The Media Financing Paradox*

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Abstract: This paper proposes a simple model to discuss how competition between media firms influences the way they are financed. In this model, the media firms' products are horizontally differentiated. Under the assumption that consumers dislike advertising, we establish the paradoxical result that the media firms rely more on advertising revenues - and less on consumer payments - the closer substitutes their products, and therefore the fiercer they compete for these advertising-averse consumers.

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1 Introduction

Why do media firms choose different ways to earn revenues? Why do we, for example, observe so many advertising-financed TV channels, when empirical evidence suggests that their audiences dislike commercials?[1] Why not charge the audience directly, and avoid product-damaging commercials? Casual observations suggest that media firms operating in niches with limited competition are based on consumer payments to a larger extent than firms offering general products to a large audience. In line with these observations, we present a simple model showing how competition between media firms can help explain the way they are financed.

In our model of a media duopoly, the audience dislikes advertising. Each firm is financed by advertising, direct payment from consumers, or both. We find that the tougher the competition, in the sense of the media products being closer substitutes, the more do the media firms rely on advertising revenues. Indeed, in the limit case where the media products are perfect substitutes, the entire profits of the media firms come from advertising. Quite paradoxically, firms rely more on advertising the fiercer the competition for those advertising-averse consumers.

In order to understand this result, note that competition in consumer prices is qualitatively different from competition in advertising prices. As is the case in more traditional markets, consumer prices are *strategic complements*: if one media firm reduces the price it charges its audience, it will be optimal for the other firm to do the same. But due to the audience's dislike of advertising, advertising prices are *strategic substitutes*: a price reduction from one firm leads to a price *increase* from the other.[2] To see why, suppose that firm 1 reduces its advertising price. This leads to an increase in its level of advertising, which is bad for its audience. Therefore, there will be a shift of media consumers from firm 1 to firm 2. Since firm 2 will end up with a larger audience, it can respond by increasing its advertising price.

Competition in strategic complements is generally more aggressive than com-

[1] See Wilbur (2005), who estimates a model of TV competition and finds viewers' disutility to be significant and positive.

[2] This is a regular feature of recent work on media competition, such as Gabszewicz, *et al.* (2004) and Anderson and Coate (2005).

petition in strategic substitutes, and more so the less differentiated the products are (see, *e.g.*, Bulow, *et al.*, 1985, and Vives, 1999). In particular, firms producing identical products at identical costs will make a positive profit if they compete in strategic substitutes, but not if they compete in strategic complements. This explains why we arrive at the result that the media firms raise all their revenues from advertising if their products are perfect substitutes; the profits from consumer prices are competed away with homogenous products.

Our work relates to other papers in which media firms are viewed as platforms, selling their media products to one set of consumers (the readers, viewers, or browsers) and advertising space to another set of consumers, *viz.* the advertisers, in such a way that there are externalities between the two groups: There are positive externalities from consumers to advertisers, who benefit from many media consumers observing their advertisements, at the same time as there are negative externalities from advertisers to consumers, who consider advertising a nuisance. Some recent models of media competition along these lines are by Gal-Or and Dukes (2003), Gabszewicz, *et al.* (2004), Anderson and Coate (2005), and Armstrong (2005).[3] Despite some differences in modeling, all these models depict the demand for media products the same way, by way of the Hotelling (1929) model of horizontal product differentiation. Here, we supplement these authors' work by presenting a representative-consumer model of product differentiation. With our formulation, we are able to address aspects of media competition that the Hotelling formulation does not allow. Notably, in the Hotelling model, total consumption is affected by neither consumer prices nor levels of advertising, as long as the market is covered. With our formulation, on the other hand, total consumption is more realistically dependent on both consumer prices and levels of advertising.

Two papers particularly closely related to ours are those by Peitz and Valletti (2005) and Crampes, *et al.* (2005), in that they, like us, study a media industry where firms get revenues from both advertisers and consumers. The analysis of Peitz and Valletti is, like the above mentioned papers, cast in the framework of

[3]For an overview of the recent literature on media economics, see Anderson and Gabszewicz (2005).

Hotelling (1929). Their results on pay TV are close to what we find here: The tougher competition is, measured by the inverse of the Hotelling differentiation parameter, the lower the consumer price, they find. One difference is that, whereas we have the consumer price approaching zero only in the limit as we approach perfect substitutes, they have a zero consumer price for a range of values of the differentiation parameter.[4] Crampes, *et al.* (2005) focus on free entry and model horizontal product differentiation by way of the Salop (1979) circle model. Thus, like us, they do not consider endogenous product differentiation. However, like in the other papers, their formulation retains the feature from the Hotelling-based models that total consumption is fixed.

2 A model of media competition

We consider a situation with two media firms. Consumers' (gross) utility is given by

$$U = V_1 (1 - A_1) + V_2 (1 - A_2) - \frac{1}{1+b} \left(\frac{V_1^2}{2} + \frac{V_2^2}{2} + bV_1V_2 \right), \tag{1}$$

where V_i and A_i are consumption and advertising at firm i, $i \in \{1, 2\}$. This particular function is a one-parameter version of the standard quadratic utility function, see, *e.g.*, Vives (1999) and Motta (2004) for expositions. That one parameter is $b \in [0, 1)$, which measures the degree of horizontal differentiation between the products of the two media firms. The products are completely independent if $b = 0$, while there is no horizontal differentiation between them in the limit as $b \to 1$. More generally, the media firms' products are closer substitutes from the consumers' point of view, the higher is b. The parameter is introduced in this particular way in order for there to be no effect on market size from an increase in b, only an effect on product differentiation. We note that there is a disutility from advertising, in that $\frac{dU}{dA_i} < 0$, $i \in \{1, 2\}$.

The consumers' demand for the media products is found by maximizing consumer

[4] To be precise, 'zero' should be replaced by 'non-positive', since Peitz and Valletti in most of their analysis do not restrict consumer prices to be non-negative.

surplus,

$$CS = U - p_1 V_1 - p_2 V_2, \tag{2}$$

with respect to V_1 and V_2. This yields the demand for firm i's product equal to

$$V_i = 1 - \frac{p_i - b p_j}{1 - b} - \frac{A_i - b A_j}{1 - b}, \quad i,\ j = 1,\ 2, \quad i \neq j. \tag{3}$$

Demand for the media product of a firm is thus decreasing in its own price and advertising level, and increasing in those of its rival. This reflects the consumers' perception of the media products as (imperfect) substitutes.

Consumer-good producers advertise with a media firm as long as the benefit of doing so is larger than the cost. For simplicity, we assume that there is only one advertiser. This single advertiser is assumed to take the media firms' advertising prices as given. It can be shown that the qualitative results of the paper hold for an arbitrary number of independent advertisers. The advertiser's gross gain from advertising is naturally increasing in its advertising level and in the number of viewers exposed to the commercials. We make it simple by assuming that the gross gain from advertising at media firm i equals $A_i V_i$. The net gain for the advertiser from advertising is then

$$\pi = A_1 V_1 + A_2 V_2 - A_1 R_1 - A_2 R_2. \tag{4}$$

To find the demand for advertising, we use equations (3) and (4) to solve $\partial\pi/\partial A_1 = \partial\pi/\partial A_2 = 0$. This yields

$$A_i = \frac{1}{2}\left(1 - p_i - \frac{R_i + b R_j}{1 + b}\right), \quad i,\ j = 1,\ 2, \quad i \neq j. \tag{5}$$

For simplicity, we put the media firms' production costs equal to zero, so that the profit of media firm i equals

$$\Pi_i = A_i R_i + p_i V_i, \quad i = 1, 2. \tag{6}$$

We consider the following game: First, the media firms simultaneously choose prices for consumers and advertiser.[5] Secondly, the advertiser decides how much

[5] Our main result would not be affected in important ways if the media firms were assumed to

advertising space to buy given those prices. And finally, consumers choose how much to buy of the media products of the two firms, given prices and levels of advertising. We note the following crucial property of our model of media competition:

Proposition 1: *Consumer prices are strategic complements, whereas advertising prices are strategic substitutes.*

This result follows from equations (3), (5), and (6), from which we find that $\frac{\partial^2 \Pi_i}{\partial p_i \partial p_j} = \frac{b}{2(1-b)} > 0$, and $\frac{\partial^2 \Pi_i}{\partial R_i \partial R_j} = -\frac{b}{2(1+b)} < 0$.

Proposition 1 shows that there is an important difference between the two markets in which the media firms operate. In the consumer market, an increase in one firm's price would provide the other firm with incentives to increase its price, too. This is in line with the normal textbook depiction of price competition. Things are quite different in the advertising market, though. As equation (5) shows, the demand for advertising facing media firm i is decreasing not only in its own price but also in that of the rival firm (for $b > 0$). To see why, suppose that R_2 increases. This causes the advertising level at firm 2 to decrease, making its product relatively more attractive for the audience. Some consumers will therefore shift from firm 1 to firm 2, and more so the closer substitutes the media firms' products. Since firm 1 then will have a smaller audience and a lower demand for advertising, it will have an incentive to reduce its advertising price. In other words, firms' advertising prices are strategic substitutes.

The fact that consumer prices are strategic complements and advertising prices strategic substitutes has important implications for how the competition between the media firms works. Competition in strategic complements is more aggressive than competition in strategic substitutes, and more so the less differentiated the services (*e.g.*, Bulow, *et al.*, 1985, and Vives, 1999). As competition becomes fiercer and b increases, the media firms' equilibrium prices to consumers therefore fall while their advertising prices rise. Thus, competitive forces make the media firms rely

set quantities rather than prices in one or both of the markets. This robustness with respect to the price-vs-quantity issue is not shared by all models cited in the Introduction. See, in particular, Crampes, *et al.* (2005), where results from price competition and quantity competition are found to differ.

increasingly on advertising as a source of revenue, and in the limit as b tends to 1, they are entirely financed by advertising.

To show this, we maximize profit (6) subject to the audience function (3) and the demand for advertising (5). Solving $\partial\Pi_i/\partial p_i = \partial\Pi_i/\partial R_i = 0$ simultaneously for the two firms gives rise to a symmetric equilibrium with the following prices:

$$R_i = \frac{1+b}{2+b}, \text{ and } p_i = \frac{1-b}{2-b}, \quad i = 1, 2. \tag{7}$$

By insertions in (3) and (5), we find that advertising quantities and audience sizes equal

$$A_i = \frac{b^2}{2\left(4-b^2\right)}, \text{ and } V_i = \frac{4+2b-b^2}{2\left(4-b^2\right)}, \quad i = 1, 2. \tag{8}$$

Thus, the firms' profits equal

$$\Pi_i = \frac{4-3b^2}{\left(4-b^2\right)^2}, \quad i = 1, 2.$$

Note that $\frac{d\Pi_i}{db} < 0$; the more competition the firms face, the lower is profit.

It is now useful to define S_i as consumer revenue's share of total revenue in firm i:

$$S_i = \frac{p_i V_i}{p_i V_i + A_i R_i} \tag{9}$$

Because of symmetry, we can write $S = S_1 = S_2$. Using equations (7) and (8), we express S as a function of b:

$$S(b) = \frac{(1-b)(2+b)\left(4+2b-b^2\right)}{2\left(4-3b^2\right)}; \tag{10}$$

Here, $S'(b) < 0$, $S(0) = 1$, and $\lim_{b\to 1} S(b) = 0$. We can therefore conclude:

Proposition 2: *Consumer revenue as share of total revenue is lower the closer substitutes the media firms' products. At $b = 0$, the media firms are entirely financed by consumer payments, while they are entirely financed by advertising in the limit as $b \to 1$.*

The equilibrium outcome is illustrated in Figure 1, where we graph advertising revenue ($A_i R_i$) and consumer revenue ($p_i V_i$) as functions of b. The Figure shows clearly that an increase in media competition leads to a shift from consumer payments to advertising as source of revenue.

From equation (8), we get another interesting feature of our model:

Proposition 3: *The media firms' audiences are larger the closer substitutes their products:* $\frac{dV_i}{db} > 0, i = 1, 2.$

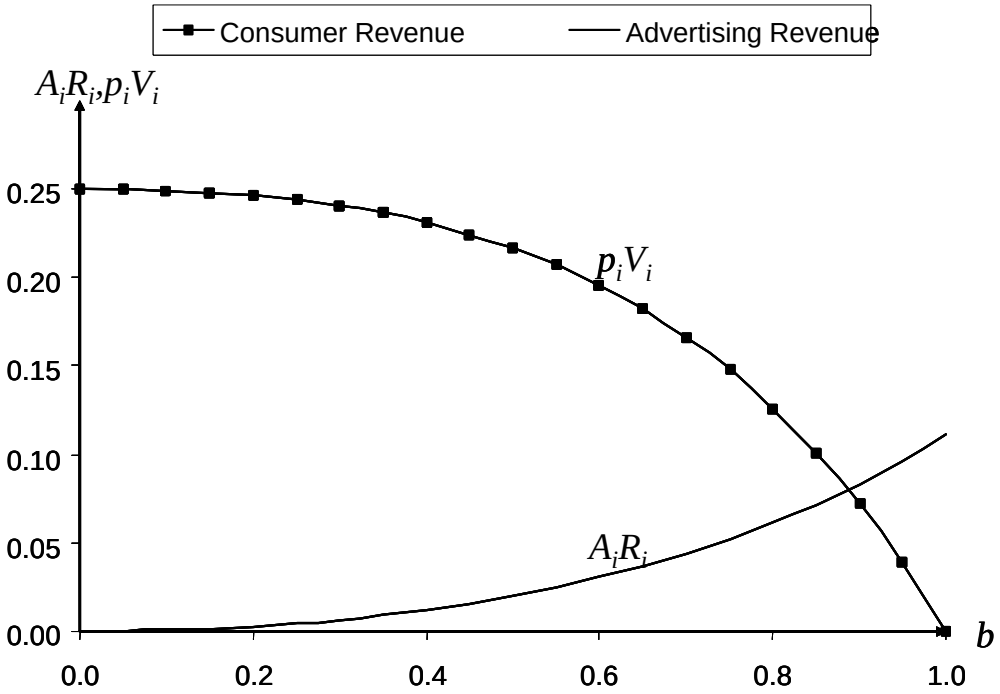


Figure 1: *Revenue from consumers and advertisers.*

There are two effects on the audience sizes as b increases: Consumer prices go down, having a positive impact on audience sizes. At the same time, advertising goes up, having a negative impact. Since an increase in b means that competition increases - reducing the media firms' ability to utilize their market power over the consumer - the former effect dominates. Thus, the closer substitutes the two media firms produce, the larger the size of the audience. This is similar to the effect we find in more traditional markets, where stronger competition leads to higher output.

In combination, Propositions 2 and 3 predict that media firms that are mainly advertising financed have relatively large audiences. However, this is not because they seek a broader public as such. On the contrary, a profit-maximizing monopoly would choose to have no advertising, high user payments and a relatively small audience. This fits well with the observation that pay-TV channels (and specialized

Internet sites with user payment) typically have relatively few viewers.

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