Media Competition Enhances New-Product Entry:
On the Market for Fake Observations*

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Abstract

We show how increased competition in a media market may have implications for the competition between firms that are advertising in that medium. We apply a simple model of a product market with network externalities where firms buy advertising space in a media market and find that entry in the product market of a new and superior product is more likely, the more competitive the media market is. The paper is the first combining a study of media markets with a behavioral foundation of how advertising affects the demand for the advertised products.

Keywords: Advertising; Media; Availability Heuristic; Network Externalities.

JEL: D03; L82; M37; L12.

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1 Introduction

This paper discusses how the media market affects entry into a market with network externalities. Such entry is difficult, even for a firm with a superior product: with network externalities, consumers benefit not only from the quality of the product they consume but also from the presence of other consumers consuming the same product. So unless also others switch to the new product, a consumer may prefer the old product despite the new product’s superior quality.

A way to get consumers to switch is through advertising, and advertising space is bought from the media. We show here, by comparing monopoly and duopoly, that more competition in the media market facilitates entry into the market with network externalities. This implies, conversely, that incentives for product development may be severely undermined by a lack of competition in media markets. The reason is that the value from the development of new products ends up in the hands of the media owners to a greater extent when there is little competition between media firms.

The way advertising works in our model is through giving the consumers the impression that the firm has many customers. The argument is that it is easier to imagine someone using a product if you have seen it often in ads, and it is in line with Tversky and Kahneman’s (1973) theory of the availability heuristic: people judge the prevalence of an event from the ease with which the event can be recalled.

How will the market for advertising space respond to this advertising activity? To answer this question, we incorporate into our model the media industry in which the advertising is placed. We find that the market structure in the media industry is important for the possibilities of a new firm to enter a market with network externalities. With monopoly in the media market, the monopolist will extract all the profit from the incumbent but only a fraction of the profit from the entrant. As a consequence, the media monopolist will often want the incumbent to be able to defend a lock-in. It follows that competition in the media market facilitates entry into the product market.

In our model, media firms first choose the price of advertising space to charge to advertisers. Thereafter, the incumbent firm and the potential entrant choose sequentially how
much advertising to purchase, and finally consumers pick products. We focus on equilibria where consumers are maximally coordinated. This and firms’ sequential moves imply that only one firm will purchase advertising in equilibrium. Whether this firm is the incumbent or the entrant depends on the price of advertising. A media monopolist will set a price of advertising that allows the entry of the new product only if its value is large, whereas a media duopoly will lead to such entry also for intermediate values.

Bagwell (2007), in his account of the economics of advertising, singles out the media in which advertising space is bought on one hand and the behavioral foundations of advertising on the other hand as two aspects of advertising that are in particular need of further analysis. As far as we know, this study is the first to combine the two. Moreover, it is one of very few studies modeling both the media market and the market where the advertisers compete with their products; others who have done the same include Nilssen and Sørgard (2003), Dukes (2004), and Esteban and Hernández (2012).

The paper is organized as follows. In Section 2, we discuss the product market with network externalities. The role of advertising when advertising prices are given is discussed in Section 3. In Section 4, we consider optimal price setting by a media monopolist, while we discuss a media duopoly in Section 5 and compare this case with that of media monopoly. Section 6 presents a short discussion before our concluding remarks in Section 7. One of our proofs is relegated to an Appendix.

2 A market with network externalities

Our model of a market with network externalities is a simplified version of that of Farrell and Saloner (1985), along the lines of Tirole (1988, ch. 10). Consider a set of consumers normalized so that they total 1. Each consumer buys one unit of the product, and consumers are then matched pairwise and randomly. Before any entry, there is only the incumbent firm’s product technology available, denoted Old, while in case of an entry, there are two

\footnote{These studies – like many other recent contributions to media economics, such as Anderson and Coate (2005) and Kind, et al. (2007, 2009) – emphasize the two-sidedness of media markets. While such two-sidedness is largely ignored in our analysis, we do discuss one aspect of it in Section 6 below: media consumers’ dislike of advertising.}
product technologies available, Old and New. A consumer’s utility depends on her product’s technology and the share of other consumers that use the same product. The new technology is the most valuable one and has an intrinsic value \( \theta \) to consumers, over and above the intrinsic value of the old technology, which is normalized to 0. The intrinsic value of the new technology varies among consumers, though, and is uniformly distributed on \([0, 1]\).

In addition to the intrinsic value of a product technology, there is a positive network externality \( a \). Let \( \lambda \) denote the share of consumers using the new technology. A consumer choosing the new product then gets a network benefit \( \lambda a \) while one choosing the old technology gets a network benefit \( (1 - \lambda)a \). We assume that \( a > 1 \), which implies that the network externality potentially dominates the intrinsic value \( \theta \) of the new technology. That is, if \( \lambda = 0 \) the network benefit of the old technology is \( a \), while it is 0 for the new technology; as \( a > 1 \geq \theta \), the network benefit in this case dominates the intrinsic value of the new technology, for all consumers.

To summarize,

**Assumption 1** The utility difference between the new and the old technology is \( \Delta u = \lambda a - (1 - \lambda)a + \theta \), where \( a > 1 \), \( \theta \) is uniformly distributed on the interval \([0, 1]\), and \( \lambda \) denotes the share of consumers using the new product.

Our focus is on advertising as a way for the new firm to enter into this market. However, independently of any advertising, there is a fraction \( m > 0 \) of consumers who switch to the new technology; we call them *early adopters*; presumably, they have heard about the new product through word of mouth or any channel, other than advertising, not modeled here. We will argue that it is reasonable to assume that there exists such a (possibly small) set of consumers who are sufficiently curious about a new technology to test it out even at the cost of lost network externalities, while the majority of consumers will have to weigh the network externalities against the benefits of the new technology. Another reason why we need the early adopters is that the model is static. With all agents making choices at the same time, there would be no-one to observe. We thus introduce a set of early adopters that will be observed by the remaining population. In a dynamic evolutionary game model there would be some random switchers, and unless we are in a stable equilibrium some switchers would
induce others to switch and thus move the entire population to a new equilibrium.²

Due to the network externalities, a technology is more attractive for a consumer the larger share of others who choose it. Thus there may be multiple equilibria, unless the share of early adopters is large. We will focus on equilibria that are stable.³ Define

\[
\overline{m} := \frac{a - 1}{2a} \in \left(0, \frac{1}{2}\right).
\]

**Proposition 1** It is always an equilibrium that all consumers choose the new product. If \( m \leq \overline{m} \), then it is also an equilibrium that no-one, except early adopters, chooses the new product. Finally, for \( m < \overline{m} \), there is also an internal equilibrium where some choose the new and some choose the old product.

The proof is in the Appendix, but the intuition for this result is straightforward. The new product is inherently better, hence with a sufficient market share all consumers prefer the new product. Thus all choosing the new technology is an equilibrium. On the other hand, due to the network externality, all consumers except early adopters will prefer the old technology if the market share of the new is too low. The lowest possible market share for the new product is \( m \), the share of early adopters. Thus if \( m \) is sufficiently low, everyone except the early adopters will choose the old technology provided they think everybody else will do so.

Compared to an evolutionary-game approach (e.g., Brekke and Rege, 2006, 2007), we assume the equilibrium selection directly instead of deriving it from the analysis of an evolutionary game. Rather than a full blown dynamic evolutionary model, we invoke the main results from a dynamic analysis as an assumption. First we assume that the internal equilibrium will not materialize as it would not have been evolutionary stable. In that equilibrium, a share \( \lambda \in (m, 1) \) adopt the new technology. But a slight deviation with a share \( \lambda + \varepsilon \) adopting the new technology will increase the network externality for the new product and decrease it for the old one, hence attracting a larger share to the new technology. This applies also to

³Note that an equilibrium consists of a share of consumers choosing the new technology such that, given the share, no-one wants to switch further. In an unstable equilibrium it would be the case that if one consumer deviates and switches, this would increase the incentives to choose the same technology as the deviator, attracting more individuals to that technology, until possibly all choose the same technology.
the case of all choosing the old technology in the limiting case of \( m = \bar{m} \). A similar argument applies to a deviation in the opposite direction. With the lack of a dynamic analysis we still rule out these equilibria. Thus we are left with only one equilibrium, with all choosing the new technology, if \( m \geq \bar{m} \).

With \( m < \bar{m} \), there are still two equilibria. Now, the initial equilibrium before the new technology arrives is that everybody uses the old technology. As this equilibrium is stable in an evolutionary game, we assume that the market will stay in that equilibrium as long as it remains an equilibrium.

To maintain these aspects of an evolutionary model, we assume that, if an equilibrium exists with only the old product present, i.e., if \( m < \bar{m} \), then this equilibrium will be realized. If \( m \geq \bar{m} \), then the only equilibrium is that all consumers choose the new product.

**Assumption 2** If \( m < \bar{m} \), then all consumers, except early adopters, choose the old product, while if \( m \geq \bar{m} \), then all consumers choose the new product.

### 3 The market for fake observations

The choices that consumers make depend not on the actual number of switchers, but on what they perceive to be the number of switchers. This creates a scope for advertising to play a role: firms may want to purchase advertising space in the media in order to produce fake observations of their products’ consumption.

In order to model this, we assume that consumers form a perception of the share \( m \) from observing other persons’ early choices. The observed persons constitute a fraction \( n \) of all consumers. Among the observed persons, \( mn \) are early switchers, while the remaining ones are not. But in addition, consumers observe some characters on TV, and these characters make choices corresponding to the interest of the advertiser paying for them.

Observations of advertising on TV influence the perceived number of early adopters as if they were real observations.\(^4\) To model this, we let \( X_N \) measure the number of observations stemming from advertising for the new technology, and let similarly \( X_O \) measure the number

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\(^4\)This notion is closely related to the availability heuristic of Tversky and Kahneman (1973). Interestingly, Shrum (1999) finds evidence of this heuristic among TV viewers.
of such observations from advertising for the old technology. Observations of early switchers, including those on TV, then amount to $mn + X_N$ while the total number of observations is given by $n + X_O + X_N$. The perceived market share of the new technology is therefore

$$
\tilde{m}(X_N, X_O) = \frac{mn + X_N}{n + X_O + X_N} = \frac{m + \frac{X_N}{n}}{1 + \frac{X_O}{n} + \frac{X_N}{n}},
$$

where $\frac{X_N}{n}$ and $\frac{X_O}{n}$ can be interpreted as the numbers of effective observations from the new and old firm’s advertising, respectively.

We let the number of observations stemming from advertising on TV be proportional to the number of times people have been exposed to a certain ad. Assuming that a media firm charges a unit price on advertising is then equivalent to assuming that it charges a unit price $R$ on fake observations $X$. The media firm’s advertising revenue is then

$$
\Pi = R(X_N + X_O).
$$

In accordance with most models of entry and entry deterrence, we let the firms choose advertising levels sequentially, with the incumbent first choosing its level of advertising and then the entrant choosing its level of advertising. But first the media firm chooses the price $R$. Solving the game backwards, we first consider the optimal behavior of the entrant for a given level of advertising $X_O$ from the old firm and a given unit cost of advertising $R$.

Assumption 2 implies that, in equilibrium of this simple model, all consumers, except early adopters, are with either the incumbent firm or the entrant. This enables us to have a very simple picture of firms’ profits. Just as the new technology is, disregarding the match, preferable to consumers, it is also more profitable. We capture the difference in a simple way by having the old product earn 1 when serving the entire market in monopoly, gross of advertising expenses, while the value of the new product in such a case is $h > 1$.

From the discussion above we know that the economy will be stuck in the equilibrium where all (except early adopters) will choose the old technology, unless $\tilde{m} \geq \tilde{m}$. In order to focus on the entrant’s incentives to take over the market through advertising, we assume that entry involves costs so large that they cannot be covered by serving the early adopters only. The implication is that there always is only one firm present in the market, either the old firm or the new firm.
Let $\bar{X}_N(X_O)$ denote the level of advertising from the new firm required to reach the level $\bar{m}$ of perceived market share, for a given level of advertising from the old firm.

**Lemma 2** Given a level $X_O$ of advertising from the incumbent firm, the new firm will choose a level of advertising

$$\bar{X}_N(X_O) := \frac{n\bar{m} - m + \bar{m}X_O}{1 - \bar{m}}$$

(1) if $R\bar{X}_N(X_O) < h$; otherwise, the new firm will not advertise at all.

**Proof.** If the entrant chooses to advertise, then he must at least advertise so much that the perceived market share $\bar{m}$ reaches $\bar{m}$, but there is no need to advertise more. This level is just so that

$$\bar{m}(\bar{X}_N, X_O) = \frac{m + \bar{X}_N}{n + X_O + \bar{X}_N} = \bar{m},$$

which gives the stated $\bar{X}_N(X_O)$. The entrant will then take the entire market with a profit $h$ less the cost of advertising; i.e., the profit is

$$h - R\bar{X}_N(X_O)$$

and the rest of the lemma follows immediately. ■

Knowing the optimal response from the entrant, we consider the optimal strategy for the old firm, which can choose between deterring entry and giving up the market. The old firm deters entry if it advertises so much that $R\bar{X}_N(X_O) \geq h$, which would make advertising unprofitable for the new firm and thus allow the old firm to retain the whole market. Let the required level be denoted $\hat{X}_O$. From (1), it follows that the old firm keeps the other out if

$$R\frac{n(\bar{m} - m) + \bar{m}\hat{X}_O}{1 - \bar{m}} = h.$$  

(2)

Since the old firm can only afford this if its advertising costs end up being less than its revenue, rearranging (2) yields:

**Lemma 3** The incumbent firm chooses a level of advertising

$$\hat{X}_O := \frac{1 - \bar{m}}{\bar{m}} \frac{h}{R} - \frac{\bar{m}n - m}{\bar{m}},$$

(3)

if $R\hat{X}_O \leq 1$; otherwise, it does not advertise.
Note that, since $\tilde{m} < \frac{1}{2}$, we have that $\frac{1-\tilde{m}}{m}h > h > 1$, and so $R\tilde{X}_O > 1$ whenever $m \geq \tilde{m}$. Thus, if the incumbent loses the market when not advertising ($m \geq \tilde{m}$), then it cannot defend the market by advertising either.

**Corollary 4** If $m \geq \tilde{m}$, then the incumbent firm does not advertise.

Thus, when there are sufficiently many early adopters, the entrant will take over the market with an arbitrarily small level of advertising. We will therefore focus here on the more interesting opposite case and therefore maintain throughout the assumption that $m < \tilde{m}$.

Whether or not the incumbent will defend the lock-in when $m < \tilde{m}$ depends on the price being such that $R\tilde{X}_O \leq 1$. From the expression for $\tilde{X}_O$ in (3) we see that the cost of the required advertising is decreasing in the unit price $R$. The reason is that the more expensive advertising is, the more costly it will be for the entrant to buy sufficient advertising and the less is required from the incumbent. Define

$$\hat{R} := \frac{(1-\tilde{m})h - \tilde{m}}{nm - \tilde{m}} > 0. \tag{4}$$

**Proposition 5** Assume that $m < \tilde{m}$.

(a) The incumbent loses the market, and $X_O = 0$, if $R < \hat{R}$.

(b) The entrant is unable to enter the market, and $\tilde{X}_N = 0$, if $R > \hat{R}$.

(c) If $R = \hat{R}$, then both these outcomes are feasible.

**Proof.** Inserting for $\tilde{X}_O$ from Lemma 3 and rewriting, we have that the condition $R\tilde{X}_O > 1$ yields $R < \hat{R}$. The rest follows immediately. ■

The entrant’s level of advertising in case (a) of the Proposition is found by setting $\tilde{X}_O = 0$ in equation (1):

$$\tilde{X}_N(0) = \frac{nm - m}{1 - \tilde{m}} \tag{5}$$

The old firm will only be able to retain the market when the share of initial switchers is low and the cost of advertising is high. The intuition is that the incumbent benefits from a high initial market share. But the incumbent has no advantage in creating fake observations among consumers, and so the incumbent is only able to retain the market share when the cost is sufficiently high to avoid these fake observations playing a large role.

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5This expression is relevant only when $m < \tilde{m}$, so the denominator is positive. The numerator is positive since $\tilde{m} < \frac{1}{2}$ and $h > 1$. 

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4 Media Monopoly

Consider next the optimal pricing by a media monopolist. Summarizing the results above we have the following. If \( R < \hat{R} \), then only the entrant advertises. If \( R > \hat{R} \), then only the old firm advertises. If \( R = \hat{R} \), then both these outcomes may occur. We will make the assumption that the media firm, at \( R = \hat{R} \), can pick who will be advertising by setting \( R = \hat{R} \pm \varepsilon \) for some \( \varepsilon \) sufficiently small to be ignored. Disregarding any costs to the media firm in providing its services to the advertisers, we can thus write the firm’s profit as

\[
\Pi_{\text{media firm}} = \begin{cases} 
R\tilde{X}_N(0) = R\frac{\bar{m}n-m}{1-m}, & \text{if } R < \hat{R} \\
\max \left[ R\tilde{X}_N(0), R\tilde{X}_O \right] & \text{if } R = \hat{R} \\
R\tilde{X}_O = \frac{1-m}{m}h - \frac{\bar{m}n-m}{m}R, & \text{if } \hat{R} > R
\end{cases}
\]

Note that, for \( R < \hat{R} \) the entrant’s advertising cost, and hence the media firm’s profit, is increasing in \( R \). For \( R > \hat{R} \) the old firm’s advertising cost is declining in \( R \) as it becomes easier to defend the lock-in when advertising is more expensive, and as a consequence also the media firm’s profit is declining in \( R \) for \( R > \hat{R} \). Clearly, the optimal choice must be \( R = \hat{R} \), when the media firm will pick either the incumbent of the entrant according to who generates the most profit for the media firm.

Define

\[
\bar{h} = \frac{1}{1 - \bar{m}} = \frac{2a}{a + 1} > 1.
\]

We have:

**Proposition 6** The media monopolist always charges the price \( R = \hat{R} \).

(i) If \( 1 < h \leq \bar{h} \), then the lock-in is maintained and only the old firm advertises.

(ii) If \( h > \bar{h} \), then the old firm does not advertise and the new firm advertises to break the lock-in.

**Proof.** The media firm wants the old firm to advertise if that is what maximizes its profit, i.e., if \( R\tilde{X}_O \geq \hat{R}\tilde{X}_N(0) \), or

\[
\tilde{X}_O \geq \tilde{X}_N(0).
\]

By putting \( R = \hat{R} \) in (3) and inserting from (3) and (5) in (7), we obtain the condition \( h \leq \bar{h} \).

\[\blacksquare\]

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We thus see that, if the potential profit \( h \) of the new firm is high, or if the network externality \( a \) is small and therefore \( \bar{m} = \frac{a - 1}{2a} \) is small, then the entrant is likely to successfully break the lock-in. Surprisingly, the share \( m \) of early shifters plays no role in this condition! We will return to this observation below.

What about the profit for the two firms? Consider first the case when \( h \leq \bar{h} \). Now the entrant has zero profit while the old firm has profit \( 1 - \hat{X}_O \hat{R} \). After some algebra\(^6\) we find that the incumbent’s advertising cost is \( \hat{X}_O \hat{R} = 1 \), and thus profit is equal to 0.

Consider next the case when \( h > \bar{h} \). Now the old firm (again) has zero profit, while the profit of the entrant is\(^7\) \( h - \hat{X}_N (0) \hat{R} = \bar{h} \bar{m} = \frac{a - 1}{a + 1} \). Note further that, since in this case \( h > \bar{h} > 2\bar{h} \bar{m} \), where the second inequality follows from \( \bar{m} < \frac{1}{2} \), the media firm captures more than half the profit from the product market.

**Proposition 7** A media monopolist will,

(i) if \( 1 < h \leq \bar{h} \), extract all profit from the incumbent firm; and

(ii) if \( h > \bar{h} \), extract a profit from the entrant equal to \( h - \bar{h} \bar{m} \); this profit is larger than the profit that the entrant retains.

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\(^6\)Inserting from (3) and (4), we have: \( \hat{X}_O \hat{R} = \frac{(1 - \bar{m}) h - (\bar{m} n - m) \bar{R}}{\bar{m}} = \frac{(1 - \bar{m}) h - (\bar{m} n - m) (1 - \bar{m}) \bar{h} \bar{m}}{\bar{m}} = 1 \).

\(^7\)Inserting from (4) and (5), we have: \( \hat{X}_N (0) \hat{R} = \frac{\bar{m} n - m (1 - \bar{m}) \bar{h} \bar{m}}{1 - \bar{m}} = h \frac{\bar{m}}{1 - \bar{m}} = h - \bar{h} \bar{m}. \)

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Figure 1. The media monopolist’s profit (thin line) and the winning firm’s profit (thick line) as a function of \( h \), for the case \( \bar{h} \bar{m} = 0.5 \), i.e., \( a = 3 \).
The Proposition is illustrated in Figure 1, showing how the media monopolist’s and the winning firm’s profits vary with \( h \).

This result is due to the sequential move structure of the game. As long as the old firm is able to defend the lock-in, it will advertise and keep the new firm out. The monopolist will, however, choose the price of advertising so that it can squeeze the last penny out of the old firm. The same does not apply to the entrant who has a higher potential profit \( h > 1 \). To squeeze more of the profit out of the entrant, the media monopolist would have to increase \( R \) but it cannot increase \( R \) beyond the point where the old firm is able to defend the lock-in. Since \( h > 1 \), the media firm will let the new firm enter if it, by allowing this entry, can extract more than the profit it can take from the old, \( i.e., \) if \( \tilde{X}_N \tilde{R} > 1 \). It follows that the new firm’s retained profit must be less than \( h - 1 \).

The profit that the media monopolist is able to extract from the firms is independent of \( m \). As long as the incumbent wins, the monopolist simply retains the entire profit, which is assumed to be independent of \( m \). If \( h \) is sufficiently high, so that the media monopolist prefers the entrant to win, the monopolist extracts a profit \( h - \tilde{R}m \), which is also independent of \( m \).

5 Media Duopoly

We turn to the case of a media duopoly. We aim in this Section at discussing the effect of an increase in competition in the media market through a comparison of monopoly and duopoly. To this end, we focus on a case with homogeneous advertising products in the media firms, as seen from the two advertisers. This means that an ad in one media firm reaches out to the same set of consumers as does one in the other media firm. This would follow, for example, from a situation of multihoming among the media firms’ content consumers, who also are the ones making the observations based on the advertising that we focus on here. If the medium in question is TV, multihoming implies that TV viewers watch both TV channels available in the duopoly.

Suppose that there is a fixed unit cost \( c \in [0, \hat{R}] \) of producing observations made from advertising; possibly, \( c = 0 \) as assumed above. The two media firms sell such observations at
prices $R_1$ and $R_2$. The advertising firms will buy advertising from the cheaper media firm, and this firm will be able to cover that demand. Hence the outcome in the product market depends only on the lower advertising price.

Consider first the case when this lower price is below $\hat{R}$, defined in equation (4), i.e., when $\min(R_1, R_2) < \hat{R}$. It follows from Proposition 5 that the entrant now will be able to break the lock-in. The entrant’s demand for observations made from advertising will be constant and equal to $\bar{X}_N(0)$, given in (5). Since either media firm is able to cover the entire demand, they will each face a residual demand

$$D(R_i) = \begin{cases} 
\bar{X}_N(0) & \text{if } R_i < R_j; \\
\frac{1}{2} \bar{X}_N(0) & \text{if } R_i = R_j; \\
0 & \text{if } R_i > R_j.
\end{cases}$$

Note that, when advertising prices are identical, each media firm has an equal chance of getting the entrant’s demand; we formulate this as each firm getting half of that demand at equal prices. It follows straightforwardly that each media firm has incentives to set its advertising price just below that of the competitor, until $R_1 = R_2 = c$.

A similar analysis applies when both firms charge prices above $\hat{R}$, i.e., when $\min(R_1, R_2) > \hat{R}$. Now they face a demand from the old firm which is decreasing in $\min(R_1, R_2)$. In this case even the monopolist has incentives to lower the price, and duopoly rivals certainly want to lower the price.

Consider finally the case where

$$R_1 = R_2 = \hat{R}.$$ 

The two media firms have equal chances of getting the demand from the incumbent firm. If one of them lowers the price, then the incumbent will withdraw from the market and they only face demand from the entrant. Thus, at $R_1 = R_2 = \hat{R}$, each of them faces an expected demand $\bar{X}_O/2$, while if one firm slightly lowers its advertising price, then that firm will get the entire market, which is now $\bar{X}_N(0)$. Thus, if

$$\bar{X}_O > 2 \bar{X}_N(0),$$

then there exists an equilibrium with $R_1 = R_2 = \hat{R}$. 

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From Section 4, we know that $\hat{R}X_O = 1$ and $\hat{R}X_N(0) = h - \bar{m}$, which imply that condition (8) can be restated as

$$2(h - \bar{m}) < 1,$$

which may be rewritten as

$$1 < h < \frac{1}{2} + \bar{m} < \frac{3}{2},$$

where the first inequality is by assumption and the last one is due to $\bar{m} \in (0, \frac{1}{2})$. We note that an $h$ satisfying the condition will only exist if

$$\frac{1}{2} + \bar{m} = \frac{1}{2} + \frac{\bar{m}}{1 - \bar{m}} = \frac{1}{2} + \frac{a - 1}{a + 1} = \frac{13a - 1}{2(a + 1)} > 1,$$

which requires $\bar{m} \in (\frac{1}{2}, \frac{1}{3})$, or $a > 3$, i.e., that network externalities are sufficiently strong.

**Proposition 8** If

$$1 < h < \frac{13a - 1}{2(a + 1)},$$

then there exists an equilibrium where $R_1 = R_2 = \hat{R}$, the lock-in is maintained, and only the old firm advertises; otherwise, the only equilibrium in pure strategies is one where $R_1 = R_2 = c$, the old firm does not advertise, and the new firm advertises to break the lock-in.

We know from Proposition 6 that, with a media monopolist, the old firm will maintain its lock-in if $h < \bar{h}$. But

$$h < \bar{h} = \frac{2a}{a + 1} \iff h < 1 + \frac{a - 1}{a + 1} = 1 + \bar{m},$$

and hence condition (9) is stricter than $h < \bar{h}$. In other words,

**Corollary 9** The incumbent firm maintains the lock-in for a wider range of parameters in the case of a media monopoly than in the case of a media duopoly.

6 Discussion

Note that a switch to the new product will be a welfare improvement for two reasons. First, all consumers put positive value on the new product, provided that they get the same network externality. In addition, the producers get a higher profit with the new product.
On the other hand, consumers dislike advertising in the media.\textsuperscript{8} This dislike is not formally modeled in our analysis and we thus cannot include this in a welfare analysis. But for modest levels of such dislike, the total effect on welfare from a switch to the new product is surely positive.

In the text above, we simply assumed that advertisers can impose a level of advertising on consumers. More realistically, the media firm can only control the number of advertising spots, say on TV. With consumers disliking advertising, they will not watch the channel if the TV is too crowded with ads. To reflect this, we assume now that the time people spend watching TV is \( V \) (\textit{i.e.}, everybody watches TV, but possibly at a lower rate when there is a lot of advertising), while \( A \) denote the number of advertising slots on the channel. The total advertising pressure is then \( X = AV \). Moreover, \( V \) is negatively affected by advertising; specifically, we assume\textsuperscript{9}

\[
V = V(A), \text{ where } V'(A) < 0 \text{ and } \lim_{A \to \infty} AV(A) = \infty.
\]

Since \( \lim_{A \to \infty} X = \lim_{A \to \infty} AV(A) = \infty \), the media firm can sell as many observations made from advertising as it likes. The fact that the firm only controls advertising spots in its channel thus does not affect the analysis above. For any \( X' \) there is a corresponding \( A' \) such that \( X' = A'V(A') \). Under this assumption, viewer behavior is thus not important for our analysis.

7 Conclusion

This paper constitutes a first attempt at incorporating behavioral aspects of advertising in a model of a media market. With a simple model, we are able to point out how the market structure in the media industry affects entry behavior in the product market. In this model, media firms first choose the price of advertising followed by the incumbent firm and the potential entrant sequentially making decisions on how much advertising to buy, with

\textsuperscript{8}See, \textit{e.g.}, Wilbur’s (2008) empirical study.

\textsuperscript{9}This can be derived from somewhat more primitive assumptions. One possibility is to assume that \( \lim_{A \to \infty} V(A) > 0 \). Alternatively, one could assume that \( V(A) > \nu A^\phi \) for \( A \) sufficiently large, where \( \nu > 0 \) and \( \phi < 1 \). In both cases, we would have \( \lim_{A \to \infty} AV(A) = \infty \).
consumers picking products in the end. When consumers are coordinated, sequential moves lead to only one firm purchasing advertising in equilibrium. A media monopolist sets the advertising price such that the new product enters if that product’s value is large. However, a media duopoly will lead to such entry also for intermediate values.

Access to advertising is essential to be able to enter a locked-in market. In this paper, we show that this crucial role of advertising can be exploited by a media monopolist, who is able to extract the major part of the profit in the product market. This undermines the incentives for product development in the product market.

With competition in the market for advertising space, it is easier to enter a locked-in market. The entrant will also retain most of his profit. Competition in the media market – the market for fake observations – is, in other words, crucial in providing incentives for product development in the product market. Our analysis, therefore, points at a mechanism whereby plurality in media, and thus media competition, fosters innovation and economic growth.

A Appendix

Proof of Proposition 1: From Assumption 1,

\[ \Delta u = U(\text{new}) - U(\text{old}) = a\lambda - (1 - \lambda)a + \theta = 2\lambda a - a + \theta \]

where \( \lambda \) is the share actually choosing the new technology. We thus see that an individual would like to choose the new technology if \( \theta \geq \hat{\theta} \), with \( \hat{\theta} \) defined such that

\[ 2\lambda a - a + \hat{\theta} = 0, \text{ i.e.} \]

\[ \hat{\theta} = a(1 - 2\lambda) \]

The share, except early adopters, who would like to choose the new technology would then be \( (1 - \hat{\theta}) = 1 - a + 2a\lambda \), truncated at 0 and 1.

We see that the share of individuals who want to choose the new technology depends on the share that actually choose it. Including early adopters, the share who want to choose the
new technology is
\[
\begin{align*}
  f(\lambda) &= \begin{cases} 
    m & \text{if } \hat{\theta} \geq 1; \\
    m + (1 - m)(1 - a + 2a\lambda) & \text{if } \hat{\theta} \in (0,1); \\
    1 & \text{if } \hat{\theta} \leq 0.
  \end{cases}
\end{align*}
\]

An equilibrium is when the share who want to choose the new technology equal the share who actually choose it, that is
\[
f(\lambda) = \lambda.
\]

It immediately follows that \( \lambda = 1 \) is an equilibrium. Furthermore, the requirement for \( f(m) = m \) is that \( a(1 - 2m) \geq 1 \), that is
\[
2am < a - 1, \quad \text{or} \\
\frac{m}{2a} < \frac{a - 1}{2a} = \bar{m}.
\]

Finally, \( f'(\lambda) = 2a(1 - m) > 1 \) for \( \hat{\theta} \in (0,1) \), and otherwise \( f'(\lambda) = 0 \). So \( f(\lambda) - \lambda \) will first be declining from \( \lambda = m \) to \( \lambda = \bar{m} \) (where \( \hat{\theta} = 1 \)), then increasing and finally declining again as \( \hat{\theta} \) reaches 0. It follows that, if \( m < \bar{m} \), then there is exactly one internal fixed point. \( \blacksquare \)

References


