Media Competition on the Internet[1]

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Abstract: This paper presents a model of competition between two advertising-financed media firms, and we apply the model to analyze competition between portals on the Internet. First, we show that equilibrium prices of advertising are actually higher the less differentiated the portals are perceived to be. Second, we show that aggregate profit for the portals increases if they form each their vertical alliance with advertisers. This is true even if there is perfect competition between the advertisers for advertising space. However, we also demonstrate that it may be individually profitable for one of the portals not to form a vertical alliance if the portals are close substitutes. In that case we end up with an asymmetric equilibrium with only one vertical alliance. This happens despite the fact that aggregate profit would be higher with two vertical alliances.

1 Introduction

The media industry has a two-fold role. It is a provider of entertainment and information on the one hand, and a transmitter of advertising for producers in the product market on the other hand. Although media firms are financed by advertising revenues, their audiences often dislike the presence of this advertising. One example is the TV industry, where viewers may find commercial breaks disturbing.[2] Another example is portals on the Internet, where surfers typically dislike pop-up ads. In 2002 the Internet portals EarthLink and AOL decided to abolish pop-up ads, arguing that such ads were a nuisance to surfers on the Internet.[3] In the present paper, we set up a simple model of media competition with audience dislike for advertising. We show that this idiosyncratic characteristic of the market implies that media firms behave differently from what we may expect from standard textbook models. We go on to apply this model to an issue of particular interest to the future development of e-commerce: under what circumstances can we expect media firms and advertisers to enter into vertical alliances? In particular, when should we expect portals on the Internet (media firms) to enter into alliances with producers (firms that advertise)?

The media industry plays an important role in the society, for example in terms of the time people spend watching TV or surfing on the Internet. However, there are relatively few studies that analyze the two-fold role of the media industry - as a provider of entertainment or information and as a transmitter of advertising.[4] Notable exceptions are Anderson and Coate (2000), Gabszewicz et al. (2000), and Nilssen and Sørgard (2001). However, in these studies the consumers visit at most

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[2]See Nilssen and Sørgard (2001) for references.

[3]See Hellweg (2002) and Richtmyer (2002). For a general description of the Internet portals, see Maxwell and Vernet (1999) and Meisel and Sullivan (2000). In the business press there are warnings about the adverse effect of pop-up ads, see for example eweek (http://www.eweek.com/article2/0,1759,1545514,00.asp) and The Register (http://www.theregister.co.uk/2004/02/24/popup_suicide_can_kill_your/).

[4]On the other hand, there is a large strand of literature that analyzes how rivalry between TV channels affects program diversity. An early analysis of this question is by Steiner (1952); see Owen and Wildman (1992) for elaborations on Steiner's model. In Nilssen and Sørgard (1998), program diversity is modelled along two dimensions.

one media firm (single-homing). In contrast to these studies, we consider (i) how the degree of product differentiation affects the rivalry on advertising between media firms in a setting with multihoming and (ii) the incentives for vertical alliances in media industries. In a related study, Dukes and Gal-Or (2003) analyze contracts between advertisers and media firms when the media outlets are differentiated. However, the way they model product differentiation and competition differs from ours. In particular, while Dukes and Gal-Or focus on how price competition influences the value of exclusive contracts and the level of advertising, we focus on the competitive effects of advertising as a nuisance to consumers.

We consider a situation where two media firms offer their differentiated products to media consumers, and where a large number of producers operate in independent product markets and buy advertising space from the media firms. We find that a reduction in product differentiation between the media firms' products would lead to *higher* prices on advertising and correspondingly lower amounts of advertising. However, even though the prices on advertising are higher the less differentiated they are, we show that the profits for each media firm are low if their products are close substitutes. The reason for this is that the media firms compete for audience by choosing a relatively small amount of advertising. This competition is more intense the closer substitutes the media firms' products are. Hence, the media firms end up with excessively high prices on advertising and too few commercials compared to a situation where the media firms maximize industry profit. Indeed, if there is no differentiation between the media firms we end up with a "Bertrand paradox" with no advertising at all in equilibrium.

We apply our model to analyze the incentives to form profit maximizing vertical alliances between media firms and advertisers. This kind of alliances is often observed between Internet portals and firms in the product market. Therefore, we interpret the media firms as Internet portals and advertising as banners on the portal's web page.

Contrary to what we may expect from conventional goods markets, we show that even in a context where there is perfect competition between the downstream firms (advertisers) for the upstream good (advertising space), aggregate profit of the

portals is maximized if each portal forms a vertical alliance. It should be noted that this is true even though we abstract from competition between the advertisers in the end-user market.[5] To grasp the intuition for this result, assume that the portals are perceived to be perfect substitutes by the consumers. Then there will be no advertising in equilibrium if the advertisers and the portals are vertically separated (Bertrand competition). However, if one of the portals forms an alliance with an advertiser, the alliance will choose to advertise both on the competing portal and on its own portal. Thereby the Bertrand paradox is avoided, and the firms will make a positive profit.

The fact that industry profit is maximized if each portal forms a vertical alliance does not necessarily mean that this is the market structure we will observe in equilibrium. Instead, we may observe an asymmetric equilibrium with only one vertical alliance. To see why, assume that only one of the portals has formed a vertical alliance. Because advertising is perceived to be a nuisance by the consumers, it is in the interest of each portal that the competitor has a large amount of advertising. In particular, the alliance can advertise more on its own portal if it can increase the advertising volume on the rival portal. This means that the alliance actually has a larger incentive than the independent producers to advertise on the independent portal. The independent portal can exploit this by increasing its advertising price once the rival has formed an alliance. If the portals are sufficiently close substitutes (so that they compete fiercely for consumers) this effect becomes so strong that the independent portal prefers not to form an alliance itself.

In the next Section, we present a duopoly model of media competition, a crucial feature of which is the specification of consumer benefits and costs of using a medium. We phrase the model in terms of Internet portals, but the model in itself is also applicable to other media. In Section 3, we present the equilibrium outcomes. In Section 4, we apply the model to analyze the incentives to form vertical

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[5]If the advertisers compete against each other in the end-user market, a portal may be able to reduce the competitive pressure faced by an advertiser by offering it an exclusivity contract. Clearly, this may give advertisers and portals additional incentives to form vertical alliances or other profit-sharing agreements.

alliances between Internet portals and their advertisers. In Section 5 we provide some concluding remarks.

2 The model

Consider a media industry where we have two advertising outlets, 1 and 2. To fix ideas and facilitate the discussion later on the Internet, we already refer to the two outlets as portals. By visiting the portals, a representative consumer obtains a (gross) utility level equal to

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

where V_j is the number of visits to portal $j = 1, 2$, and $b \in [0, 1]$ is a measure of product differentiation: The higher is b, the closer substitutes are the two portals in the consumers' view. We normalize the number of consumers to 1.

The portals are financed by selling advertising banners to firms that intend to spur sales of their products. Let us call these firms producers (or advertisers). Consumers visit the portals free of charge. However, they have a disutility of being interrupted by commercials. To capture this fact, we assume that the subjective cost of visiting portal $j = 1, 2$ is $C_j = A_j V_j$, where A_j is the total level of advertising on that portal. Optimal consumer behavior is characterized by $\partial U/\partial V_j = A_j$, which implies that

$$V_j = 1 - \frac{A_j - bA_{-j}}{1 - b},\tag{2}$$

From (2) we find that the total number of visitors is equal to $V_1 + V_2 = 2 - A_1 - A_2$. Note that the total number of visitors is independent of b for any given levels of advertisements. We further see that

$$\frac{\partial V_1}{\partial b} = -\frac{A_1 - A_2}{(1-b)^2} = -\frac{\partial V_2}{\partial b}$$

This means that if $A_1 > A_2$, say, then portal 2 will capture a larger number of visitors at the expense of portal 1 the higher the value of b. This reflects the fact

that an increase in b makes the portals less differentiated, so that the consumers become more prone to shift from one portal to the other.

We envisage a two-stage game wherein the portals choose how much advertising space to make available for the producers at stage 1 (quantity setting), while the producers choose how many advertising banners to purchase from each of the two portals at stage 2. Alternatively, we could have assumed that the portals set the price of advertising rather than the quantities. However, it can be shown that letting the portals choose price rather than quantity is not crucial for our main results.

The portals' profit functions

Let R_1 and R_2 denote the prices that the portals charge from the producers for each advertising banner, and assume that the cost for the portals of inserting a banner is equal to zero. The profit functions of the portals may then be written as

$$\Pi_j = R_j A_j. \tag{3}$$

The producers' (or advertisers') profit functions

We have n symmetric producers, indexed $i \in \{1, .., n\}$, that operate in independent markets and generate sales by advertising on the portals. More specifically, by inserting A_{ji} banners on portal j, producer i will sell A_{ji} units of its goods to each visitor on that portal.[6] Assuming that the revenue per banner equals 1, the profit level of producer i can then be written as

$$\pi_i = (A_{1i}V_1 + A_{2i}V_2) - R_1 A_{1i} - R_2 A_{2i}. \tag{4}$$

Industry optimum

Suppose first that the whole industry (portals and producers) is owned by one single firm. Since the banner prices are irrelevant in this case, the maximization

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[6]One interpretation is that we assume an inelastic consumer demand for the goods sold by the producers, and that all consumers have the same willingness to pay for each unit of the goods. The producers will then charge the consumers a price equal to their reservation price. Since the consumers pay their reservation price for the goods from the producers, we do not need to include these goods in the consumers' utility function. This formulation is analogous to the one used in Anderson and Coate (2000).

problem is simply

$$\max_{A_1, A_2} \left\{ A_1 V_1 + A_2 V_2 \right\}, \tag{5}$$

where $A_j \equiv \sum_{i=1}^{n} A_{ji}$. Because the total market size is independent of b, the level of advertisements will also be independent of b. Performing the maximization problem in (5), it is straightforward to show that total advertising on the two portals equals (with an asterisk to denote industry optimum)

$$A_j^* = 1/2. \tag{6}$$

Aggregate industry profit is equal to $\Pi^* = 1/2$, and the number of visitors to each portal is $V_j^* = 1/2$.

3 Equilibrium analysis

We now move to our main case of two independent portals and n independent producers. We are looking for a subgame-perfect equilibrium of our two-stage game and therefore proceed by examining stage 2 first.

Stage 2:

The maximization problem of producer i is

$$\pi_i = \max_{A_{1i}, A_{2i}} \left\{ (A_{1i} V_1 + A_{2i} V_2) - R_1 A_{1i} - R_2 A_{2i} \right\}, \tag{7}$$

so that its first-order conditions are given by $\partial \pi_i / \partial A_{1i} = \partial \pi_i / \partial A_{2i} = 0$ $(i = 1, .., n)$.

Setting $\partial \pi_i / \partial A_{1i} = 0$ we find

$$A_{1i} = \frac{1}{2} \left[(1-b)(1-R_1) - A_{1,-i} + b(2A_{2i} + A_{2,-i}) \right], \tag{8}$$

where $A_{1,-i}$ and $A_{2,-i}$ are the number of banners inserted by the other producers on portal 1 and 2, respectively. Equation (8) shows that the advertising level A_{1i} for producer i on portal 1 is decreasing in $A_{1,-i}$ and increasing in the number of banners on the other portal. This latter property reflects the fact that portal 1 is more attractive for the consumers, other things equal, the more they are interrupted

by banners on portal 2. Finally, we see that A_{1i} is decreasing in the advertisement costs R_1. We have a similar expression for demand for advertising on portal 2.

Since the producers are symmetric, they will all have the same advertising level in equilibrium. This means that $A_{ji} = A_j/n$. Inserting this into (8) and rewriting we have:

$$A_j(R_j, R_{-j}) = \frac{n}{1+n}\left(1 - \frac{R_j + R_{-j}b}{1+b}\right), \tag{9}$$

so that the level of advertising on each portal depends negatively on the advertisement costs of that portal $(\partial A_1/\partial R_1 = \partial A_2/\partial R_2 < 0)$.[7] This means that the portal with the lower banner price will have the larger number of banners. Note, however, that the number of banners on each portal is decreasing also in the costs of advertising on the other portal if $b > 0$; $\partial A_1/\partial R_2 = \partial A_2/\partial R_1 = -nb/((1+n)(1+b)) < 0$. In other words, advertising on portal 1 and advertising on portal 2 are complementary goods. To see why, suppose that R_1 increases. The direct effect of this is that the producers reduce their advertising on portal 1, which consequently becomes more attractive for the consumers. This in turn means that portal 2 becomes relatively less attractive and will therefore be visited by fewer consumers. Thus, the producers will respond by reducing their advertising on portal 2 as well, and more so the more equal the portals are perceived to be by the consumers. The negative effect of setting a relatively high banner price is therefore smaller the higher the value of b.

One interesting implication of equation (9) is that the portal with the higher advertising price will sell more banners the more equal the portals are perceived to be. Thus, if $R_1 > R_2$, say, then the relatively high consumer attractiveness of portal 1 means that A_1 is increasing in b (while A_2 is decreasing in b). This can be seen formally by differentiating equation (9) with respect to b:

$$\frac{\partial A_1}{\partial b} = \frac{n}{1+n}\frac{R_1 - R_2}{(1+b)^2} = -\frac{\partial A_2}{\partial b} > 0 \text{ iff } R_1 > R_2. \tag{10}$$

We can summarize our analysis of stage 2 as follows:

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[7]Equation (9) holds provided that it implies non-negative advertising levels, which we prove to be true below.

Lemma 1: *For a given pair of banner prices,*

a) if the price per banner is the same on the two portals, then the number of banners is independent of b, i.e., if $R_1 = R_2 = R$, then $A_1 = A_2 = \frac{n}{1+n}(1-R)$;

b) if the price per banner differs between the portals, then the cheaper portal will attract more banners.

c) if the price per banner differs between the portals, then the number of banners on the more expensive portal is higher the less differentiated the portals are perceived to be.

Stage 1:

At the first stage, portal j maximizes $\Pi_j = R_j A_j$ with respect to A_j. Solving this, we find that the equilibrium advertising level on each portal is:

$$A_j = \frac{n}{1+n}\frac{1-b}{2-b}. \tag{11}$$

From this it follows that the number of banners on each portal is decreasing in b ($\partial A_j / \partial b = -n/((2-b)^2(1+n)) < 0$). The reason for this is the fact that an increase in b means that the consumers perceive the portals to be better substitutes. Thereby the portals will have to compete more fiercely for visitors, and thus reduce the level of utility-decreasing advertising.

From the equilibrium amount of advertisements we can easily compute the equilibrium price:

$$R_j = \frac{1}{2-b}; \quad \frac{\partial R_j}{\partial b} = \frac{1}{(2-b)^2} > 0. \tag{12}$$

This shows that the closer substitutes the portals are, the higher is the price per banner in equilibrium. This is because the portals compete for visitors by reducing the level of advertising, which allows them to charge higher banner prices. Note also that the number of producers (n) does not affect the equilibrium price. It is thus the rivalry between the portals that is decisive for banner prices.

We always have $A_j^* = 1/2$ in industry optimum, in which case the consumers are interrupted by advertising banners to the same extent whether b is high or low. The fact that the number of banners is decreasing in b in the present case implies that

the number of visits to the portals is increasing in b. However, the higher banner prices imply that the producers earn a lower profit the less differentiated the portals:

$$\pi_i = \frac{2}{(1+n)^2} \left(\frac{1-b}{2-b} \right)^2, \quad \frac{\partial \pi_i}{\partial b} < 0. \tag{13}$$

The fact that a higher b leads to higher equilibrium prices for the banners does not mean that the profits of the portals are increasing in b. On the contrary, the profit level is decreasing in b:

$$\Pi_j = \frac{n}{1+n} \frac{1-b}{(2-b)^2}; \quad \frac{d\Pi_j}{db} < 0. \tag{14}$$

To see why, suppose that $b = 0$. From equation (12) we then have that $R_j = 1/2$. Since the two portals de facto serve independent markets when $b = 0$, it follows that a banner price equal to $1/2$ maximizes aggregate profit for the portals in this case. Moreover, since the size of the market is independent of b, it further follows that $R_j = 1/2$ actually maximizes portal profit for all values of b. Thus, the fact that an increase in b leads to higher banner prices is detrimental to the profitability of the portals.

To sum up, we have the following:

Proposition 1: *The level of advertising is lower and the price per banner is higher the less differentiated the portals are perceived to be, even though this behavior reduces the portals' profit* $(d\Pi_j/db < 0)$.

From (11) and (14) we further obtain:

Corollary 1: *If* $b \to 1$, *then* $A_j \to 0$ *and* $\Pi_j \to 0$.

We see that if the portals are (almost) perfect substitutes, then there will be (almost) no advertising in equilibrium. This is an outcome which parallels the well-known Bertrand paradox, since it implies that the portals compete away (almost) all profits. Interestingly, though, this is true even though the portals are quantity setters rather than price setters. The reason for this is that advertising on the margin is perceived to be a bad by the consumers. In the limit $b = 1$ each portal

therefore has an incentive to set a lower advertising level than the other in order to attract visitors, forcing the number of banners down to zero.[8]

4 Vertical Alliances on the Internet

In the previous Section the producers and the media firms were by assumption independent firms. We now relax that assumption, and allow a producer and a media firm to form a vertical alliance. Such alliances are regularly observed on the Internet. However, even though some portals form alliances with producers, others choose to be independent.

There are numerous examples of deals between portals and producers.[9] One example is found on parenting sites on the Internet, offering information on pregnancy and child-upbringing etc. Yahoo! made an exclusive advertising agreement with Kimberly-Clark in its parenting portal, and this can be interpreted as an alliance between a portal and a producer.[10] Other parenting sites on the Internet have chosen not to form an alliance, and offer banners and advertisements for a large variety of producers.[11] This illustrates that there is a mixture, where some portals have formed close alliances with a producer and ended up with exclusivity, while other portals behave more independently and offer banners for various competing producers. We also observe that producers which have exclusivity agreements with

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[8]Suppose that the portals compete in advertising prices rather than advertising quantities at stage 1. In that case we will observe advertising also in the limit $b = 1$, because this resembles Cournot competition in an 'ordinary' market. However, it is still true that $\partial A_j/\partial b < 0$ (see Barros et al, 2002).

[9]In 1998 the web portal Excite.com signed an exclusive advertising agreement with NetGrocer Inc., under which the latter would be the only supermarket featured in the portal. In a similar spirit, iVillage.com, a women's portal, established eight commercial partners to be advertised throughout the portal. In 2000, Verizon Communications, a telecommunications company, invested \$3 million in an exclusive sponsorship of the "Lifestyle" channel at BET.com, a web portal aimed at African Americans.

[10]See the portal http://health.yahoo.com/parenting/. For details concerning the agreement between Yahoo! and Kimberly-Clark, see www.clickz.com/news/article.php/1059251.

[11]One example is www.babyzone.com, who carries the banners of numerous different producers.

a portal, also buy banners on competing portals. Kimberly-Clark is an example of this.[12]

In this section we ask the following question: when should we expect a vertical alliance between a portal and a producer to be the equilibrium outcome? In order to answer this question, we extend our model by introducing a stage 0 in which each of the portals decides whether to enter into an alliance with a producer. This gives rise to essentially three different subgames following stage 0: one in which no vertical alliances are formed, which is the situation analyzed above; one in which one vertical alliance has been formed while the other portal and the other producers continue as independent firms; and one in which we have two vertical alliances. In the following two subsections, we analyze the latter two subgames. Finally, we return to stage 0 to determine what is the equilibrium outcome of this three-stage game. We highlight the possible competitive advantages of partnerships between portals and advertisers by modelling vertical alliances as vertical integration

4.1 One Vertical Alliance (1VA)

Suppose that portal 1 and producer 1 have formed a vertical alliance and maximize their aggregate profit, while portal 2 and the remaining $m \equiv (n-1)$ producers are independent firms (it can be shown that the qualitative results will not change if there are more than one advertisers in the alliance).

Let A_{1m} denote the aggregate advertising level from the m independent producers on portal 1, and let A_{11} and A_{21} denote producer 1's advertising level on portal 1 and 2, respectively. We can then write the profit level of the alliance as

$$\hat{\Pi}_1 = R_1 A_{1m} + A_{11} V_1 + A_{21} V_2 - R_2 A_{21}. \tag{15}$$

The first term in (15) is the profit from selling banners to the independent producers, the second and third terms downstream profits, and the fourth term the costs of

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[12]As noted above, the company has made an exclusive agreement with the parenting portal at Yahoo! At the same time the competing portal www.babyzone.com has banners for various Kimberly-Clark brands, for example Huggies products, as well as for other producers' products.

advertising on the independent portal. The profit levels of the independent portal and advertisers are still given by equations (3) and (4), respectively.

As shown above, the gains from advertising will in general be split between each portal and its advertisers. Thus, it can easily be verified that the alliance has no incentives to let the independent producers advertise on portal 1. Thereby $A_{1m} = 0$. Note that this corresponds to the exclusivity agreements in vertical alliances discussed above.

At stage 2 the alliance solves $(A_{11}, A_{21}) = \arg \max \hat{\Pi}_1$, while each independent producer k solves $A_{2k} = \arg \max \pi_{2k}$ $(k = 1, .., m)$. From this we find that the advertising level on the alliance's own portal is equal to

$$A_{11} \equiv A_1 = \frac{1}{2} - \frac{b}{2(1+b)} R_2, \qquad (16)$$

while we for the independent portal have

$$A_{2k} = \frac{1-b}{2+m}(1 - R_2) \text{ and } A_{21} = A_{2k} + \frac{b}{2(1+b)}(1 + b(1 - R_2)). \qquad (17)$$

From equation (16) we see that the advertising level on the alliance's own portal is equal to $A_1 = 1/2$ if $b = 0$. This is identical to industry optimum (c.f., equation (6)). We further see that $\partial A_1 / \partial b < 0$. This reflects the fact that competition between the portals induces a lower advertising level the higher is b, as was the case with vertical separation.

However, the formation of an alliance has implications for the demand for banners on the independent portal. The reason is that the portal that has formed an alliance gets access to a new instrument; the ability to influence directly on the advertising level on the competing portal. Since the consumers perceive advertising as a nuisance it is namely in the interest of each portal that the competitor has a large amount of advertising. On the margin the alliance therefore has a higher willingness to pay for advertising on the competing portal than has each of the independent producers. From equation (17) we therefore see that $A_{21} > A_{2k}$ for $b > 0$.

Interestingly, equation (17) indicates that the Bertrand paradox is solved if there exists a vertical alliance; even though $A_{2k} = 0$ in the limit when $b = 1$, the same is not true for A_{21} and $A_1 = A_{11}$. This suggests that both the independent portal and

the alliance make positive profits for all values of b. Contrary to what we find in more traditional markets, this also suggests that vertical integration or formation of vertical alliances may increase total industry profit even if there is perfect competition between the downstream firms (advertisers) for the upstream good (banners on the portals). To check this conjecture, we will in the rest of the paper make the following assumption:

Assumption: *There is an infinite number of independent producers* $(m = \infty)$

Solving for stage 1 we find (with superscript $1VA$ to indicate equilibrium values with one vertical alliance)

$$A_1^{1VA} = \frac{1}{2} - \frac{2-b}{4(2-b^2)}b \text{ and } A_2^{1VA} = \frac{1}{2} - \frac{1}{4}b, \tag{18}$$

which are positive even in the limit $b \to 1$.[13] Note also that $A_1 > A_2$ for $b \in (0, 1)$. Thus, the advertising volume is in general higher on the portal of the alliance than on the independent portal. Comparing with equation (9) we further see that each portal has a higher advertising volume in the present case than under complete vertical separation when $b > 0$.

Let $\hat{\Pi}_1^{1VA}$ denote the profit level of the alliance. Inserting for the equilibrium advertising levels from equation (18) into the profit functions, we find that the profit levels of the alliance and the independent portal are always positive, and equal to

$$\hat{\Pi}_1^{1VA} = \frac{(1+b)(4-2b-b^2)^2}{16(2-b^2)^2} \text{ and } \Pi_2^{1VA} = \frac{(1+b)(2-b)^2}{8(2-b^2)}. \tag{19}$$

From equation (19) we have

$$\Pi_2^{1VA} - \hat{\Pi}_1^{1VA} = \frac{(1+b)(4-3b)b^3}{16(2-b^2)^2} > 0. \tag{20}$$

This means that the independent portal earns a higher profit than the alliance, because of the latter's high willingness to pay for advertising on portal 2.[14]

To sum up, we have the following results:

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[13]Equations with arbitrary values of m are given in the Appendix

[14]The alliance makes a higher profit than the independent portal for sufficiently low values of b if $m < \infty$. The reason for this is the fact that the smaller the number of independent firms, the lower is the advertising level on the independent portal. If $m = 2$, for instance, we find that the alliance makes a higher profit than the independent portal if $b < 0.58$. See Appendix.

Lemma 2: *Assume a market structure with one vertical alliance (case 1VA).*

a) The independent producers will be foreclosed from the portal belonging to the vertical alliance ($A_{1m} = 0$).

b) Both portals will have higher advertising levels than under complete vertical separation. In particular, the advertising levels are positive also in the limit as $b \to 1$.

c) The vertical alliance makes a lower profit than the independent portal.

Although the last part of the Lemma shows that the independent portal is better off than the integrated portal, this does not mean that the portals have no incentives to form alliances. We come back to this question below (see Section 4.3).

4.2   Two Vertical Alliances (2VA)

The next and final market structure to consider, is one where portal 1 has formed an alliance with producer 1 and portal 2 has formed an alliance with producer 2. In such a case it follows from the above analysis that all the independent producers are foreclosed from the market. The profits of the firms are thus

$$\hat{\Pi}_1 = R_1 A_{12} + A_{11} V_1 + A_{21} V_2 - R_2 A_{21} \text{ and } \hat{\Pi}_2 = R_2 A_{21} + A_{22} V_2 + A_{12} V_1 - R_1 A_{12} \quad (21)$$

Maintaining the same timing structure as above, we find that the second stage yields the advertising levels

$$A_{11} = \frac{(1+b) + R_1 - 2R_2 b}{3(1+b)} \text{ and } A_{22} = \frac{(1+b) + R_2 - 2R_1 b}{3(1+b)} \quad (22)$$

on the allied firms' own portals, and

$$A_{12} = \frac{(1+b) + R_2 b - 2R_1}{3(1+b)} \text{ and } A_{21} = \frac{(1+b) + R_1 b - 2R_2}{3(1+b)} \quad (23)$$

on the competing portal. In the asymmetric case considered above, we saw that the alliance will advertise on the competing portal. The same mechanism is present also in the case where we have two vertical alliances; in order to reduce the negative consequences of competition, each alliance has an incentive to advertise on the rival

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portal. We should thus expect that advertising on each portal is higher with two vertical alliances than with just one vertical alliance or vertical separation. Formally, this is proved by using (22) and (23) and solving for stage 1 with two vertical alliances. We then find

$$A_j^{2VA} = \frac{5 - 2b}{10 - b},$$ (24)

which for $b > 0$ is higher than the advertising levels in the two other market structures we have considered (c.f., equations (9) and (18)).

Using (24) we now find that the profit levels of the alliances are equal to

$$\hat{\Pi}_j = \frac{(5 + b)(5 - 2b)}{(10 - b)^2}.$$ (25)

We have:

Lemma 3: *The advertising levels are higher if there are two vertical alliances than if there is one or no vertical alliance.*

4.3   The incentives to form alliances

In the previous subsections, we investigated different vertical structures. Using equations (14) and (25) we can compute the difference between aggregate industry profit as a function of b when we have two vertical alliances (Π^{2VA}) and when there are no vertical alliance (Π^{NA}):

$$\Pi^{2VA} - \Pi^{NA} = \frac{4(2 + b)(4 - b)}{(10 - b)^2(2 - b)^2}b^2 > 0.$$ (26)

Equation (26) implies that total industry profit is higher with two vertical alliances than with no vertical alliances if $b > 0$, and that the difference is increasing in b. The reason is that the formation of alliances leads to more advertising, particularly for high values of b.

Although the industry as a whole benefits from vertical alliances, this is not necessarily the equilibrium vertical structure. The question is whether the firms have incentives to form vertical alliances at stage 0. We focus on the case of equilibria

in pure strategies.[15] Stages 1 and 2 are as before. In the appendix we prove the following proposition:

Proposition 2: *Aggregate industry profits are higher with two than with no or one vertical alliance, and more so the closer substitutes the portals are. However, there will be only one vertical alliance in equilibrium if $b > 0.68$. Otherwise, two vertical alliances are formed.*

We see that when portals are differentiated, there is no conflict between individual rational choice and the industry profits. However, this is no longer true when the portals are close substitutes. Then the firms find it individually rational not to form a second alliance. Note that those are the situations where the industry as a whole has most to gain from forming two vertical alliances.

The intuition for our results is closely related to the intuition we gave in the previous section for how the degree of portal differentiation affects the firms' profits. By forming a first alliance total advertising in the industry increases, which is good for both portals. By forming a second alliance total advertising will increase further. However, when the portals are close substitutes the second alliance will not be formed. Instead, the independent portal prefers to free ride on the increased demand for advertising from the alliance.

5 Concluding remarks

We have presented a model of media competition when consumers dislike advertising. The model complements previous work in the literature on media economics, and has the merit of being both simple and based on first principles (i.e., consumer preferences). The model has the robust prediction that advertising prices are higher and advertising levels lower the closer substitutes the media channels are in the eyes of the consumers.

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[15]Below, we show that for sufficiently high b there are two equilibria in pure strategies: (i) portal 1 forms an alliance and portal 2 does not, or (ii) portal 1 does not form an alliance while portal 2 does. Obviously, there will then be a third equilibrium in mixed strategies.

In order to highlight the forces behind the competition between media firms, we have abstracted from competition between the advertisers/producers in the end-user market. When we analyzed the incentives to form vertical alliances we further assumed that there is an infinitely large number of advertisers. In particular, this means that the advertisers take the banner prices as given and that there does not exist any double marginalization problem. Nonetheless, we showed that aggregate industry profit is highest if the media firms integrate vertically. This result is in sharp contrast to what we typically find in more traditional markets, where total industry profit is independent of the vertical market structure if downstream firms are price takers with respect to the upstream good.

As far as we know, Elfenbein and Lerner (2003a, 2003b) are the only empirical studies of portal alliances. However, they focus on alliances between general and more specialized portals. Their main interest lies in explaining the variation in contracts between different portals. Therefore, there is a need for more empirical studies that analyze to what extent portals form vertical alliances with producers, how they compete with their rivals, and which forms the alliances take.

6   References

Anderson, S.P. and S. Coate, 2000, "Market Provision of Public Goods: The Case of Broadcasting", Working Paper 7513, National Bureau of Economic Research.

Dukes, A. and E. Gal-Or, 2003, "Negotiations and Exclusivity Contracts for Advertising", *Marketing Science, 22, 222-245.*

Elfenbein, D. and J. Lerner, 2003a, "Designing Alliance Contracts: Exclusivity and Contingencies in Internet Portal Alliances", manuscript.

Elfenbein, D. and J. Lerner, 2003b, Ownership and Control Rights in Internet Portal Alliances, 1995-1999, *RAND Journal of Economics*, 34, 356-369.

Gabszewicz, J., D. Laussel, and N. Sonnac, 2000, "TV-Broadcasting Competition and Advertising", Discussion Paper 00/6, CORE, Université Catholique de Louvain.

Goldfarb, A, 2004 "Concentration in Advertising-Supported Online Markets: An Empirical Approach" Economics of Innovation and New Technology, 13(6), 581-594.

Hellweg, E., 2002, "EarthLink's Pop-Up Market Strategy", *CNN/Money* August 21, 2002, http://money.cnn.com/2002/08/21/technology/techinvestor/hellweg.

Maxwell, W. and F. Vernet, 1999, "Access Issued Raised by Internet Portals", *Communications and Strategies* 36, 237-253.

Meisel, J. B. and T. Sullivan, 2000, "Portals: The New Media Companies", *Info* 2 (5), 477-486.

Nilssen, T. and L. Sørgard, 2001, "The TV Industry: Advertising and Programming", manuscript.

Owen, B.M. and S.S. Wildman, 1992, *Video Economics*, Cambridge, MA: Harvard University Press.

Richtmyer, R., 2002, "Are AOL's Pop-Ups Really Busted?", *CNN/Money* October 16, 2002, http://money.cnn.com/2002/10/16/technology/aol_popups.

Salant, S.W., S. Switzer, and R.J. Reynolds, 1983, "Losses from Horizontal Mergers: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium", *Quarterly Journal of Economics* 98, 185-199.

Steiner, P.O., 1952, "Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting", *Quarterly Journal of Economics* 66, 194-223.

Appendix

One vertical alliance and an arbitrary number of independent producers

Since the alliance will not accept banners from the independent producers, the advertising price R_1 is irrelevant as long as $A_{1m}(R_1) = 0$. At stage 1 we therefore solve $A_2 = \arg \max \Pi_2$ subject to (16) and (17). From this we find

$$A_2 = \frac{1}{4} \frac{(2-b)\,m+2}{2+m} \text{ and } A_{11} = A_1 = \frac{m\left(4-2b-b^2\right)+2\left(2-b\right)}{4\left(2+m\left(2-b^2\right)\right)}. \quad (27)$$

Inserting for a and A_1 into the profit expressions it can be shown that $\left(\Pi_2^{1VA} - \Pi_1^{1VA}\right)$ is decreasing in m. Specifically, we have

$$\Pi_2^{1VA} - \hat{\Pi}_1^{1VA} = \frac{-45 + 57b + 50b^2 - 18b^3 - 5b^4 - 7b^5}{64\left(3-b^2\right)^2} \gtreqless 0 \text{ for } b \gtreqless 0.576,$$

for $m = 2$, as stated in footnote 18, while $\left(\Pi_2^{1VA} - \Pi_1^{1VA}\right) > 0$ for all values of b in the limit $m \to \infty$ (c.f., equation (20)).

Proof of Proposition 2

For $m \to \infty$ we have

$$\Pi^{2VA} - \left(\Pi_2^{1VA} + \hat{\Pi}_1^{1VA} \right) = \frac{512 + 76b^2 - 560b + 156b^3 - 95b^4 + b^5}{16 \left(10 - b \right)^2 \left(2 - b^2 \right)^2} b^2,$$

with $\partial \left(\Pi^{2VA} - \left(\Pi_2^{1VA} + \hat{\Pi}_1^{1VA} \right) \right) / \partial b > 0$. This shows that aggregate industry profit is always higher with two vertical alliances than with just one, and more so the higher is b.

Using equations (14) and (19) we further find that

$$\hat{\Pi}_1^{1VA} - \Pi_2 = \frac{16 \left(1 - b \right) + b^3 + b^4}{16 \left(2 - b \right)^2 \left(2 - b^2 \right)^2} b^3 > 0 \text{ for } b > 0.$$

Thus, we will always observe at least one vertical alliance. However, using equations (19) and (25) we have

$$\Pi_2^{1VA} - \hat{\Pi}_2 = \frac{-64 + 120b - 39b^2 + b^3}{8 \left(2 - b^2 \right) \left(10 - b \right)^2} b^2 \gtreqqless 0 \text{ for } b \gtreqqless \tilde{b},$$

where $\tilde{b} \approx 0.68$. Portal p consequently prefers to be independent if portal P has formed a vertical alliance and $b > 0.68$. Q.E.D.