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Multihoming and market expansion: Effects on media platforms' pricing and content creation incentives

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Multihoming and market expansion: Effects on media platforms' pricing and content creation incentives

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Abstract

Conventional assumptions in the classical linear city of Hotelling, the workhorse model in media economics, are (i) that no consumer buys more than one of the goods (they are singlehomers) and (ii) that the market is covered. We relax both assumptions and analyze how exclusive and non-exclusive content affect pricing and profit for media platforms. In contrast to the outcome in a covered market with consumer multihoming, we show that the consumer price in an uncovered market depends on both exclusive and non-exclusive content. If advertisers have a high willingness to pay for exclusive eyeballs, platforms prefer to provide non-exclusive rather than exclusive content.

Keywords: Media competition, pricing, content creation, market expansion

1. Introduction

Consumers have horizontally differentiated preferences for media products. As an example, in the British newspaper market, *The Guardian* is generally preferred by left-wingers and *The Times* by right-wingers; in the United States, *CNN* is more attractive to left-wingers, and *Fox News* is more attractive to right-wingers. This illustrates why the linear city model of Hotelling (1929), and other discrete choice models with horizontal differentiation, are workhorse models within media economics.[2]

'Covered markets' and 'consumer singlehoming' are key assumptions in the classical Hotelling model. Market coverage implies that all consumers subscribe to at least one of the platforms, and singlehoming implies that consumers can only subscribe to one platform. Given market coverage, the recent literature on media platform competition, which allows for consumer partial multihoming (buying *The Guardian*, *The Times*, or *both*), provides clear-cut predictions about equilibrium outcomes. The equilibrium consumer price depends on a platform's level of exclusive content but is independent of the level of non-exclusive content (the latter is easy to duplicate by rivals).

Furthermore, the consumer price is decreasing in advertisers' willingness to pay for access to multihomers but is not affected by advertisers' willingness to pay for exclusive eyeballs (singlehomers). The reason is that a marginal reduction in the consumer price turns the rival's marginal singlehomer into a multihomer; the number of singlehomers at a platform is

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[2]Another merit of discrete choice models, like Hotelling, is that demand follows from individual utility functions.

independent of its own price. When a platform gains an additional multihomer, they can only charge advertisers the incremental value of reaching a consumer more than once.[3]

These predictions change drastically when we relax the assumption of market coverage. By allowing for consumers to the left of *The Guardian* and to the right of *The Times* (hinterlands), we show that non-exclusive content also matter for consumer pricing. Increased provision of non-exclusive content will attract new hinterland singlehomers for *both* platforms. Consequently, both platforms increases their consumer price, and this causes fewer multihomers between the platforms. Furthermore, advertisers' willingness to pay for exclusive eyeballs now matter for consumer pricing, since a price reduction attracts more hinterland singlehomers.

The total number of consumers (buying at least from one of the platforms,) increases more from a marginal increase in non-exclusive than exclusive content; consumers' willingness to pay increases in both hinterlands with more non-exclusive content. An increase in exclusive content increases the number of multihomers, since consumers' incremental value from multihoming increases. In contrast, an increase in non-exclusive content decreases the number of multihomers, since both platforms' prices increase but there is no increased incremental value from multihoming.

Consequently, in an uncovered market, if exclusive eyeballs have a high value compared to non-exclusive eyeballs for advertisers, a two-sided platform may prefer to provide more non-exclusive content rather than more exclusive content. This contrasts the outcome in a one-sided market where platforms have no ad revenues. Two-sided media platforms may therefore provide more investigative journalism (easy to duplicate for rivals) than pure consumer financed media platforms, who will focus on their exclusive content. This result is in contrast to the common argument that investigative journalism will be undersupplied,[4] due to its character as a public good.

2. The model

We consider a Hotelling model with two platforms, $i = 0, 1$, located at $X_0 = 0$ and $X_1 = 1$, respectively. Consumers are uniformly distributed with density equal to one between $-h$ and $1 + h$, where $h > 0$. We follow the convention of labelling the segment $(-h, 0)$ as platform 0's 'hinterland', and $(1, 1 + h)$ as platform 1's 'hinterland.[5]. This allows for market expansion, the absolute number of consumers in the market increases if the price is reduced or the quality is improved. The hinterlands, h, are sufficiently large that some consumers do not buy even if $p_i = 0$.[6]

[3] In a one-sided market, Kim and Serfes (2006) and Anderson et al. (2017) show that only exclusive content matters for pricing incentives, as long as consumers have no value of access to the same content/features more than once. In a two-sided market, where platforms collect all revenue from advertisers, Ambrus et al. (2016); Anderson et al. (2018) and Athey et al. (2018) show that platforms can only charge advertisers for the incremental value of reaching the same eyeballs more than once. On the interplay in two-sided markets, see also Belleflamme and Peitz (2019); Haan et al. (2021) and Jeitschko and Tremblay (2020). A comprehensive textbook treatment is given by Belleflamme and Peitz (2021).

[4] See e.g., Hamilton (2016).

[5] See Graitson (1982) and Armstrong and Wright (2009), among others.

[6] A remark on location incentives. In our model platforms' locations are exogenously given at $X_0 = 0$ and $X_1 = 1$, respectively. Under uniform distribution of consumers, platform 0 may have incentives to move to the left

Platforms have two sources of revenue: consumer payment and advertisement. The profit of media platform i is $\pi_i = (p_i + s)\, x_i^{SH} + (p_i + m)\, x^{MH}$. Consumers pay $p_i \geq 0$. Advertisers are charged s for singlehoming consumers, x_i^{SH}, and m for multihoming consumers, x^{MH}, where $0 \leq m < s$ reflects that the second impression is less valuable for advertisers than the first impression.

The net utility of buying *only* media product i is $u_i = n + e_i - t\,|X_i - x| - p_i$, and the net-utility of buying *both* products is $u_{0+1} = n + e_0 + e_1 - t - p_0 - p_1$. We denote by n the value of non-exclusive content, and e_i the value of platform i's exclusive content, and $t > 0$ is the transportation cost. For simplicity, we assume consumers to be ad neutral.

We have four margins (see figure 1). From $u_i = 0$, we find the location of consumer x_i who is indifferent between not buying at all and buying from platform i – the hinterland margin. Consumer x_{ij}, follows from $u_{0+1} = u_i$, and is the consumer indifferent between using only platform i and using both platforms – the singlehomer-multihomer margin. We restrict attention to equilibrium candidates where some, but not all, consumers located between the platforms are multihoming, i.e., $0 < x^{MH} = x_{10} - x_{01} < 1$, as illustrated in figure 1. Under the assumption of market coverage, as is typically used in the literature, we have that $x_i^{SH} = |x_{ij} - X_i|$. In an uncovered market, we have that $x_i^{SH} = |x_{ij} - x_i|$.

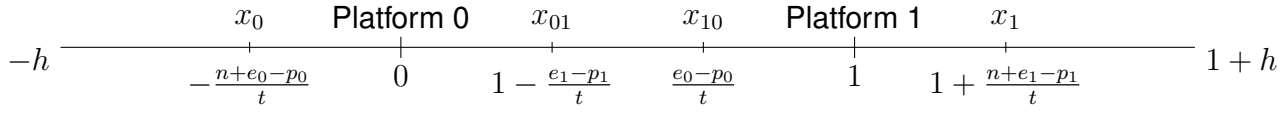

Figure 1: Hotelling line with hinterlands and multihoming consumers.

2.1. Benchmark: A covered market

In the benchmark model, all consumers are located between the platforms in the interval $x \in [0, 1]$, and the only relevant margins are x_{ij}. When platform i set p_i, the decision affects x_{ji}, but not x_{ij}; i.e., it affects the purchase decision of only their "last" consumer. Hence, p_i affects the number of multihomers, but not the number of singlehomers on platform i. This gives rise to the incremental pricing principle shown in the literature. Pricing behavior of platform i only depends on exclusive content, e_i (Kim and Serfes, 2006; Anderson et al., 2017), and the value of multihomers for advertisers, m (Ambrus et al., 2016; Anderson et al., 2018; Athey et al., 2018). Non-exclusive content, n, and advertisers' willingness to pay for access to singlehomers' eyeballs, s, does not affect prices. By solving $\partial\pi_i/\partial p_i = 0$, given $x_i^{SH} = |x_{ij} - X_i|$, we find $p_i = (e_i - m)/2$.

2.2. Pricing behavior in an uncovered market

By solving $\partial\pi_i/\partial p_i = 0$, given $x_i^{SH} = |x_{ij} - x_i|$, we find $p_i = (2e_i + n - s - m)/4$. In contrast to the benchmark, non-exclusive content, n, and the value of exclusive eyeballs for advertisers, s, now matter for pricing behaviour. The outcome is not surprising, but nevertheless

(and platform 1 to the right), such that we may end up with an uncovered market in the middle. However, a normal distribution of consumers, which is more reasonable, prevents such an outcome, see e.g., Anderson et al. (1997). For simplicity, we do not introduce a normal distribution of consumers.

implies that we should be careful of considering covered markets an innocent assumption. If platform i increases p_i, it turns its "last" (multihoming) consumer (at x_{ji}) from a multihomer to a singlehomer of the rival platform j. This resembles the mechanism from a covered market. At the same time, platform i loses a hinterland singlehomer x_i when p_i increases. We note that an increase in e_i only affects the platform's own price (as in a covered market), whereas an increase n affects both platforms' prices identically.

2.3. Content creation incentives in an uncovered market

For simplicity, we abstract from costs of creating content.[7]

Exclusive content. An increase in e_i causes an increase in p_i because consumer willingness to pay at x_i and x_{ji} increases; $\partial p_i/\partial e_i = 1/2$. Increasing e_i attracts the same number of new hinterland singlehomers at x_i as the number of new multihomers attracted from rival platform j's singlehomers at x_{ji}; $\partial x_i^{SH}/\partial e_i = -\partial x_j^{SH}/\partial e_i = 1/(2t)$. Consequently, the increase in total demand from an increase in e_i arises from more multihomers, $\partial x^{MH}/\partial e_i = 1/(2t)$. The total effect on profit from increasing exclusive content is

$$\frac{\partial \pi_i}{\partial e_i} = \left[\frac{2e_i + n}{2t}\right] + \frac{s+m}{2t} > 0 \tag{1}$$

Non-exclusive content. An increase in n causes an identical increase in willingness to pay by hinterland consumers at x_0 and x_1, but has no direct effect on x_{01} and x_{10} (see figure 1), since consumers can access non-exclusive content through either platform. However, the increase in prices turns marginal consumers at x_{01} and x_{10} from multihomers to singlehomers. Both platforms increase their prices as n increases, but an increase in n affects own price, p_i, less than an increase in e_i, because $\partial p_i/\partial n = 1/4 < \partial p_i/\partial e_i = 1/2$. First, an increase in n attracts new hinterland singlehomers for platform i at x_i. Second, since it also induces a price hike for the rival, the multihomer at x_{ij} is turned into a singlehomer of platform i ($\partial x_i^{SH}/\partial n = \partial x_j^{SH}/\partial n = 1/t$.) This causes the number of multihomers to decrease when n increases $\left(\partial x^{MH}/\partial n = -1/(2t)\right)$. The total effect on profit is

$$\frac{\partial \pi_i}{\partial n} = \frac{1}{2}\left[\frac{2e_i + n}{2t}\right] + \frac{2s-m}{2t} > 0 \tag{2}$$

Results. The term in the square bracket is identical in (1) and (2). Hence, the effect from the marginal consumer on profit by an increase in e_i is twice as high as from an increase in n. Consequently, a one-sided platform prefers to introduce exclusive content rather than non-exclusive content, all other things equal. This mean that the incentive to provide non-exclusive content is driven by the advertisement side. By comparing (1) and (2) we find:

$$\frac{\partial \pi_i}{\partial e_i} - \frac{\partial \pi_i}{\partial n} = \frac{[2e_i + n] - 2(s-2m)}{4t} \leq 0 \text{ if } s \geq \underline{s} = \frac{2e_i + n}{2} - 2m$$

To ensure non-negative prices, we have $s \leq \overline{s} = (2e_i + n) - m$. To summarise our results:

[7] For content creation incentives under partial multihoming in a one-sided market, see Jiang et al. (2019).

Proposition 1.

(i) In a one-sided market (no ad revenue), platform i is better off by marginally increasing its exclusive than non-exclusive content; $\partial\pi_i/\partial e_i > \partial\pi_i/\partial n$.

(ii) In a two-sided market, platform i is better off by marginally increasing its non-exclusive content, n, than exclusive content, e_i, if $\underline{s} < s \leq \overline{s}$.

(iii) Total demand increases more from a marginal increase in n than e_i, while the number of multihomers decreases in n and increases in e_i.

2.4. Discussion

For a media platform with all, or most, of its revenues from consumer payments, an increase in exclusive content increases profit more than an increase in non-exclusive content. In the consumer market, singlehomers and multihomers are charged the same price. For a platform that also collects revenue from the advertisers, exclusive eyeballs (singlehomers) are more valuable than multihomers. Consequently, platforms with ad revenues care about the distribution of consumers, singlehomers versus multihomers. Whereas an increase in exclusive content increases the number of multihomers, an increase in non-exclusive content decreases the number of multihomers. Therefore, if exclusive eyeballs have a high value compared to non-exclusive eyeballs for advertisers, a two-sided platform may prefer to provide more non-exclusive content rather than more exclusive content. Platforms with a significant revenue from advertisers may for instance provide more investigative journalism – which is typically easy to duplicate for rivals once published – than a pure consumer financed media platforms.

From a media policy perspective, it is often considered a goal to increase the number of multihomers, e.g., that more people read both a newspaper with a left-wing slant and a newspaper with a right-wing slant. However, in recent years more focus has been put on the fact that people to the far left and to the far right do not subscribe to any media platform. Increasing non-exclusive content increases the total number of consumers buying at least from one of the platforms more than an identical increase in exclusive content. We show that there thus exists a trade-off from a media policy perspective.

3. Concluding remarks

The classical Hotelling model assumes pure singlehoming and market coverage. To deny consumers from accessing more than one media platform is an unappealing assumption[8], and recent literature shows how partial consumer multihoming impact theoretical predictions. In the present model, we also relax the assumption of market coverage. Allowing for market expansion provides results that are more in line with outcomes from representative consumer models. As in most markets, it is reasonable to expect that lowering the price increases the total number of consumers, and, furthermore, that an identical increase in quality (non-exclusive content) also matters for the pricing behaviour.

[8]Empirical literature shows that a fraction of consumers are multihoming, see e.g. (Gentzkow et al., 2014, 2022) and Shi (2016).

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