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[2]This means we can write the net utility of a group i viewer as $u_i = r_i - \gamma_i a_i$ from watching, with a zero utility from not watching, with r_i uniformly distributed on $[0, R_i]$.

equivalently, half the total market potential is delivered (a standard result for linear demand functions), and the maximized level of profit is

$$\pi_i^* = v_i \frac{R_i N_i}{4\gamma_i}, \qquad\qquad i = 1, ..., K, \qquad (3)$$

which is written in closed form solely in terms of parameters of the model.

Inspection of (3) and comparison across different market groups indicates which ones will be served in equilibrium. Since if two broadcasters were to provide the same content, competition in advertising levels would drive profits to zero (effectively the well-known Bertrand result), the equilibrium genre choices for n broadcasters are to serve those n groups for which profits are greatest.[3] Ceteris paribus, the groups most likely served are those with the higher advertiser valuations (v_i), market size (N_i), entertainment valuations (R_i), and least advertising nuisance (γ_i).

3.2 Introducing a Public Broadcaster

It is worthwhile considering the benefits of a public TV station in the setting above. A first question is whether the public broadcaster ought to air ads. Clearly if $\gamma_i > v_i$, it ought not because the nuisance exceeds the social benefit. In this case a public station should provide programming to groups with high nuisance costs and low advertising valuations.

If $\gamma_i < v_i$ we have an interesting conundrum. First, the ads are worth more than the nuisance, but putting on ads displaces viewers. If the private and social benefit of ads coincides and are both equal to v_i, the full social optimum would have all viewers watch, and be exposed to ads. In principle this can be achieved by subsidizing viewers to watch, and a subsidy of size $\gamma_i a_i$ would induce all viewers to watch. However, in reality such a subsidy infeasible, and also not easily enforceable:

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[3]We ignore mixed strategy equilibrium with the associated coordination difficulties: see Anderson, Simon P; Engers, Maxim

Participation Games: Market Entry, Coordination, and the Beautiful Blonde

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the viewer can claim to be watching, leave the TV on and sit in the sauna instead. Feasibility might instead require no subsidies, and then we have a constrained problem: provide the programming without ads (social benefits of $N_i R_i/2$), or put on a_i ads and allow viewers to choose whether to watch or not. The latter policy yields surplus of

$$S_i = (R_i - \gamma_i a_i) \frac{N_i}{R_i} \left(v_i a_i + \frac{(R_i - \gamma_i a_i)}{2} \right).$$

A public channel maximizing social surplus solves the problem

$$\max_{a_i} S_i = \left\{ \frac{N_i}{R_i} (R_i - \gamma_i a_i) \left(\underbrace{\frac{R_i - \gamma_i a_i}{2}}_{\text{average viewer surplus}} + \underbrace{v_i a_i}_{\text{advertiser gross benefit}} \right) \right\}.$$

The surplus derivative is

$$\frac{dS_i}{da_i} = (R_i - \gamma_i a_i)(v_i - \gamma_i) - \gamma_i v_i a_i,$$

It is optimal for the public channel to show no ads if $\gamma_i > v_i$. Otherwise, the derivative is positive at $a_i = 0$ if and only if $v_i > \gamma_i$. and the optimal level of ads shown is

$$a_i^P = \frac{R_i (v_i - \gamma_i)}{\gamma_i (2v_i - \gamma_i)}. \tag{4}$$

It is readily shown that $a_i^P < a_i^M$: the public station's ad broadcast level is less than the monopoly level, because the public firm internalizes the ad nuisance.

We can next ask in which group we would most like the public channel to replace the private firm. A surplus maximizing firm which provides the monopoly ad level $\left(a^M = R_i/2\gamma_i \right)$ generates a surplus of

$$S_i^M = \frac{N_i R_i}{4} \left(\frac{1}{2} + \frac{v_i}{\gamma_i} \right).$$

The public channel, in contrast, has a surplus in each segment it serves of (using the expression derived above for a_i^P):

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$$S_i^P = N_i R_i \left(\frac{v_i}{2v_i - \gamma_i} \right) \left(\frac{v_i}{2\gamma_i} \right) \qquad \text{for } \gamma_i \leq v_i \text{ and } a_i^P > 0$$

$$S_i^P = N_i R_i \qquad \text{for } \gamma_i \leq v_i \text{ and } a_i^P = 0$$

The surplus increment from a public firm is then given by $\Delta S_i = S_i^P - S_i^M$, or

$$\Delta S_i = \frac{N_i R_i}{8} \left(\frac{\gamma_i}{2v_i - \gamma_i} \right) \qquad \text{for } v_i > \gamma_i$$

$$\Delta S_i = \frac{N_i R_i}{8} \left(3 - \frac{2v_i}{\gamma_i} \right) \qquad \text{for } v_i < \gamma_i,$$

with $\Delta S_i = \frac{N_i R_i}{8}$ if $\gamma_i = v_i$.

It is clear that the optimal replacement policy for the public firm is to choose the sector for which ΔS_i is greatest. In order to do so, the government needs information on the disutility of ads from different viewer segments as well as advertiser valuations. In principle these may be private information.

4 Some concluding remarks

Two-sided markets are characterized by two groups which interact through an intermediary, or platform, that takes into account the externalities between the groups. Advertising-financed broadcasting constitutes such a two-sided market, where the platform is the broadcast company and the two interacting groups are viewers and advertisers.[4] Advertisers like more viewers to receive their messages, but viewers very often find advertising a nuisance as it detracts from available time to watch a program. The negative externality from ads is the indirect price viewers pay for programming. Advertisers produce programming for viewers who care less about

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[4]The commercial television market can be a one-sided market in the case of pay-TV when there is no advertising finance.

program interruption (ads) and at the same time are valuable to advertisers. A public channel has a clear role to play in such a setting, and its programming choices should depend on the size of the viewer segments and on the strength of the linkages between the two potential sides of the market.

One other aspect of media industries that renders them special is that they provide much of the current affairs information that is needed for consumers to make informed voting choices. A free press with diversity of viewpoints is therefore fundamental to the democratic process. Manipulation of the press has been a concern for years. Joseph Goebbels well recognized the power of propaganda in furthering the aims of Nazi Germany. Earlier, in the first World War, mutinies in the French soldiery in 1917 were blamed in part on German-subsidized papers in France. Amazingly, this Press was still allowed to operate despite enemy subsidies.

"at the time almost no independent press, and that one of the top liberal newspapers was being literally financially subsidized by the Germans! Mr. Watt explains that, for some reason, French newspaper ads didn't generate much profit, so, to survive, periodicals had to accept money from political factions."

<div align="center">(online review of Watt (1963): Dare Call it Treason)</div>

Such stories, and the political climate of the time, remain a prime reason why the early television and radio stations in Europe at least, were state-run. It was just too dangerous to leave them open to manipulation by hostile interests. Even today, control of the press (and television, radio, etc.) is exercised by many dictatorships and authoritarian governments. However, while recognizing the key role of bias, and concerns with market provision of media, this study has concentrated on the (more standard) performance aspects of the media. A fuller analysis of the role of the public broadcaster would also include its effects on overall market bias.

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