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Inter-firm price coordination in a two-sided market☆

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ABSTRACT

In many two-sided markets we observe that there is a common distributor on one side of the market. One example is the TV industry, where TV channels choose advertising prices to maximize own profit and typically delegate determination of viewer prices to independent distributors. We show that in such a market structure the stronger the competition between the TV channels, the greater will joint profits in the TV industry be. We also show that joint profits may be higher if the wholesale contract between each TV channel and the distributor consists of a simple fixed fee rather than a two-part tariff.

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1. Introduction

The most widespread business model in the TV industry is one where different TV channels use a common distributor to reach the viewers. The TV channels set advertising prices on their own, but delegate to the distributor to determine the prices that the viewers have to pay. This delegation has the benefit that there will be no price competition between the TV channels in the viewer market; any business-stealing effects will be internalized by the distributor. In a traditional ("one-sided") market, such inter-firm price coordination would always be beneficial to the firms. Other things equal, it would generate the same joint profit that would be obtainable in a perfect cartel. However, we show that this logic does not apply in a two-sided market.[1]

To understand this, note that the distributor does not fully internalize the impact of high viewer prices on revenues from the advertising side of the market. Likewise, the TV stations, in setting their prices to advertisers, do not fully internalize the effect that advertising volume has on viewers' willingness to pay for watching TV. Due to these shortcomings, inter-firm coordination can lead to some seemingly counter-intuitive results. We find, for instance, that if the TV channels become less differentiated, then joint industry profits increase even though the TV channels compete more fiercely. The reason for this surprising result is that the lack of internalization becomes less serious if the competitive pressure increases.

In our analysis, we allow the distributor and each TV channel to bargain over a two-part wholesale contract that consists of a fixed fee and a unit wholesale price. Since the viewer price is increasing in the unit wholesale price, one might expect that the contract could be used to induce firms to set optimal end-user prices. The problem, however, is that the unit wholesale price affects the relative profitability between the two sides of the market and therefore changes both the viewer price and the advertising price. It follows that a two-part tariff does not solve the coordination problems. Indeed, we show that joint profits are higher if the industry can commit to simple fixed fees rather than to a two-part wholesale contract. To see why, note that, if a channel receives a higher unit wholesale price from the distributor, it will optimally reduce the ad volume in order to attract a larger audience. But then the rival channels will reduce their ad levels too, and their profits fall. This profit effect is not internalized in a non-cooperative equilibrium, so unit wholesale prices – and thus viewer prices – are distorted upwards. Two-part tariffs consequently lead to inefficiently high prices. Both the industry and the consumers would be better off if the

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[1] In the media sector we observe the use of a common distributor towards the end-users not only in the TV market, but also in the newspaper market. Another example is the market for game consoles, where the producers contract directly with software developers and sell hard- and software through retailers. For a definition of two-sided markets, see Weyl (2010). Examples, in addition to the TV industry, are other media industries, the payment-card industry, real-estate brokerage, and the computing industry (computer operating systems, software, game consoles *etc.*). See Wright (2004) for a general discussion of the problems associated with applying a one-sided logic to a two-sided market. Note, however, that he does not discuss the points we make in this paper.

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wholesale contracts instead consisted of simple fixed fees. Although we apply our model to the TV industry, the coordination problem we highlight is of relevance in all two-sided markets.

The focus on the TV industry is a timely one, since business models in this industry are about to change. The presence of the Internet has made it possible for TV channels to bypass independent distributors and instead sell directly to viewers. One example is Hulu, a US company that offers TV shows, clips, movies, *etc*., over the Internet.[2] Another example is the TV market in Norway, where it is possible to watch programs from both the public broadcaster and the largest commercial broadcaster directly over the Internet.[3] Bearing this technological development in mind, we analyze the consequences of skipping the distributor. In such a situation TV stations set prices non-cooperatively in both markets. Now, each firm takes into account the interdependence between the two sides of the market, and thus coordinates its prices (intra-firm price coordination). In other words, a TV station uses both viewer prices and advertising prices in order to account for the externalities involved between its two groups of consumers. The downside is that there will be no inter-firm coordination of prices, since the distributor has disappeared. We show that if TV stations' products are sufficiently differentiated in viewers' demand, so that competition for viewers is sufficiently lax, then a regime with intra-firm coordination of prices leads to higher industry profit than one with inter-firm coordination through the distributor. Welfare, on the other hand, is always higher in the former case.

Early studies of media markets, such as Steiner (1952), were mostly concerned with how competition for raising advertising revenue affects media plurality.[4] More recent studies – such as Rochet and Tirole (2003, 2006), Caillaud and Jullien (2003), Anderson and Coate (2005), Armstrong (2006), Kind et al. (2007, 2009), and Peitz and Valletti (2008) – emphasize how important it is to take the view that these industries are two-sided markets, serving both content consumers and advertisers. However, the media-economics literature does not analyze the kind of coordination problems that we focus on in this paper. Most models on competition between TV stations in two-sided markets, for example, either abstract from the role of distributors, or implicitly assume that these distributors are passive firms with no influence on end-user prices. This does not seem to fit well with how the TV industry typically is organized in most countries.

Bel et al. (2007) is the only other paper we are aware of that discusses the presence of distributors in a two-sided TV market.[5] They focus on a situation where a firm is vertically integrated, controlling both the distribution and the program production. They do not compare regimes where either distributors or TV stations set end-user prices, as we do here.

In the next section we present a model of the TV industry. In Section 3 we solve this model for the situation where the distributor sets viewer prices, and in Section 4 we solve it for the situation without the distributor, where each TV station sets both its prices. The outcomes are compared in Sections 5. In Section 6 we study a TV station's incentives to bypass the distributor unilaterally. Some further issues are discussed in Section 7, while Section 8 concludes. Appendixes A and B present a few elaborations of our analysis.

2. A model of the TV industry

We consider a setting with two TV stations that earn revenues from advertisers and viewers. The advertising level in the programs provided by TV station i (hereafter *TVi*) is denoted A_i, and the level of viewers' consumption of program content is denoted C_i, $i = 1{,}2$. Advertisers pay r_i per unit of advertising on *TVi*, while consumers pay p_i per unit of program content.

The preferences of a representative viewer are given by the following quadratic utility function:

$$U = C_1 + C_2 - \left[(1-s)\left(C_1^2 + C_2^2\right) + \frac{s}{2}(C_1 + C_2)^2\right], \tag{1}$$

where $s \in [0, 1)$ measures product differentiation: viewers perceive the TV stations' content as independent if $s = 0$ and as perfect substitutes as $s \to 1$.

This formulation of viewer preferences has two realistic features. First, viewers do not choose just one TV station, but rather consume content from both TV stations; this is called multi-homing and is a feature of consumer behavior common in the TV industry that distinguishes it from many other two-sided markets. Secondly, viewers' total demand across TV stations is not fixed, which allows for viewers to respond to lower prices with an increase in total demand. Neither of these features is present in the Hotelling-line approach to viewer demand, which is widely used in analyses of media markets.[6]

Viewers' consumer surplus from watching *TVi* depends both on the viewer price p_i and on the advertising level A_i. To capture this dependency, we follow the standard procedure in the media economics literature in letting the *generalized price* for watching content on *TVi* be given by

$$G_i = p_i + \gamma A_i. \tag{2}$$

In Eq. (2), $\gamma > 0$ measures viewers' disutility of being interrupted by ads.[7] The total price paid by viewers is thus the sum of the direct payment (p_i) and the indirect payment (γA_i) due to disutility from watching ads. Consumer surplus can now be written as

$$CS = U - (G_1 C_1 + G_2 C_2).$$

We choose the unit size of advertising such that $\gamma = 1$. Viewers' demand for each media product is found by solving $\frac{\partial CS}{\partial C_i} = 0, i = 1, 2$, to obtain:

$$C_i = \frac{1}{2} - \frac{(2-s)(A_i + p_i)}{4(1-s)} + \frac{s\left(A_j + p_j\right)}{4(1-s)}, i, j = 1, 2, i \neq j. \tag{3}$$

There are a total of n advertisers interested in buying advertising space on the two TV channels. Let A_{ik} denote advertiser k's advertising level on *TVi*, such that $A_i = \sum_{k=1}^{n} A_{ik}$. The advertiser's gross gain from advertising on *TVi* is naturally increasing in its advertising level and in the number of viewers exposed to the ads. We make it simple by assuming that the gross gain equals $\eta A_{ik} C_i$, where $\eta > 0$. This implies that the net gain for advertiser k from advertising on TV equals

$$\pi_k = \eta(A_{1k} C_1 + A_{2k} C_2) - (r_{1k} A_{1k} + r_2 A_{2k}), \tag{4}$$

where r_i is the advertising price charged by TV channel i for one unit of advertising.

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[2] See hulu.com. One option is to pay a monthly fee (currently $ 7.99), and then receive TV programs including commercial breaks.

[3] NRK is the public broadcaster, where access is free through nrk.no and there is no advertising. TV2 is the commercial broadcaster, where viewers can purchase access through the Internet portal sumo.tv2.no. Sumo viewers pay directly as well as indirectly through watching advertising slots. Consistent with the assumptions we apply in our model, both the viewer and advertising prices are set by TV2. In addition to the reasons for bypassing distributors which we focus on in this paper, it should be noted that channels might also go on the Internet in order to enlarge the size of the market (*e.g.* by allowing people to watch TV on smart phones outside their homes).

[4] Steiner (1952) and Beebe (1977) discuss how competition affects content, while Spence and Owen (1977) discuss how financing of TV stations affects content.

[5] Vertical integration in a two-sided media market is discussed in Barros et al. (2004), though. But there the interest is with respect to integration between platforms and consumers, in particular between Internet portals and advertisers.

[6] The merit of using the particular utility function in Eq. (1), which is due to Shubik and Levitan (1980), is that market size does not vary with; see Motta (2004) for further discussion.

[7] While advertisers obviously benefit from the presence of viewers, empirical studies like that of Wilbur (2008) indicate that the typical viewer has a disutility from the presence of advertising.

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