Advertising with Subjective Horizontal and Vertical Product Differentiation

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Abstract.
In this paper, we analyze the impact of advertising on markets where subjective horizontal and vertical product differentiation are important. A simple model shows how advertising can be used to create subjective horizontal and vertical differentiation. The model predicts that firms are likely to be symmetric when advertising creates subjective horizontal differentiation and that name and generic brands are most likely to coexist in markets where advertising creates subjective vertical differentiation. In all cases, the ability to advertise creates distance between products which increases the market power of firms. Finally, several real world examples are used to illustrate the conditions under which the model is most relevant.

Key words: Horizontal differentiation, persuasive advertising, price competition, vertical product differentiation.

JEL Classifications: D21; D43; L15; M37.

I. Introduction

An important issue in economics concerns the impact of advertising on the price-setting process, especially in imperfectly competitive markets. According to Kaldor (1949–1950) and Bain (1956), advertising is socially wasteful because it enhances brand loyalty by creating subjective or perceived product differentiation. Alternatively, Stigler (1961) and Telser (1964) emphasize the informative role of advertising. By providing consumers with useful product information, advertising leads consumers to lower priced commodities that have more preferred character-

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istics. Thus, advertising improves the efficiency of markets and reduces market power.

There has been considerable theoretical research on the role of informative advertising. For example, Grossman and Shapiro (1984) show how informative advertising can lead to greater price competition in an imperfectly competitive setting. In addition, Nelson (1974), Milgrom and Roberts (1986), and Bagwell and Ramey (1988) show how advertising may signal product quality. More recently, Von der Feher and Stevik (1998) and Block and Manceau (1999) analyze the impact of persuasive advertising in duopoly markets with horizontal differentiation, and Tremblay and Martins-Filho (forthcoming) analyze the case with vertical differentiation. Since the work by Kaldor (1949–1950) and Bain (1956), however, there has been no theoretical work on the role of purely persuasive advertising in markets with no real product differentiation.

The purpose of this note is to show how advertising can affect price competition in a duopoly setting when product differentiation is purely subjective and not real.\(^1\)

The model assumes products are perfectly homogeneous but allows advertising to create subjective horizontal and vertical differentiation.\(^2\)

In the first case, we allow advertising to influence consumer perceptions of a product’s location on its characteristic space that is both non-functional and horizontal in nature (Hotelling, 1929). A good example is the market for premium cola, as this market is dominated by two products: Coca-Cola Company’s Coke brand and Pepsico’s Pepsi Brand.\(^3\) There is little real difference between products, but each firm uses advertising to create an image that appeals to different consumers. Coke’s advertising creates an image that appeals to more traditional values with its “Coke, the Real Thing” campaign, while Pepsi’s advertising appeals to a younger and more rebellious consumer with its “generation X” campaign.

Next, we allow advertising to create subjective vertical differentiation by persuading consumers to (incorrectly) believe that heavily advertised brands are of higher quality than unadvertised or sparsely advertised brands. This is consistent with Caves and Greene’s (1996) empirical finding that advertising does not generally serve as a signal of quality and with Caves and Porter’s (1977), Hallagan and Joerdin’s (1983), and Sutton’s (1992) explanation for the coexistence of name and generic brand products in many consumer goods markets. For example, in the market for many over-the-counter drugs, advertising is used to establish name

\(^1\) Because this type of advertising creates market power, it reduces social welfare. For a more complete discussion of the welfare effect of advertising, see Dixit and Norman (1978), Becker and Murphy (1993), Tremblay and Tremblay (1995), and Farr et al. (2001). For an analysis of persuasive advertising in monopolistic competition, see Hallagan and Joerdin (1983).

\(^2\) This approach to modeling advertising was first suggested by Anderson et al. (1992, footnote 1).

\(^3\) See Gasmi et al. (1992), Muris et al. (1993), and Golan et al. (1996) for a description of this market.
brands that are perceived to be of higher quality than their generic Counterparts.\textsuperscript{4} Klein and Leffler (1981) develop a model that predicts that name brand products of high quality will exist in markets where consumers are most concerned with the cost of purchasing a low quality product. In contrast to the Klein and Leffler model, however, we show that name and generic products can coexist even though they are of like quality.

In the sections that follow, we develop models that allow firms to create subjective horizontal and vertical differentiation. Firms play a multiple stage game of perfect and complete information. An ability to advertise allows firms to create subjective distance between products, which dampens price competition. In addition, the results indicate that advertised and non-advertised brands are likely to coexist when advertising creates subjective vertical differentiation. Finally, several real world examples are used to illustrate the conditions under which the model is most likely to provide accurate predictions.

II. Advertising and Subjective Horizontal Differentiation

Consider a duopoly market where firms i and j produce products that are physically identical but where firms can create subjective product differentiation through advertising. For simplicity, production costs are linear and are the same for both firms. We normalized these costs to zero.

Although there is no real product differentiation, consumers have a preference for a subjective horizontal characteristic, product image. Following Hotelling (1929), assume there is a continuum of consumers uniformly distributed on a line of unit length, with population normalized to one, where each location describes a consumer’s desired point in this horizontal characteristic space ($\theta$). For consumer $k$, characterized by location $\theta_k \in [0, 1]$, the disutility associated with purchasing brand $x$, with perceived location $\theta_x$, is given by $(\theta_k - \theta_x)^2$. Consumers have unit demands and will purchase from the firm with the best price-characteristic combination. Let $\theta_i$ and $\theta_j$ represent the perceived locations and $p_i$ and $p_j$ be the prices of brands $i$ and $j$, respectively. Consumer $k$ will purchase brand $i$ if $(\theta_k - \theta_i)^2 + p_i < (\theta_k - \theta_j)^2 + p_j$ and brand $j$ if the inequality is reversed. With equality, the consumer is indifferent between brands $i$ and $j$.

If neither firm advertises, product images are identical and the brands are viewed as perfect substitutes. We assume that the perceived brand locations are $\theta_i = \theta_j = \frac{1}{2}$ when firms do not advertise. Firms can engage in advertising that results in a change a product’s image and, therefore, its perceived location. As indicated in the introduction, a good example is the market for premium cola, where Pepsi advertising creates a rebellious image and Coke advertising creates an image that appeals to consumers with more conservative values. Advertising units are defined so that the amount of advertising equals the change in perceived location. That

\textsuperscript{4} For prescription drugs, however, Grabowski and Vernon (1992) find a first-mover advantage is used to create name brands.
is, \( A_x = |\frac{1}{2} - \theta_x|, x = i, j \). Advertising costs are monotonically increasing and convex: \( c'_i(A_x) > 0, c''_i(A_x) > 0, \) and \( c_i(0) = 0 \).

Given that advertising creates subjective differentiation, firms are assumed to develop advertising campaigns before choosing prices.\(^5\) Thus, in the first stage of the game, firms simultaneously choose advertising, and in the second stage they simultaneously choose price. We are interested in characterizing the subgame-perfect equilibrium of this game.

If advertising costs were zero, that is, firms could freely choose where to locate, this game would be identical to the one analyzed in d’Aspremont et al. (1979). In their paper, equilibrium prices in the second stage are higher as the distance between the firms increases. In the first stage, firms will choose to locate as far apart as possible, at 0 and 1, in equilibrium.

In our model, firms can change their perceived locations but only by investing in advertising. As in d’Aspremont et al. (1979), equilibrium prices in the second stage rise as the distance between the perceived locations of the brands increases. If firms do not advertise, brands will be viewed as identical leading to a Bertrand equilibrium with zero profits. With advertising, positive profits are possible as long as advertising costs are not too high. In equilibrium, firms will advertise so that their perceived locations move in opposite directions. Let firm \( i \) choose an advertising campaign that moves its perceived location toward 0 and let firm \( j \) choose an advertising campaign that moves its perceived location toward 1. Using results reported in Tirole (1988, p. 281), firm \( i \) will choose to advertise such that \( \theta_i = 0 \) as long as \( c'_i(\frac{1}{2} - \theta_i) < \frac{(2 + \theta_i)}{3(\theta_j - \theta_i)} \), that is, where the marginal cost of advertising is less than the marginal benefit. A similar expression can be derived for firm \( j \). Because firms create product differentiation through advertising, they are able to charge prices in excess of production costs. Whenever advertising costs are low enough to allow positive advertising in equilibrium, brands are viewed as differentiated and firms earn positive profits.

In sum, as long as advertising is not too costly both firms find it advantageous to advertise to create subjective differentiation. This allows higher prices to be set in the second stage, thereby generating higher equilibrium profits. Since consumers do not agree on what constitutes a preferred characteristic, both firms can advertise and appeal to some fraction of consumers. Finally, if tastes are uniformly distributed and firms face the same cost of advertising, a symmetric equilibrium will result.

III. Advertising and Subjective Vertical Differentiation

In the vertical differentiation model, consumers care about the perceived quality of the brand they purchase. In contrast to horizontal differentiation, all consumers agree on the ranking of the vertical characteristic, perceived quality. That is, all

\(^5\) This is in contrast to purely informative advertising, where a firm may first choose a price and then use advertising to communicate that price to consumers.
consumers prefer the higher quality brand over the lower quality brand when they sell at the same price. As before, there are two firms, $i$ and $j$, and a continuum of consumers with population size normalized to one. Consumers have unit demands and will purchase the good from the firm with the best combination of perceived quality and price. Let $z_x$ be the perceived quality of brand $x$, where $z_x \geq 0$ for $x = i, j$. Consumer $k$’s willingness to pay for brand $x$ is given by $\phi_k z_x$, were $\phi_k$ represents the consumer’s taste for quality and is uniformly distributed over the range $[0, 1]$ in the population. If $\phi_k z_i - p_i > \phi_k z_j - p_j$, then consumer $k$ will purchase brand $i$. If $\phi_k z_i - p_i < \phi_k z_j - p_j$, then consumer $k$ will purchase brand $j$. With equality, the consumer is indifferent between the two brands.

Brands $i$ and $j$ are of like quality, but advertising affects consumer perceptions of quality. Define units of advertising such that perceived quality equals the amount of advertising: $z_x(A_x) = A_x$. As before, advertising costs are monotonically increasing and convex, $x'(A_x) > 0$, $c''(A_x) > 0$, and $c_x(0) = 0$. Production costs are linear, the same for both firms, and normalized to zero.

Firms play a two-stage game. In the first stage, firms simultaneously choose advertising that determines perceived quality. In the second stage, firms simultaneously choose price. We solve for the subgame-perfect equilibrium of the game.

Note that if both firms choose the same level of advertising (same perceived quality), then consumers will choose strictly on the basis of price, yielding a Bertrand equilibrium with zero profit (net of advertising cost) for each firm. If one firm, say firm $i$, advertises more than its rival, then consumers choose on the basis of both perceived quality and price.

In this case, firm demand is defined by identifying $\phi_i, p_j$, the level of $\phi$ that makes a consumer indifferent between brands $i$ and $j$ when prices are $p_i$ and $p_j$:

$$A_i \phi(p_i, p_j) - p_i = A_j \phi(p_i, p_j) - p_j;$$

$$\phi(p_i, p_j) = \frac{p_i - p_j}{A_i - A_j}$$

(1)

Consumers with a $\phi$ greater than $\phi(p_i, p_j)$ will buy brand $i$, while consumers with a $\phi$ less than $\phi(p_i, p_j)$ will buy brand $j$. The respective profit expressions ($\pi$) for firms $i$ and $j$ are:

$$\pi_i = [1 - \phi(p_i, p_j)]p_i - c_i(A_i) = \left[1 - \frac{p_i - p_j}{A_i - A_j}\right]p_i - c_i(A_i)$$

$$\pi_j = \phi(p_i, p_j) - c_j(A_j) = \frac{p_i - p_j}{A_i - A_j}p_j - c_j(A_j)$$

(2)

Solving for Nash equilibrium prices in the second stage yields:

$$p_i = \frac{2(A_i - A_j)}{3}$$

$$p_j = \frac{A_i - A_j}{3}$$

(3)
Substituting these best reply functions into the profit expressions for each firm gives:

\[ \pi_i = \frac{4(A_i - A_j)}{9} - c_i(A_i) \]
\[ \pi_j = \frac{A_i - A_j}{9} - c_j(A_j) \]  

(4)

The profit expression for firm \( j \) shows that profit is a declining function in its own advertising. Thus, firm \( j \) will choose not to advertise. On the other hand, firm \( i \) will choose to advertise as long as the initial marginal costs of advertising are not too large. As a result, only one firm will advertise a brand of perceived higher quality in equilibrium. This enables the firm to charge a higher price and gain market share over its non-advertising competitor. To illustrate the possible magnitude of the asymmetry, Tremblay and Polasky (2000) develop a special case of this model, one that assumes a linear utility function that follows Mussa and Rosen (1978) and a simple quadratic advertising function. In this special case, firm \( i \)'s equilibrium price and output levels are twice that of firm \( j \).

Although these results are consistent with those of Klein and Leffler (1981), they occur for different reasons. In the Klein and Leffler model, heavily advertised name brands develop in markets where consumers are most concerned with the cost of purchasing a product of deceptively low quality. Because advertising costs are sunk, firms that advertise are encouraged to offer products of high quality. In our model, however, advertising has no effect of real quality differences between brands. Likewise, advertising does not serve as a signal of quality, a result that is consistent with the empirical work of Caves and Greene (1996). Instead, our results provide game theoretic support for the coexistence of name and generic brands of like quality. In this case, the producer of the name brand product advertises in order to enhance its market power by increasing the perceived quality of its product, a result that is more in the spirit of Caves and Porter (1977), Hallagan and Joerding (1983), and Sutton (1992).

### IV. Market Evidence and Methods for Testing

The analysis above indicates two important implications concerning the relationship between advertising and subjective product differentiation. First, when advertising creates purely subjective horizontal differentiation, the equilibrium is likely to be symmetric with rivals charging similar prices and having similar output and advertising market shares. Alternatively, when advertising creates subjective vertical differentiation, firm behavior is likely to be asymmetric. Firms that invest heavily in advertising will coexist with firms that do not advertise, and the heavy advertiser will market a brand of perceived higher quality, charge a substantially
ADVERTISING WITH PRODUCT DIFFERENTIATION

higher price, and have a larger market share. There are many consumer goods markets with characteristics consistent with these results. As previously discussed, perhaps the best example of the purely horizontal case is the market for premium cola, a market that is dominated by Coke and Pepsi. These products are physically similar, but horizontal differentiation is created through advertising that ties a different image to each product. Coke creates an advertising theme that appeals to traditional family values, while Pepsi’s advertising appeals to a younger and more rebellious consumers. As the figures in Table 1 indicate, the market evidence is quite consistent with a symmetric equilibrium. Product prices deviate by only 4 percent and the output and advertising shares of each brand diverge by no more than 7 percentage points.

In contrast, an excellent example of the vertical differentiation case is the market for aspirin. For both regular and children’s aspirin, the Bayer brand coexists with a number of private label or generic suppliers that sell chemically identical products. The Bayer brands are heavily advertised with campaigns that emphasize quality and safety. This is consistent with Klein and Leffler (1981), who argue that name brands will emerge for products like over-the-counter drugs where consumers are most concerned with quality control. Table 1 indicates that the market equilibria are asymmetric. Bayer’s regular aspirin sells for over twice that of its generic counterparts, and Bayer regular and children brands of aspirin have output and advertising shares of over 90 percent. These figures are entirely consistent with the model where advertising creates subjective vertical differentiation.

Table 1 presents evidence from several other markets that are consistent with the implications of the vertical differentiation case. One is the market for chlorine bleach, where the nationally advertised Clorox brand coexists with many private labels. These products are chemically identical (5.25 percent sodium hypochlorite and 94.75% water), yet Clorox uses advertising to persuade consumers of its superior quality which enables it to command a market share of over 50 percent and a price premium of between 13 and 67 percent in various regional markets. Another example is the market for photographic film, where the Kodak brand has a price premium of over 24 percent over the Fuji brand and commands a dominant output and advertising share of the market. Other examples found in the literature include ReaLemon brand’s dominance of the market for reconstituted lemon juice.

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6 The low quality firm may still use informative advertising to help consumers locate the geographic location of retail outlets, for example. As both firms would be expected to use this form of advertising, however, one would still expect the high quality firm to advertise more intensively.

7 To avoid subtle distinctions among brands, these examples focus on the two polar cases where differentiation is purely vertical and purely horizontal.

8 Since the cost of purchasing a deceptively low quality product is likely to be higher for children’s medications, the relatively low market share of children’s generic aspirin is also consistent with Klein and Leffler (1981).

Table 1. The price and market shares of leading rivals: selected consumer goods markets*

<table>
<thead>
<tr>
<th>MARKET (quantity)</th>
<th>Brand</th>
<th>Price</th>
<th>Market share of output</th>
<th>Market share of advertising</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREMIUM COLA (2 liters)</td>
<td>Coke</td>
<td>$1.00</td>
<td>53.3%</td>
<td>53.5%</td>
</tr>
<tr>
<td></td>
<td>Pepsi</td>
<td>$1.04</td>
<td>46.7%</td>
<td>46.5%</td>
</tr>
<tr>
<td>REGULAR ASPIRIN (100)</td>
<td>Bayer</td>
<td>$4.98</td>
<td>93.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Private Labels</td>
<td>$1.47</td>
<td>7.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>CHILDREN’S ASPIRIN (36)</td>
<td>Bayer</td>
<td>$2.85</td>
<td>99.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Private Labels</td>
<td>$2.07</td>
<td>1.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>CHLORINE BLEACH (gallon)</td>
<td>Clorox</td>
<td>$0.98</td>
<td>56–72%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Private Labels</td>
<td>$0.87</td>
<td>28–44%</td>
<td>0.0%</td>
</tr>
<tr>
<td>PHOTOGRAPHIC FILM (roll)</td>
<td>Kodak</td>
<td>$2.06</td>
<td>84.3%</td>
<td>88.6%</td>
</tr>
<tr>
<td></td>
<td>Fuji</td>
<td>$1.66</td>
<td>15.7%</td>
<td>11.4%</td>
</tr>
<tr>
<td>CIGARETTES (carton)</td>
<td>Marlboro</td>
<td>$19.50</td>
<td>28.1%</td>
<td>21.7%</td>
</tr>
<tr>
<td></td>
<td>Winston</td>
<td>$19.50</td>
<td>5.8%</td>
<td>2.8%</td>
</tr>
<tr>
<td></td>
<td>Doral</td>
<td>$15.25</td>
<td>5.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td></td>
<td>Newport</td>
<td>$19.50</td>
<td>5.1%</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>GPC</td>
<td>$15.25</td>
<td>5.8%</td>
<td>4.9%</td>
</tr>
<tr>
<td></td>
<td>Camel</td>
<td>$19.50</td>
<td>4.7%</td>
<td>4.1%</td>
</tr>
<tr>
<td></td>
<td>Salem</td>
<td>$19.50</td>
<td>4.7%</td>
<td>3.8%</td>
</tr>
<tr>
<td></td>
<td>Kool</td>
<td>$19.50</td>
<td>4.7%</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>Virginia Slims</td>
<td>$19.50</td>
<td>2.4%</td>
<td>5.7%</td>
</tr>
<tr>
<td>BANANAS (40 lb box)</td>
<td>Chiquita</td>
<td>$8.08</td>
<td>26.9%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>Dole</td>
<td>$8.20</td>
<td>29.4%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Del Monte</td>
<td>$7.48</td>
<td>16.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Private Labels</td>
<td>$7.21</td>
<td>26.9%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

(Krouse, 1984) and the dominance of many name brand over generic brand drugs (Scherer and Ross, 1990, pp. 588–592).

Of course, not all consumer good markets are accurately characterized by these models of subjective horizontal and vertical differentiation. For example, one might expect the cigarette market to be a good example of the horizontal case. In this market, the Marlboro and the Virginia Slims brands are physically similar, and advertising is used to create very different horizontal images for each brand. The famous “Marlboro Man” campaign creates a rugged masculine image, while Virginia Slims creates an image targeted at cosmopolitan women. This view is supported by market research (Greer, 1992, pp. 146–147), which concludes that Marlboro smokers “use the cigarette as part of their wardrobe, the way some use costume jewelry or a watch”. Yet, although these brands sell at similar prices, Table 1 indicates that Marlboro commands much higher output and advertising market shares.

Likewise, one might expect the market for bananas to be consistent with the vertical differentiation case. This is a market where three name brand producers (Chiquita, Dole, and Del Monte) coexist with several generic suppliers. Table 1 indicates that although the name brand products sell for a higher price than private label brands, only Chiquita uses extensive advertising to market its bananas.10

Given its restrictive assumptions, it is not surprising that some real world markets are not completely described by the model. The model predicts that persuasive advertising can be used to enhance the market power, produce a symmetric equilibrium when advertising creates subjective horizontal differentiation, and produce an asymmetric equilibrium when advertising creates subjective vertical differentiation. These predictions are based on a duopoly model in which consumers have a uniform distribution of tastes, products are physically identical, and producers are single product producers.

The model is unlikely to provide a precise description of markets that violate these assumptions. Regarding cigarettes, for example, consumer preferences are not uniformly distributed. With more male than female smokers, it is not surprising that cigarette producers segment the market, male and female, and that Marlboro has a larger market share than Virginia Slims.11 In the market for bananas, Wiggins and Raboy (1996) find that name brand producers supply better quality bananas by using more expensive shipping methods to reduce bruising. Thus, the higher price paid for name brand bananas may simply reflect the premium paid for higher quality. To signal quality, it appears that Chiquita uses advertising, while Dole and Del Monte use their existing reputations, established through their success in other

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10 Wiggins and Raboy (1996) point out that supermarkets will frequently advertise their weekly special of fruits and vegetables in local newspapers. Since this is a purely informative form of advertising, however, these advertising figures are not included in Table 1.

11 This market share difference could also occur if men are more susceptible to persuasive advertising.
fruit and vegetable markets. This provides some evidence that the predictions of the model are likely to be inaccurate when important assumptions are violated.

A more accurate test of the implications of the model requires additional empirical work. One approach is to collect a sample of firm and industry data over several periods of time from two (or more) industries: one that is predisposed to subjective horizontal differentiation, like premium cola, and another that is predisposed to subjective vertical differentiation, like regular aspirin. In the ideal, products within each industry should be physically identical and advertising should be primarily persuasive in nature. Then, one could use regression analysis to estimate the determinants of price, output, and advertising variability in these two markets. For example, one could estimate the following regression equations for commodities that are predisposed to subjective horizontal (Regime 1) and subjective vertical differentiation (Regime 2):

\begin{align*}
\text{Regime 1: } \text{Var} \{ p_t \} &= f_1(A_t, x_t; \beta) + \epsilon_t; \\
\text{Regime 2: } \text{Var} \{ p_t \} &= f_2(A_t, x_t; \beta) + \eta_t,
\end{align*}

where \text{Var} \{ p_t \} is the variance in firm prices for a particular industry in period \( t \), \( A_t \) is the level of industry advertising expenditures in period \( t \), \( x_t \) is a vector of other important explanatory variables, \( \beta \) is a vector of parameters to be estimated, and \( \epsilon_t \) and \( \eta_t \) are randomly distributed error terms. Accurate estimation of the advertising parameters requires one to account for all relevant explanatory variables. These would include the variance in marginal costs among firms and indicators of non-uniform tastes (e.g., the percent of consumers who are male), the variance in the reputations among firms, and other demand differences.

With estimates of these regression equations, one can test the hypothesis that advertising causes a symmetric versus an asymmetric price-equilibrium. If advertising creates subjective horizontal differentiation and produces a symmetric equilibrium (Regime 1), then advertising will have no effect on the variance of prices since this type of persuasive advertising causes all prices to rise proportionally. If advertising creates subjective vertical differentiation and produces an asymmetric equilibrium (Regime 2), then advertising will increase the variance in prices as the price of the brand of perceived higher quality will rise relative to that of other brands.\textsuperscript{12} With appropriate data, similar models could be developed to test the extent to which persuasive advertising induces asymmetries in output and advertising expenditures.

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V. Concluding Remarks

Two simple duopoly models are used to show how advertising may influence consumer perceptions of product differentiation. Even when products are physically

\textsuperscript{12} Alternatively, one could estimate this type of regression equation for each industry, and classify an industry as having subjective vertical (horizontal) differentiation if advertising has a positive and significant (no significant) effect on price variability.
identical, we show that firms may use advertising to create subjective horizontal and vertical product differentiation. This form of advertising can benefit firms as it dampens price competition and increases their market power.

When advertising creates purely horizontal differentiation, a symmetric equilibrium results. With purely vertical differentiation, however, the firm with the product of perceived higher quality is larger, charges a higher price, and advertises more than its rival. This provides one explanation for the coexistence of heavily-advertised name brand and unadvertised generic brand products within a market. As all brands are of like quality, however, advertising does not serve as a signal of quality and does not encourage name brand producers to supply high quality products.

The horizontal and vertical differentiation models are shown to accurately characterize several real world markets. For example, advertising may have enhanced subjective vertical differentiation and caused name and generic brands to coexist in the market for aspirin, a market where quality and product safety are an important consumer concern. The market for premium cola best exemplifies the purely horizontal case where advertising helps create images that appeal to different types of consumers.

Several market examples are used to demonstrate how the results may change when key assumptions of the model are violated. For example, when consumer tastes are concentrated at a particular location, firms will locate “where the demand is” (Tirole, 1988, p. 286). This may help explain the divergent market shares of various brands in the cigarette market. In addition, pricing behavior is likely to differ from the predictions of the model when there are real quality differences among brands (as with bananas). Finally, firms may use actions other than advertising to signal quality and create a brand name. For example, it appears that Dole’s reputation in other fruit markets enables it to signal quality without advertising at all.

Because these violations can be important, we propose an empirical model that is designed to test the predictions of the model. In the ideal, this would require firm level data from at least two markets: one with subjective horizontal differentiation and another with subjective vertical differentiation. In both cases, products within markets should be physically identical and advertising should be persuasive in nature. An important direction for future research is to identify such markets and implement empirical tests to better understand how persuasive advertising affects market outcomes when there is little or no real product differentiation.

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