Title: Targeted Branding, Price Competition and Consumer Data

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Abstract

The extensive data on consumer preferences that has been facilitated by digital technology can also be used to reveal distinctive traits and personalities about a firm’s potential consumers. Understanding more about what different consumers like and value can help a firm target its branding strategy as well its pricing strategy. We investigate how targeted branding affects price competition in a spatial duopoly market. Our findings suggest that when targeted branding is valued by consumers it softens competition and improves profitability, compared to the benchmark case of price discrimination. Firms have an incentive to engage in branding even though it is a costly activity and branding costs are incurred before transactions take place. The more profitable branding strategy is when there are “locational advantages” to the firm in its branding, even if those strategies are costlier. Targeted branding leads to higher average prices being set and greater price dispersion than would be observed in the benchmark case.

Keywords: Target advertising, branding, spatial competition
Targeted Branding, Price Competition and Consumer Data

1. Introduction

Recent technological advances in the collection and aggregation of “big data” have enabled firms to learn a great deal more about their consumers. A consequence of these advances combined with the growth of online technologies is a dramatic increase in firms’ ability to engage in price discrimination. Tailored air travel pricing and surge-pricing along with several well-publicized pieces in the popular press\(^2\) provide anecdotal evidence that price discrimination is becoming more common in the digital age.

Research such as Mikians et al (2012) report empirical evidence of price discrimination based on geographic location, user URL, and markers for income. In Esteves and Resende (2016) it is firms’ acquisition of consumer data that permits them to target their informative advertising and prices to different customer types. In this context the term “targeted advertising” refers to an information strategy that facilitates price discrimination.

However, as Becker and Murphy (1993) long ago argued, a firm’s advertising may be valued by consumers not as information, but rather as a complementary good or service that enhances consumers’ utility and valuation of the good. This kind of advertising gives a product a “brand identity” that consumers may value in addition to the physical attributes of the product.\(^3\) Popular ad campaigns such as “Dos Equis: Most Interesting Man in the World” or Audi’s “2017 Super Bowl Gender Pay Gap Ad” have limited information at best,\(^4\) instead they build on

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\(^4\) See Anderson and Renault, (2006) explore a different explanation for limited information in advertising that builds on a hold-up problem in shopping behavior. This is less likely to hold for well-known brands such as Coke or Dos Equis.
consumers’ knowledge of the brand and offer an experience of feeling worthwhile, of friendship, of generosity or of happiness.

When advertising refers to this kind of branding strategy it follows that firms may use their data on consumers to customize their branding strategies in addition to tailoring the price to different customer types. Today firms have a plethora of media outlets, of influencers, and of sponsorships with which to complement and brand their product. Take for example, Budweiser, which is the most advertised beverage brand in America. It has a long history of sponsoring different sports franchises, professional sporting events, and individual players. And besides a wide range of TV campaigns, including Whassup, Clydesdale horses and the immigrant story, the brand has partnered with YouTube stars, soccer stars and media personalities to create branded videos on Instagram to reach different audiences.

Our paper explores firm behavior in the setting in which consumers value advertising as a complement to the purchased good and firms have the technologies to customize both their price and the complementary branding effort to different consumer types. Specifically, we model a spatial duopoly in which firms implement both price discrimination and targeted, customized branding. In this framework, advertising is a complement bundled in with the product itself and that thereby adds value to the combined package when the product is consumed. This assumption is consistent with evidence in the marketing literature that it is primarily after a purchase that consumers appear to enjoy the its brand identity.5

Providing value to the consumer in a targeted branding strategy is a costly activity for the firm and moreover these costs are incurred before transactions take place. There are, however, likely to be comparative cost advantages for firms when designing branding strategies for their potentially loyal customers. Potentially brand loyal consumers are likely to share other features besides a

similar taste for product attributes that the firm can use in branding its product. For example, Listerine discovered in their market research that their loyal customers enjoy doing bold activities and went on to design a branding strategy in 2016 around this finding.\(^6\) We captures this cost advantage in a spatial model so that each firm has a locational advantage to its most loyal or spatially nearest consumers.

We next provide a brief review of the literature on targeted advertising and price discrimination in the next section, and then introduce the model and results in section 3. Concluding remarks follow in section 4.

2. Background Literature

There is a large and recent literature on targeted informative advertising and price discrimination\(^7\), see for example Esteves, (2009) as well as Esteves and Resende (2016). Using data that firms are now able to collect, research on this topic explore how firms sort consumers by their time preference, (Jing, 2011), by whether they are old or new customers, Villas-Boas (1999), Fudenberg and Tirole (2000), by their observed buying history at one or more firms, Taylor, (2004) Acquisti and Varian (2005), or by what information firms have regarding location or “address” in a product space, Chen and Iyer (2002).\(^8\)

In a spatial model of product differentiation Ulph and Vulkan, (2001) have investigated whether it is in the interest of firms to set personalized prices or practice first degree price discriminate in e-commerce markets. They use a simple duopoly model and, among other results, find that stronger consumer tastes for variety intensify the use of price discrimination. Chen and Yang (2009) show, however, that price discrimination may lead to softer price competition in a

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\(^6\) https://www.listerine.co.uk/bringoutthebold
\(^7\)Fudenberg and Villas-Boas, (2007) provide a helpful survey of many of these analyses.  
\(^8\)Our model is a nice complement to Chen and Iyer (2002) who examine the strategic impact of consumer addressability or location on spatial competition between marketing firms.
model with forward-looking consumers. Neither spatial model includes targeted brand building advertising, and this is also the case in the more recent work of Taylor and Wagman (2014) who explore price discrimination under different forms of imperfect competition.

Our spatial model builds on Thisse and Vives (1988) but allows for a different approach to targeted advertising first explored by Becker and Murphy (1993). In this respect it is worth noting that two recent papers provide empirical evidence in support of the complementarity role for advertising. Tuchman, Nair and Gardete (2018) use a rich data set that includes observations not only on the number of ads to which a household may have been exposed but also on the number of ads a household “skipped.” They find that ad-skipping is lower when the household has purchased more of the brand in the past. In other words, advertising consumption is positively associated with consumption of the advertised product.

Lee, Hosanagar and Nair (2017) implement a large-scale study investigating consumer engagement with the ads placed on the Facebook pages of top brands. Engagement is measured by the number of likes, comments, and/or impressions an ad generates. They find that including humor or, more generally, emotional content of some kind, as well as unrelated “small talk” in an ad has a significantly positive effect on subsequent consumer engagement. In contrast, they find that the inclusion of informative advertising on prices, availability, and product features, by itself, reduces consumer engagement. It is only when the informative content is interacted with more enjoyable content that the information variables have a positive impact on consumer engagement.

3. The Model

We consider a duopoly market where each firm is located at the opposite end of a Hotelling line, set to unit length, and along which a mass of $H$ consumers is uniformly distributed. Firm 1 is
located at the left end of the line and firm 2 is located at the right-most point. Each firm has incurred a sunk cost $F$ to locate.

The fixed cost provides the firm with information on consumer preferences that enables the firms to price discriminate as well as to target branding to different consumer types. In other words, the “location” of consumer $x$ on the line defines not only the consumer’s most preferred specification of product attributes, but also provides additional information about the consumer’s likes and dislikes regarding complementary advertising.

Specifically, a consumer whose preferred good is closer to one firm’s product than a rival’s may have other likes that makes it possible for the firm to target customized branding messages to attract or retain the consumer from rival competition. This gives a firm a comparative “locational” advantage in designing complementary branding strategies for consumers who are “closer” and have the greatest potential to be loyal to the firm’s brand. The unit cost $c$ of producing either good is assumed to be identical across the two firms and without loss of generality is normalized to zero.

We first review the benchmark case of first-degree price discrimination when there is no targeted branding, in a set-up similar to the price discrimination game in Thisse and Vives (1988).

### 3.1 The Benchmark Model of First-Degree Price Discrimination

Assume that each consumer buys at most one unit of the differentiated product each period. If consumer $s$ buys a product from firm $i$ ($i=1,2$) at price $p_i(x)$ without receiving any complementary advertising she obtains utility:

$$U(x) = V - p_i(x) - tx \quad \text{if } i = 1 \text{ if buy good 1, 0 otherwise}$$

$$U(x) = V - p_i(x) - t(1 - x) \quad \text{if } i = 2 \text{ if buy good 1, 0 otherwise}$$

(1)
$V$ is the reservation price for the consumer’s preferred product and $t$ is a measure of the loss of utility per unit “distance” that the consumer incurs in buying a product other than the most preferred one. We assume that $V > t > 0$.

Each consumer buys exactly one unit of the product that offers the greatest consumer surplus. In case of a tie we assume that consumer purchase decisions are randomly distributed over the tied products. In equilibrium this occurs for a zero-measure set of consumers.

With a marginal cost of zero, each firm makes a profit on any unit of the good that it sells at a positive price. Hence, under first-degree price discrimination, each firm is willing to cut its price asymptotically to zero to attract any specific consumer. Given that $V - t > 0$ it follows that for each consumer $x$ we have in equilibrium:

\[
V - p_1(x) - tx = V - p_2(x) - t(1 - x)
\]

\[
p_1(x) - p_2(x) = t(1 - 2x)
\]

Because firm 2 is willing cut its price to its marginal cost equal to zero firm 1 will be able to sell at a non-negative price and capture its most valuable consumers $x$ where $0 \leq x \leq \frac{1}{2}$. Symmetrically, firm 2 can sell at a non-negative price and capture its most valuable consumers $x$ where $\frac{1}{2} \leq x \leq 1$.

The schedule of prices paid by each consumer to the firm from which it buys is in the benchmark case:\n
\[
p_1^0(x) = t(1 - 2x) \text{ for } 0 \leq x \leq \frac{1}{2}
\]

\[
p_2^0(x) = t(2x - 1) \text{ for } \frac{1}{2} \leq x \leq 1
\]

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9 For firm 1 the maximum feasible price is $\epsilon$ below the price $p_1^0(x)$ so that the consumer is not indifferent between the two goods. Similarly for firm 2.
First degree price discrimination intensifies price competition in the spatial model as the average price $\bar{p}^0 = \frac{t}{2}$ paid by consumers under first-degree price discrimination is less than the uniform price $p = t$ paid when price discrimination in this market is not feasible. The range of price dispersion in the case of first-degree price discrimination is $[0, t]$.

Consumer surplus $CS^0$ and producer surplus $PS^0$ are:

$$CS^0 = H \left(V - \frac{3}{4}t\right) \quad \text{and} \quad PS^0 = \frac{Ht}{2}$$

Not surprisingly consumer surplus is greater and producer surplus less than in the uniform pricing standard spatial model.

3.2 Price Discrimination with Targeted Advertising

Access to more information about consumers’ preferences permits firms to develop branding strategies that are valued by consumers. As noted earlier, we assume that targeted branding enhances the consumption value of the good and serves a role more than simply conveying product and price information. Targeted branding may also be a potentially profitable way to soften price competition.

Denote by $\alpha_i(x)$ be the branding that firm $i$ targets specifically to consumer $x$. Consumer $x$ values $\alpha_i(x)$. Specifically, we assume that the consumer’s utility function is separable and additive in $\alpha_i(x)$ when brand $i$ is purchased. Consumer surplus from purchasing a firm’s product is now:

$$U(x) = V + \alpha_i(x) - p_i(x) - tx \quad \text{if} \ i = 1 \ \text{is purchased}, \ 0 \ \text{otherwise}$$

$$U(x) = V + \alpha_i(x) - p_i(x) - t(1 - x) \quad \text{if} \ i = 2 \ \text{is purchased}, \ 0 \ \text{otherwise}$$

Observe that the increase in utility experienced from targeted branding does not depend on the parameter $t$, which refers to how far a brand is from the preferred physical attributes of the product. Branding is an activity that is not related to the physical properties of the product, but instead is
related to personality traits or values of the consumer that affect consumer preferences for brand identity. For example, many products, such as Dove, Hellmanns, and Ben & Jerry’s, use branding strategies that reflect the environmental values of their target consumer population.\textsuperscript{10}

Targeted advertising or branding is not a costless activity and the costs of designing targeted branding strategies are incurred before transactions take place. In addition, we assume that the cost of providing targeted branding to any consumer \(x\) rises as the consumer is located at a greater distant from the firm and that this cost is subject to decreasing returns. For example, it may be easier or less costly for Coke than it is for Pepsi to target its branding to a consumer who prefers the attributes or taste of Coke to that of Pepsi. Specifically, for firm \(i\) to target branding \(\alpha_i(x)\) to consumer \(x\) the cost of branding incurred by the firm is:

\[
C[\alpha_i(x)] = \beta \alpha_i(x)x + \alpha_i(x)^2 \quad \text{if } i = 1
\]

\[
C[\alpha_i(x)] = \beta \alpha_i(x)(1 - x) + \alpha_i(x)^2 \quad \text{if } i = 2
\]

To explore how targeted branding is a strategy, in addition to price, that firms can adopt to compete for customers we adopt a three-stage game. In the first stage a firm \(i\) \((i = 1, 2)\) incurs the cost of targeting its branding, and offers a differentiated branding and price combination to consumers that are potentially the most brand loyal to its product; i.e. for firm 1 these are consumers \(x\) where \(0 \leq x \leq \frac{1}{2}\), whereas for firm 2 these consumers are in the market segment described by \(\frac{1}{2} \leq x \leq 1\). The costs of branding are incurred at this stage and firms commit to the price offered to their most brand loyal consumers in stage 1. In the second stage a firm \(i\) may incur additional branding costs and target consumers with a branding and price strategy in its rival’s segment of the market. In the third stage consumers make their purchase decisions.

There are three cases to consider, depending on the value of the parameter $\beta$, which affects the comparative locational advantage, or disadvantage, in the cost of targeted branding. Although an increase in $\beta$ increases the cost of targeted branding it does so asymmetrically. Firms closer in location to a consumer preferred product have better information or ability to design for these consumers’ preferences for complementary branding. This makes it less costly for the firm to provide targeted advertising to them.

The first case we consider is when $\beta$ is relatively high, specifically $\beta \geq 2$, and the locational disadvantage discourages a firm in stage 2 from trying to target their branding to consumers located beyond the midpoint of the Hotelling line. However, the firm can still compete for these consumers in price. The second case we consider is when $\beta$ is relatively low, specifically $0 < \beta \leq 1$. Here the locational disadvantage is not so great, and a firm can afford to design targeted branding to consumers who are located far away. The third case is when $\beta$ is such that $1 < \beta < 2$ and is a hybrid of the two former cases.

### 3.2.1 Case 1: The Locational Advantage in Targeting Branding is Relatively High and $\beta \geq 2$.

When $\beta \geq 2$, the cost function (6) makes clear that the cost to a firm, say firm 1, of sending targeted branding to a consumer $x$ at a distance greater than $\frac{1}{\beta}$ from firm 1’s location exceeds the value of the branding added to the consumer. Firm 1 will not have a profit incentive to send targeted branding to consumers located in the segment $[\frac{1}{\beta}, 1]$. Similarly, when $\beta \geq 2$ firm 2 does not have an incentive to send targeted branding to consumers who are located in the market segment $[0, 1 - \frac{1}{\beta}]$.

There is therefore a segment of the market $[\frac{1}{\beta}, 1 - \frac{1}{\beta}]$ that consists of consumers who receive no targeted branding. In this segment firms will compete only in price and exploit their locational
advantage in how they price discriminate across consumers. For example, firm 1 will serve those consumers in the region \([\frac{1}{\beta^2}, \frac{1}{\beta}]\), competing in price against a rival who could offer these consumers a less preferred good at a zero price. When \(\beta\) is very large this case approximates the case of first-degree price discrimination only. As \(\beta\) falls, firm have an incentive to engage in targeted branding.

For a consumer \(x\), where \(0 \leq x \leq \frac{1}{\beta}\), firm 2, the rival firm, has no incentive to target advertising to firm 1’s most loyal consumers and competes in this segment only in price. It follows from (5) that firm 1 will attract consumer \(x\) in stage 3 of the game by offering in stage 1 a combination of valued branding \(\alpha_1(x)\) and a price \(p_1(x)\) such that:

\[ p_1(x) \leq \alpha_1(x) + t(1 - 2x) \]  

(7)

Firm 1 will charge consumer \(x\) the maximum feasible price \(p_1(x) = \alpha_1(x) + t(1 - 2x)\), and its profit from serving the consumer is:

\[ \pi_1(x) = \alpha_1(x) + t(1 - 2x) - \beta \alpha_1(x)x - \alpha_1(x)^2 \]  

(8)

Firm 1 chooses targeted branding \(\alpha_1^*(x)\) to maximize (8), which leads it to offering consumer \(x\)

\[ \alpha_1^*(x) = \frac{1 - \beta x}{2} \]

targeted branding at a price \(p_1^*(x) = \frac{1 - \beta x}{2} + t(1 - 2x)\) understanding that firm 2 will not offer any targeted branding to consumer \(x\) where \(0 \leq x \leq \frac{1}{\beta}\) and will compete in stage 2 only in price. Similarly, we can solve for firm 2’s profit-maximizing advertising and pricing strategy for each consumer \(x\) in the market segment \([\frac{1}{\beta}, 1]\).

The above reasoning leads us to the following outcome for the case where \(\beta \geq 2\):

(1) **In stage 1**: Firm 1 offers: to consumer \(x\) where \(0 \leq x < \frac{1}{\beta}\), targeted branding

\[ \alpha_1^*(x) = \frac{1 - \beta x}{2} \text{ at a price } p_1^*(x) = \frac{1 - \beta x}{2} + t(1 - 2x); \text{ and to consumer } x \text{ such that } \frac{1}{\beta} \leq x < \]

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1) Again the maximum feasible price is \(\epsilon\) below this price so that the consumer is not indifferent between the two goods.
\( \frac{1}{2} \), it offers no targeted branding \( a_1^*(x) = 0 \) and a price \( p_1^1(x) = t(1 - 2x) \).

Firm 2 offers: to consumer \( x \) where \( \frac{1}{2} < x \leq 1 - \frac{1}{\beta} \), targeted branding \( a_2^*(x) = 0 \) and a price
\[
p_2^2(x) = t(2x - 1);
\]
and to consumer \( x \) where \( 1 - \frac{1}{\beta} \leq x \leq 1 \), it offers targeted branding
\[
a_2^2(x) = \frac{1 - \beta(1 - x)}{2} \quad \text{and a price} \quad p_2^2(x) = \frac{1 - \beta(1 - x)}{2} + t(2x - 1).
\]

(2) **In stage 2:** Firm 1 offers: to consumer \( x \) where \( \frac{1}{2} < x \leq 1 \) targeted branding \( a_1^*(x) = 0 \) at a price \( p_1^1(x) = 0 \).

Firm 2 offers to consumer \( x \) where \( 0 \leq x < \frac{1}{2} \), targeted branding \( a_2^*(x) = 0 \) and a price
\[
p_2^2(x) = 0.
\]

(3) **In stage 3:** Consumer \( x \) where \( 0 \leq x < \frac{1}{2} \) purchases brand 1 from firm 1. Consumer \( x \) where \( \frac{1}{2} < x \leq 1 \), purchases brand 2 from firm 2. The consumer \( x = \frac{1}{2} \) buys with equal probability either brand 1 or 2.

Consumers that are located relatively close to a brand are potentially brand loyal. They receive some targeted branding and they experience utility from their loyalty to the brand. The consumer with the highest willingness to pay, e.g. in the case of brand 1 consumer \( x = 0 \), is targeted the most, enjoys branding the most and pays the most. The consumer \( x = \frac{1}{2} \) has the least willingness to pay for either brand and buys each with equal probability. This consumer receives no targeted branding and has the least potential for brand loyalty; i.e. \( a_1 \left( \frac{1}{2} \right) = a_2 \left( \frac{1}{2} \right) = 0 \) and \( p_1^1 \left( \frac{1}{2} \right) = 0 \) or \( p_1^1 \left( \frac{1}{2} \right) = 0 \).

In case 1 where the comparative advantage in targeted branding is relatively high and \( \beta \geq 2 \), consumer surplus is the same as in benchmark case where there is first-degree price discrimination.
and no targeted branding. The reason is that each consumer $x$ receives targeted branding from at most one firm when $\beta \geq 2$. The price the consumer pays in stage 3 is constrained in stage 2 by the rival brand being able to offer its good at the zero-brand loyalty price, i.e., price equal to zero. This yields the same consumer surplus as in the benchmark case.

$$CS^1 = H \left( V - \frac{3}{4} t \right) = CS^0$$

(9)

The average price paid in the market in the case of targeted branding and price discrimination when $\beta \geq 2$ is $\bar{p}^1 = \frac{t}{2} + \frac{1}{2\beta}$, which is greater than $\bar{p}^0 = \frac{t}{2}$, the average price in the benchmark case of first-degree price discrimination. The range of price dispersion in case 1 is $[0, \frac{1}{2} + t]$, which is also greater than $[0, t]$, the range in the benchmark case.

However, producer surplus is now larger than the benchmark case with no targeted branding. The intuition is that with targeted branding and $\beta \geq 2$ each firm chooses to send some targeted branding to its potentially most brand loyal customers even though its rival does not compete with targeted branding to that same consumer. A firm will only engage in targeted branding if it is profitable to do so. This will be less likely as $\beta$, the parameter measuring a firm’s comparative advantage in targeted branding, rises.

$$PS^1 = H \left( \frac{t}{2} + \frac{1}{6\beta} \right) > PS^0$$

(10)

The maximum producer surplus or profitability in this case is: $\bar{PS}^1 = H \left( \frac{t}{2} + \frac{1}{12} \right)$ is when $\beta = 2$.

Producer surplus decreases as the locational cost parameter $\beta$ increases. Targeted branding is generally always more profitable than competing in price alone as in the benchmark case. As the locational cost parameter $\beta$ increases, the segment of the market that is targeted with customized branding becomes smaller and the firms compete less and less in targeted branding. In the limit
when $\beta \to \infty$ and branding is very costly firms brand only to their most loyal consumers, or $\frac{1}{\beta} \to 0$ for firm 1, and $1 - \frac{1}{\beta} \to 1$ for firm 2, and to all other consumers firms compete as in the benchmark case.

### 3.2 Case 2: The Comparative Advantage in Targeted Branding is Relatively Low and $0 < \beta \leq 1$.

When the cost parameter $\beta$ is relatively low such that $0 < \beta \leq 1$, it is potentially profitable for each firm to offer targeted branding to consumers across the entire market. In this case the values, or traits that consumers share, are such that the data are more available to all firms and/or the traits are not so differentiated by consumer address. Each firm has a locational advantage in one segment of the market, but when a firm targets its branding and price to a consumer $x$ in this segment it knows that its rival who is at a locational disadvantage could potentially offer targeted branding and a price to poach consumer $x$ from its brand. Poaching can occur in stage 2 after a firm makes its offers in stage 1 to consumers for whom it has a comparative locational price and branding strategy.

Consider firm 1 who has a locational advantage in serving consumer $x$ where $0 \leq x < \frac{1}{2}$. The firm’s strategy of offering brand 1 to consumer $x$ with targeted branding $a_1^*(x) = \frac{1-\beta x}{2}$ at a price $p_1^1(x)$ is the firm’s best response to its rival not branding its product to consumer $x$, $a_2(x) = 0$, and selling it at a price $p_2(x) = 0$. However, if firm 1 offers to consumer $x$ in stage 1 a price $p_1^1(x)$, firm 2 can poach that consumer in stage 2 by offering for its good targeted branding $a_2^*(x) = \frac{1-\beta(1-x)}{2}$ at a price $\varepsilon$ below $\tilde{p}_2(x) = a_2(x)$.$^{12}$

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$^{12}$If firm 2 deviates from offering $a_2(x) = \frac{1-\beta(1-x)}{2}$ at a breakeven price and instead offers some other level $\tilde{a}_2$ at the corresponding breakeven price $\tilde{p}_2 = \tilde{a}_2 \beta (1-x) + \tilde{a}_2^2$ we can show that the consumer still prefers to buy brand 1 at firm 1’s profit-maximizing price and targeted advertising strategy. This holds for consumer $x$ where $0 \leq x < \frac{1}{2}$. 

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Hence, for firm 1 to exploit its locational advantage in this segment of the market it must offer in stage 1 a price and branding strategy to consumer \( x \) that makes it unprofitable for its rival to use a branding strategy to poach this consumer. Specifically, firm 1 must offer brand 1 to consumer \( x \) at a price \( p^1_2(x) \) with branding \( a^*_1(x) \) that undercuts firm 2’s profitability to use targeted branding in this segment of the market. That is, firm 1 must offer its brand to consumer \( x \) at a price 

\[
p^1_2(x) \leq a^*_1(x) - a^*_2(x) + t(1 - 2x) + p^B_2(x)
\]

Solving (12) we find the price \( p^1_2(x) \) that firm 1 offers in stage 1 of the game.

Similarly, firm 2 recognizes that for consumer \( x \) where \( \frac{1}{2} < x \leq 1 \), firm 1 can try in stage 2 to attract and win this consumer by sending its optimal targeted branding \( a^*_1(x) = \frac{1-\beta x}{2} \) at a competitive or breakeven price. In stage 1 firm 2 must offer a targeted price and branding to consumer \( x \) such that firm 1 cannot profitably poach or attract consumer \( x \) to its brand in stage 2. Alternatively, competition from the rival brand constrains the price premium that each firm can charge its potentially brand loyal consumer for its brand and targeted branding in stage 1.
The equilibrium for case 2 when that $0 < \beta \leq 1$ is characterized as follows:

1. **In stage 1**: Firm 1 offers to consumer $x$ where $0 \leq x < \frac{1}{2}$, targeted branding

   $$a_1^*(x) = \frac{1 - \beta x}{2} \text{ at price } p_1^2(x) = \frac{1}{4} + t(1 - 2x) + \frac{\beta^2}{4}(3x^2 - 4x + 1).$$

   Firm 2 offers to consumer $x$ such that $\frac{1}{2} < x \leq 1$, targeted branding $a_2^*(x) = \frac{1 - \beta (1 - x)}{2}$ at

   $$p_2^2(x) = \frac{1}{4} + t(2x - 1) + \frac{\beta^2}{4}(3(1 - x)^2 - 4(1 - x) + 1).$$

2. **In stage 2**: Firm 1 offers to consumer $x$ where $\frac{1}{2} < x \leq 1$ no targeted branding $a_1^*(x) = 0$ at

   price $p_1^2(x) = 0$.

   Firm 2 offers to consumer $x$ where $0 \leq x < \frac{1}{2}$ no targeted branding $a_2^*(x) = 0$ at a price

   $p_2^2(x) = 0$.

3. **In stage 3**: Consumer $x$ where $0 \leq x < \frac{1}{2}$ purchases brand 1 from firm 1. Consumer $x$ where

   $\frac{1}{2} < x \leq 1$, purchases brand 2 from firm 2. The consumer $x = \frac{1}{2}$ buys with equal probability

   either brand 1 or 2.

When the locational cost parameter $\beta$ is relatively low each consumer $x$ receives targeted
branding from the brand that they buy. This is, in contrast to case 1, where $\beta$ is relatively high and
only consumers in the market segments $[0, \frac{1}{\beta}], [1 - \frac{1}{\beta}, 1]$ receive valued targeted branding from the
brand they buy. Even the potentially least brand loyal consumer $x = \frac{1}{2}$ enjoys either the targeted
branding: $a_1^*(\frac{1}{2}) = a_2^*(\frac{1}{2}) = \frac{1}{2} - \frac{\beta}{4}$, at either the price: $p_1^2(\frac{1}{2}) = p_2^2(\frac{1}{2}) = \frac{1}{4} - \frac{\beta^2}{16}$.

Comparing the consumer surplus of the consumer who is potentially most brand loyal to
brand 1, $x = 0$, we find that in case 1 the consumer enjoys a surplus of $V - t$ whereas in case 2 the
consumer enjoys a greater surplus of $V - t + \frac{1 + \beta^2}{4}$. And for the consumer who is the least brand
loyal \( x = \frac{1}{2} \), the consumer receives a consumer surplus of \( V - \frac{\ell}{2} \) in case 1, but a greater surplus of

\[
V - \frac{\ell}{2} + \frac{1}{4} - \frac{\beta}{4} + \frac{\beta^2}{16}
\]

in case 2. All consumers are better off in case 2 and total consumer surplus is unambiguously higher than case 1:

\[
CS^2 = H \left( V - \frac{3}{4} t + \frac{1}{4} - \frac{1}{8} \beta - \frac{1}{16} \beta^2 \right) > CS^1 = H \left( V - \frac{3}{4} t \right) = CS^0 \tag{13}
\]

Comparison with the benchmark case shows that consumer surplus rises as the locational advantage in targeted branding, or \( \beta \), falls and firms compete more in branding. In addition, potential competition in targeted branding from the rival brand forces each firm to lower its price and earn a lower margin relative to its advertising cost.

The average price paid in the market in case 2 of targeted branding and price discrimination when \( 0 < \beta < 1 \) is \( \bar{p}^2 = \frac{1}{4} + \frac{\ell}{2} + \frac{\beta^2}{16} \), which is greater than the average price \( \bar{p}^1 \), set case 1 where costs and locational advantages are higher. A fall in the cost of branding, specifically the locational advantage, does not lead to lower consumer prices, but instead more competition in branding and higher prices. The range of prices set in case 2 is \([ \frac{1}{4} + \frac{\beta^2}{16}, \frac{1}{4} + t + \frac{\beta^2}{4} ]\), which is a smaller range of prices than was set in case 1.

Profitability or producer surplus in case 2 increases as the locational cost advantage \( \beta \) increases over the range \( 0 < \beta < 1 \). Specifically, \( PS^2 = H \left( \frac{\ell}{2} + \frac{\beta^2}{12} \right) \). Hence, given the limits \( \beta \) for this case, \( PS^2 \) ranges from a minimum of \( PS^2 \sim \frac{H \ell}{2} \) when \( \beta \sim 0 \), \( (= PS^0) \), to a maximum of \( PS^2 = \frac{1}{12} \), the maximum in case 1. Indeed, it is easily verified that the upper and lower bounds of profitability in case 2 when \( \beta \) is relatively low \( (0 \leq \beta \leq 1) \), are the same as in case 1 where \( \beta \) is relatively high \( (\beta \geq 2) \). In case 2 when \( \beta \to 0 \) firms do not have any effective “locational”
advantage in their targeted branding and targeted branding is relatively cheaper. They compete more fiercely for consumers and in both price and branding efforts.

3.3 Case 3: The Comparative Advantage in Targeted Branding is Moderate and $1 < \beta < 2$.

The equilibrium outcome in case 3 combines features of both previous cases. The case 1 equilibrium outcome characterizes two segments of the market, those segments that contain the potentially most brand loyal consumers. The first segment consists of consumers $x$ such that $0 \leq x \leq 1 - \frac{1}{\beta}$, who are closer to brand 1, and the second of consumers $x$ such that $\frac{1}{\beta} \leq x \leq 1$, who are closer to brand 2. The case 2 equilibrium outcome, on the other hand, holds for consumers $x$ such that $1 - \frac{1}{\beta} \leq x \leq \frac{1}{\beta}$, who could be potentially loyal to either brand.

The equilibrium for case 3 when that $1 < \beta < 2$ is characterized as follows:

1. **In stage 1:** Firm 1 offers: to consumer $x$ where $0 \leq x \leq 1 - \frac{1}{\beta}$, targeted branding $a_1^*(x) = \frac{1-\beta x}{2}$ and a price $p_1^3(x) = \frac{1-\beta x}{2} + t(1 - 2x)$; to consumer $x$ where $1 - \frac{1}{\beta} \leq x \leq \frac{1}{2}$, targeted branding $a_1^*(x) = \frac{1-\beta x}{2}$ and a price $p_1^3(x) = \frac{1}{4} + t(1 - 2x) + \frac{\beta^2}{4}(3x^2 - 4x + 1)$.

Firm 2 offers: to consumer $x$ where $\frac{1}{2} \leq x \leq \frac{1}{\beta}$, targeted branding $a_2^*(x) = \frac{1-\beta(1-x)}{2}$ and a price $p_2^3(x) = \frac{1}{4} + t(2x - 1) + \frac{\beta^2}{4}(3(1 - x)^2 - 4(1 - x) + 1)$; to consumer $x$ such that $\frac{1}{\beta} \leq x \leq 1$, targeted branding $a_2^*(x) = \frac{1-\beta(1-x)}{2}$ and a price $p_2^3(x) = \frac{1-\beta(1-x)}{2} + t(2x - 1)$.

2. **In stage 2:** Firm 1 offers: to consumer $x$ such that $\frac{1}{2} < x \leq 1$, no targeted branding $a_1^*(x) = 0$ at a price $p_1^3(x) = 0$. 

19
Firm 2 offers to consumer $x$ where $0 \leq x < \frac{1}{2}$, no targeted branding $a_2^*(x) = 0$ and a price $p_2^*(x) = 0$.

(3) **In stage 3:** Consumer $x$ where $0 \leq x < \frac{1}{2}$ purchases brand 1 from firm 1. Consumer $x$ where $\frac{1}{2} < x \leq 1$, purchases brand 2 from firm 2. The consumer $x = \frac{1}{2}$ buys with equal probability either brand 1 or 2.

Consumer surplus in case 3 is:

$$CS^3 = H \left( V - \frac{3}{4}t - \frac{3}{4} + \frac{1}{2} - \frac{3}{8} \beta - \frac{1}{16} \beta^2 \right).$$  (14)

Not surprisingly, in this hybrid case, consumers are better off than in case 1 where targeted branding is relatively expensive but not as well off as they are when targeted branding is relatively inexpensive in case 2. That is, $CS^2 \geq CS^3 \geq CS^1 = CS^0$.

The average price paid in the market in case 3 of targeted branding and price discrimination when $1 < \beta < 2$ is $\bar{p}^3 = \frac{t}{2} + \frac{5}{4} - \frac{1}{2} \beta - \frac{\beta}{2} \left( 1 - \frac{\beta}{8} \right)$, which is greater than the average price $\bar{p}^1$, set in case 1 where costs and locational advantages are higher. A fall in the cost of branding, specifically the locational advantage, does not lead to lower consumer prices, but instead as in case 2 more competition in branding and higher prices. However, a higher average price is set in case 2 where the locational cost parameter is relatively lower. The range of prices set in case 3 is $\left[ \frac{1}{4} - \frac{\beta^2}{16}, \frac{1}{2} + t \right]$, which is a smaller range of prices than was set in case 1 but not as small as in case 2.

Producer surplus in case 3 is on the other hand, is greater than in either case 1 or 2. When the comparative locational advantage in branding is such that $1 < \beta < 2$ it follows that profitability or producer surplus in this case is:

$$PS^3 = H \left( \frac{t}{2} + \frac{\beta^2}{12} - \frac{\beta}{2} - \frac{1}{2} \beta + \frac{1}{2} \right) \geq PS^1 = PS^2 = H \left( \frac{t}{2} + \frac{1}{12} \right).$$  (15)
The maximum profitability for firms occurs in this case when \( \beta \approx 1.35 \). When \( \beta = 1.35 \) producer surplus \( \bar{PS}^3 = H\left(\frac{t}{2} + 0.1065\right) \) whereas the maximum producer surplus in case 1 or 2 is \( \bar{PS}^1 = \bar{PS}^2 = H\left(\frac{t}{2} + 0.0833\right) \). More weight on the locational cost disadvantage in branding discourages firms from competing heavily in the rival’s brand loyal segment and yet at the same time targeted branding is attractive for firms to use as consumers value it and it softens price competition. This middle ground case is the best scenario for firms to compete in targeted branding and targeted prices, and offers the insight that firms should look for “locational advantages” in their branding, even if they are more costly.

4. Conclusions and Summary

Much of the economics literature has focused on how big data and online technologies facilitate the practice of first-degree price discrimination\(^{13}\), limiting targeted advertising to an informative role that enables more intense price competition. However, as Becker and Murphy (1993) argued advertising, or more aptly branding, may enhance the consumption value of the good, a view long supported by the marketing literature. If firms have access to consumer information to customize prices they are likely to have information as well to customize their branding strategies.

This is the approach to targeted advertising that we have taken in this paper. We have modeled duopoly competition in a spatial setting in which the consumer data permits firms to tailor both their prices and their advertising to different consumer types. Targeted advertising or branding permits a deepening of brand identity to different consumer types and this can soften the price competition associated with price discrimination. Firms have an incentive to engage in branding even though it is a costly activity and branding costs are incurred before transactions take place. Moreover, the

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\(^{13}\) First degree price discrimination in a spatial model was explored before the advent of the digital age in Thisse and Vives (1988) and Norman and Thisse (1996).
more profitable branding strategy is when there are “locational advantages” to the firm in its branding, even if those strategies are costlier.

Relative to the benchmark case of pure price discrimination, firm profits are always higher when they can bundle in customized branding with the pricing of their product. The effect on profit is not monotonic. When firms do not have any “locational” advantage in their targeted branding, or when branding is symmetrically cheap for both firms they compete more fiercely for consumers in both price and branding. Profit or producer surplus rises as a firm’s comparative locational advantage in the cost of branding rises. Firms benefit from an increase in cost, but if the cost of branding becomes too high profitability declines. Nevertheless, it is always greater than in the case where there is no targeted branding.

Because consumers value brand identity they are always better off relative to the benchmark. Moreover, this gain is monotonic as the comparative cost advantage of branding falls. In contrast producer surplus or profits are maximized when a firm’s locational cost advantage in branding is just high enough to discourage rivals from poaching its brand loyal consumers. This suggests that firms have an incentive to identify branding or advertising strategies that more fully exploit their “locational” advantage, i.e., that are more difficult for another, more “distant” firm to offset with branding or advertising of its own.

Two other points are worth noting. First, in a market with targeted and costly advertising, the price paid by any one consumer must now cover the cost of the advertising. Because that cost varies across consumers, we will observe greater price dispersion than in a world without targeted branding. Second, the fact that a reduction in advertising costs can intensify competition and lower profit suggests that in a market where entry is possible, lower targeted advertising costs could be associated with more advertising and fewer firms, echoing in many ways the earlier work of Sutton (1991).
5. References


