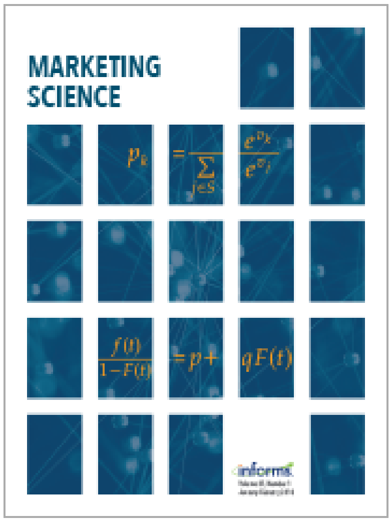

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Greg Shaffer, Florian Zettelmeyer,

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Advertising in a Distribution Channel

Greg Shaffer
William E. Simon Graduate School of Business, University of Rochester, Rochester, New York 14627,
shaffer@simon.rochester.edu

Florian Zettelmeyer
Haas School of Business, University of California at Berkeley, Berkeley, California 94720, and
National Bureau for Economic Research, florian@haas.berkeley.edu

Conventional wisdom suggests that one of the goals of manufacturer advertising is to reduce the cross-price elasticity between products (make one's own and rivals' products appear to be *less* substitutable in the eyes of consumers). Conventional wisdom also suggests that, all else being equal, retailers will be able to obtain better terms of trade from manufacturers the *more* substitutable are the manufacturers' products. It follows that retailers should be opposed to advertising that has the effect of reducing cross-price elasticities and thus that manufacturer advertising can be a source of channel conflict. We show that these conventional wisdoms need not hold when only some consumers are exposed to the advertising messages. Using a Hotelling model of demand, we show that (1) manufacturers can be worse off from advertising that reduces the cross-price elasticities between their products, (2) channel conflict need not arise, even when the sole purpose of advertising is to affect cross-price elasticities, and (3) depending on its bargaining power, a retailer can be better off when the manufacturers' products are perceived to be less substitutable.

Key words: advertising; differentiation; channel conflict; bargaining; channel coordination; distribution channel; game theory
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1. Introduction

A common theme in marketing is that manufacturers can earn higher profit by making their products less substitutable, thereby reducing cross-price elasticities. These higher profits allegedly come at the expense of consumers in the form of higher retail prices and at the expense of retailers in the form of better terms of trade. Not surprisingly, the instruments available to reduce cross-price elasticities are well known. Firms can design their products to appeal to some consumer groups but not others. They can offer products of different qualities. They can locate in different areas, and they can offer different service levels to consumers. In addition, marketing communications and advertising messages can be used to influence consumers' perceptions of product substitution. While all these strategies are at the disposal of manufacturers in the long run, in the short run things like product design, location, and service infrastructure are fixed. Much of the role in shaping consumers' perceptions of the substitutability among competing products in the short run thus falls to marketing communications and advertising.

It follows from conventional wisdom that manufacturers should advertise in a way that reduces cross-price elasticities; retailers should advertise with an eye towards increasing cross-price elasticities (e.g., with comparison charts emphasizing similarities); and manufacturers and retailers should be opposed to each other's advertising. Thus, it follows that advertising—whether conducted by the manufacturer or by the retailer—can be a source of channel conflict.

In this paper, we show that conventional wisdom about persuasive advertising need not hold when only some consumers are exposed to the advertising messages. In particular, we show that (1) competing manufacturers can be worse off from advertising that reduces the cross-price elasticities between their products, (2) channel conflict need not arise even when the sole purpose of advertising is to affect cross-price elasticities, and (3) depending on its bargaining power, a retailer can be better off when the manufacturers' products are less substitutable.

The main theme of this paper is that the choice of advertising medium, and thus the extent of ad exposure (which consumers receive the ads and which do not), drives firms' optimal strategies. Intuitively, when a retailer sells the products of competing manufacturers, changes in a manufacturer's profit are driven by how the perceived substitution among products affects equilibrium prices (determined by the marginal consumers) *relative to* the hypothetical prices a retailer would set in the absence of the manufacturer's product. Conventional wisdom holds when the advertising messages reach *all* consumers, because then such ads always affect both the equilibrium prices and the hypothetical prices. However, when the ads reach only a subset of consumers, they may affect the equilibrium prices of the retailer *but not* the hypothetical prices a retailer would set if it did not sell the manufacturer's product. We show that this can change the distribution of profits in the channel in a way that reverses conventional wisdom.

The rest of the paper proceeds as follows. Section 2 discusses related literature. Section 3 introduces the notation and describes the Hotelling model of demand in the familiar case when firms sell directly to final consumers. It then extends the model to include a retail sector in which a common retailer sells the products of competing manufacturers. Section 4 analyzes how marketing communications and advertising messages that affect cross-price elasticities influence firms' profits when only a subset of consumers are exposed to the advertising messages. Section 5 discusses some extensions and alternative model formulations. Section 6 concludes.

2. Related Literature

This paper contributes to the advertising and channels literatures. One branch of the modeling-oriented literature on advertising examines the informative role of advertising, where consumers are alerted to a product's existence, price, or product quality (see, for example, Grossman and Shapiro 1984, Milgrom and Roberts 1986, Zhao 2000, Dukes and Gal-Or 2003). A second branch considers the persuasive role of advertising, where consumers' preferences and valuations are affected by the content of the advertising itself (see, for example, Dixit and Norman 1978, Lal and Narasimhan 1996, Agrawal 1996, Bloch and Manceau 1999). A third branch considers how advertising can be used as a signalling and coordination tool between channel members (see, for example, Desai 1997, 2000). In this paper we focus on the persuasive role of advertising. Thus, we will assume that consumers already know about the product's existence, price, and quality, and that only consumers' willingness to pay are affected by the advertising communications.

Although it is common in the literature on informative advertising to assume that not all consumers are exposed to a firm's advertising, none of the previous literature on persuasive advertising has considered this possibility. As a result, we are the first to challenge the conventional wisdom that one of the goals of manufacturer advertising should be to decrease consumers' cross-price elasticities between the firm's own and its rivals' products.

The papers closest to ours are Lal and Narasimhan (1996), Agrawal (1996), and Shaffer and Zettelmeyer (2002). Lal and Narasimhan (1996) are concerned with whether advertising increases or decreases the margins of manufacturers and retailers. Agrawal (1996) is concerned with optimal levels of advertising and trade promotions as a function of consumers' brand loyalty. We focus instead on whether firms are better or worse off with ads that reduce cross-price elasticities. We also differ in that we allow for the possibility of nonlinear contracts (wholesale prices and fixed fees) and consider manufacturer-retailer bargaining. This eliminates potential problems such as double marginalization and allows us to place the model's emphasis on understanding how each firm might try to manipulate its share of the total channel profits.

Shaffer and Zettelmeyer (2002) are concerned with the effects of information provision on the profits of channel members when the information is supplied by third parties. Although not about advertising per se, their model can be adapted in a straightforward way to analyze advertising issues. However, in their model, all consumers are assumed to receive the advertising messages, whereas in our model consumers can be selectively exposed. This difference is crucial for our results (compare Observation 2 and Proposition 1 below). We also differ in that our focus is on cross-price elasticities, whereas the focus in their model is on core and noncore demand shocks, and we differ in that we allow for the possibility of manufacturer-retailer bargaining.

There is also a large, related literature on firm conduct in distribution channels (see, for example, Jeuland and Shugan 1983, Mathewson and Winter 1984, Moorthy 1987, Chintagunta and Jain 1992, Chu 1992, Ingene and Parry 1995, Chu and Messinger 1997, Iyer 1998). This literature tends to focus on channel management concerns by an upstream monopolist and does not consider competing upstream duopolists. Another set of related papers model situations in which multiple manufacturers compete (see, for example, McGuire and Staelin 1983, Coughlan 1985, Moorthy 1988, Coughlan and Wernerfelt 1989). These papers focus on the channel choices of manufacturers. Models in which multiple manufacturers sell through a common retailer tend to focus on manufacturer incentives for exclusive dealing (see, for example, O'Brien and Shaffer 1997, Bernheim and Whinston 1998), or restrict attention to take-it-or-leave-it manufacturer-retailer contracts with linear wholesale prices (Choi 1991).

3. Model of Hotelling Demand

Consumers are distributed uniformly along the line segment between 0 and 1 and purchase at most one unit of a product. They can choose between two products, one located at 0 (product X) and the other located at 1 (product Y). All consumers located at 0 derive a gross utility V from consuming product X and $V-t$ from consuming product Y. All consumers located at 1 derive a gross utility $V-t$ from consuming product X and V from consuming product Y. In general, all consumers located at $z \in [0,1]$ derive a gross utility $V-zt$ and $V-(1-z)t$ from the consumption of products X and Y, respectively, where $t>0$ is the rate at which utility decreases as a consumer's ideal point moves away from the locations of X and Y, respectively.

The parameter t is often referred to as the "transportation cost," and it is widely recognized as a measure of the price sensitivity between the firms' products. An increase in t implies that consumers' cross-price elasticity of demand is lower. This is because consumers located at 0 prefer product X by a greater margin than before, whereas consumers located at 1 prefer product Y by a greater margin than before. Conversely, a decrease in t implies that consumers' cross-price elasticity of demand is higher because consumers located at 0 prefer product X to product Y by a lesser amount than before the ad, and analogously for consumers located at 1.[1]

In this setup, it is well known that the prices and profits of competing firms will be increasing in t (for example, Tirole 1988 shows that when each product is produced at constant marginal cost c, the unique Bertrand equilibrium prices are $t+c$ for both firms). This result suggests that advertising that has the effect of increasing t will increase firm profits.

Observation 1. *In the Hotelling model of demand, advertising that increases t (decreases cross-price elasticities) leads to higher profits when the firms sell directly to final consumers.*

An example of an advertising communication that may change consumers' cross-price elasticities is the display of a comparison chart on a manufacturer's website that highlights the features of different brands in a product category. Depending on the design of the chart, the contents can either emphasize the differences or similarities among competing product offerings. If the content focuses on similarities, consumers may come to perceive that the products are closer substitutes than they had previously thought, whereas if the content focuses on differences, consumers may come to perceive the opposite. Similarly, persuasive advertising messages that appear on network television or on radio can also influence perceptions.

Of course, advertising often plays other important roles as well, including increasing the awareness of a firm's product, and informing consumers of the firm's price and product quality. However, our focus in this paper is on the proper role of persuasive advertising and marketing communications. Within this class of advertising, Observation 1 implies that manufacturers should strive to influence consumers' perceptions in a way that decreases cross-price elasticities. In what follows, we consider this insight to be the conventional wisdom among marketing academics and practitioners (it will thus serve as a useful benchmark for the results to follow).

3.1. Adding a Retail Sector to the Hotelling Model

The simplest way to incorporate a retail sector into the Hotelling model is to suppose that products X and Y are sold through a common retailer who then distributes the products to consumers. For convenience, we assume the retailer has local monopoly power and that both products are produced at constant marginal cost that, for convenience, is normalized to zero.

The game consists of two stages. In the first stage, the retailer contracts with each manufacturer over a per-unit price w_i and fixed fee F_i, $i=x,y$. In the second stage, the retailer chooses how much to buy of products X and Y and then resells these quantities to consumers. Let x denote the quantity the retailer buys of product X and y denote the quantity the retailer buys of product Y. We assume the firms are profit maximizers, and that each consumer maximizes her consumer surplus. If the retailer sells both products, firm X's profit is $\pi_x = w_x x + F_x$, firm Y's profit is $\pi_y = w_y y + F_y$, and the retailer's profit is $\pi_r = (p_x - w_x)x + (p_y - w_y)y - F_x - F_y$, where p_x, p_y, are the retail prices of X and Y, respectively. If the retailer sells only product X, firm X's profit is $\pi_x = w_x x + F_x$, firm Y's profit is 0, and the retailer's profit is $\pi_r = (p_x - w_x)x - F_x$. If the retailer sells only product Y, profits are 0, $\pi_y = w_y y + F_y$, and $\pi_r = (p_y - w_y)y - F_y$.

The solution to this game is known. In equilibrium (subgame perfect if the manufacturers make take-it-or-leave-it offers, or Nash bargaining solution if bargaining satisfies the Nash axioms), each manufacturer earns profit proportional to its bargaining power and product's incremental contribution to overall channel profit, with the retailer earning the residual.[2]

For example, suppose the manufacturers and retailer engage in bargaining, and assume that (1) bargaining between the retailer and firm i results in maximization of the two players' joint profit, taking as given the retailer's contract with firm j, $j \neq i$, and

[1] More formally, the location z^* of the marginal consumer given the price of X, p_x, and the price of Y, p_y, is given implicitly by $V - tz^* - p_x = V - t(1-z^*) - p_y$. Solving for z^* and differentiating with respect to p_x gives $|dz^*/dp_x| = dz^*/dp_y = 1/(2t)$, from which it follows that the cross-price elasticity of demand is decreasing in t.

[2] See O'Brien and Shaffer (1997), Bernheim and Whinston (1998), and, for Nash bargaining, Shaffer (2002).

(2) each firm earns its disagreement payoff (what it would earn if negotiations fail) plus a share of the incremental gains from trade (the joint profit of the retailer and firm i when they trade minus their joint profit when they do not trade), with proportion λ_i going to firm i. Then, given these assumptions, it can be shown that the equilibrium per-unit prices and fixed fees are unique.

Let Π_{xy} denote the profit a fully integrated firm would earn if it sold both products, and let Π_x (Π_y) denote the profit a fully integrated firm would earn selling only product X (Y). Then the unique equilibrium profits as a function of the bargaining parameters λ_x and λ_y are:

$$\begin{aligned} \pi_x^* &= \lambda_x(\Pi_{xy} - \Pi_y), \\ \pi_y^* &= \lambda_y(\Pi_{xy} - \Pi_x), \\ \pi_r^* &= \Pi_{xy} - \pi_x^* - \pi_y^*, \end{aligned} \tag{1}$$

where π_x^r, π_y^r, and π_r^* denote firm X, firm Y, and the retailer's equilibrium profit.[3] Firm i earns proportion λ_i of the difference between the overall channel profit, Π_{xy}, and the joint monopoly profit of the retailer and its rival, Π_j. That is, firm i earns a fraction λ_i of the incremental profit contributed by its product. The solution to the bargaining game includes the solution to the game with take-it-or-leave-it offers as a special case. For example, if $\lambda_i = 1$, the manufacturer has all the bargaining power, and if $\lambda_i = 0$, the retailer has all the bargaining power. Alternatively, if $\lambda_i = 1/2$, then the retailer and firm i divide the gains from trade equally.

To derive Π_{xy}, Π_x, and Π_y in our model, we assume the retailer wants to cover the market even if it offers only one product to consumers; i.e., $V \geq 2t$.[4] If the retailer only offers product X for sale, then the inverse demand for product X is $p_x(x) = V - xt$, $x \in [0, 1]$. It follows that the joint profit of the retailer and firm X is $p_x(x)x$ (recall that production costs are zero), and the joint-profit maximizing price and quantity of the retailer and firm X is $p_x^m = V - t$ and $x^m = 1$, yielding profit $\Pi_x = V - t$. Similarly, the joint-profit maximizing price and quantity of the retailer and firm Y is $p_y^m = V - t$ and $y^m = 1$, yielding profit $\Pi_y = V - t$. If a retailer sells both products, channel profits are maximized by choosing x and y to solve[5]

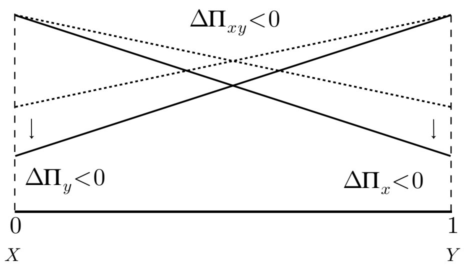
$$\max_{x,\,y}(p_x(x)x + p_y(y)y) \quad \text{such that } x + y = 1. \tag{2}$$

[3] For a derivation of these equilibrium profits, we refer the reader to the results in Shaffer (2002).

[4] This assumption simplifies our analysis but is not critical for the main results of the paper. See Footnote 6.

[5] In equilibrium, the retailer chooses x and y in the second stage as if it were maximizing total channel profit. This implication of games with a common retailer was first shown in Bernheim and Whinston (1985).

Figure 1 **Ads That Decrease Cross-Price Elasticities for all Consumers**



At the optimum, we have that the retailer chooses $p_x^* = p_y^* = V - t/2$, and so $\Pi_{xy} = V - t/2$.

Because $\Delta\Pi_{xy} = -\Delta t/2$ and $\Delta\Pi_x = \Delta\Pi_y = -\Delta t$ for a change in t, and thus $\lambda_i\left(\Delta\Pi_{xy} - \Delta\Pi_i\right) = \lambda_i \Delta t/2$, $i = x, y$, the results in (1) suggest that advertising that has the effect of increasing t will increase firm X's and firm Y's equilibrium profits and decrease the retailer's profit.

Observation 2. *In the Hotelling model of demand with a retail sector, advertising that increases t (decreases cross-price elasticities) allows the manufacturers to capture a larger share of total channel profit. Firm* X*'s and firm* Y*'s profits increase and the retailer's profit decreases.*

We take Observation 2 to be conventional wisdom when firms sell their products through a common retailer. The idea is that the manufacturers will be able to negotiate more favorable terms of trade when their products are less substitutable. To see why, consider Figure 1.

In this case, prices decrease when the products are perceived to be less substitutable (the retailer must decrease its prices to reflect the fact that consumers in the middle are now less well served by either product). As a consequence, overall joint profit decreases ($\Delta\Pi_{xy} < 0$ when $\Delta t > 0$). In addition, because the monopoly profit of the retailer with each manufacturer is also maximized at a lower price in this case, we have $\Delta\Pi_x = \Delta\Pi_y < 0$. To determine which effect is larger, notice that, to avoid having consumers drop out of the market, the hypothetical monopoly prices would have to be lowered by more than the actual prices are lowered. This reflects the fact that the marginal consumer when both products are sold is located in the middle, whereas the marginal consumer when only one product is sold is located at an end point. As a result, the incremental contribution of each product increases and each firm's profit is higher. The retailer, meanwhile, is worse off with ads that decrease cross-price elasticities—there is less overall joint profit and each manufacturer captures a larger share.

4. When Does Conventional Wisdom Extend?

Observations 1 and 2 implicitly assume that all consumers who are relevant at the margin for the firms' pricing decisions receive the advertising messages. For example, when the firms sell directly to final consumers, it is critical that the consumers near the middle of the Hotelling line (near 1/2) receive the messages, because these are the marginal consumers. If only consumers located near 0 or 1 were exposed to the advertising, there would be no pricing or profit effects. On the other hand, when the firms sell their products through a common retailer, the marginal consumers are located not only in the middle but also at the end points. The consumers located near the middle are important for equilibrium pricing when both products are sold, and the consumers located near the end points are important for equilibrium pricing when the retailer threatens to drop a manufacturer's product. This difference between the two scenarios produces some counterintuitive results. Whereas in the case of firms selling direct to consumers, conventional wisdom always holds (at worst there is no effect from increasing t) independent of who receives the ads, this is not so in the case of firms selling through a common retailer.

There are many reasons why a firm's advertising messages may not reach all consumers. For example, the firm's choice of advertising medium implies that certain types of consumers will or will not be exposed to the advertising. Whereas manufacturer advertising on network television is likely to reach a majority of potential car buyers, irrespective of whether those consumers have a strong preference for one make over another, an ad in *Car & Driver's* annual "Car Reviews Issue" is likely to reach primarily consumers who don't have strong preferences for one vehicle over another and are hoping to use the magazine to make up their minds. Similarly, comparison charts set up by the retailer at the point of sale that compare the features of different products in the category are more likely to be read by consumers who need help in choosing which product to buy than by consumers who have already made up their minds.

We model situations in which not all consumers are affected by supposing that only consumers located from $[l, 1-l]$, where $l \in [0, \frac{1}{2}]$, are exposed to the ads. Consumers' valuations are thus $V - zt$ and $V - (1-z)t$ for $z \in [0, l)$ or $(1-l, 1]$ and $V - z(t + \Delta t)$ and $V - (1-z)(t+\Delta t)$ for $z \in [l, 1-l]$. When l is close to zero, we say that consumers with strong, moderate, and weak brand preferences are exposed to the ads. For intermediate levels of l, we say that only consumers with moderate and weak brand preferences are exposed to the ads. When l is close to 1/2, we say that only consumers with weak brand preferences are exposed to the ads.

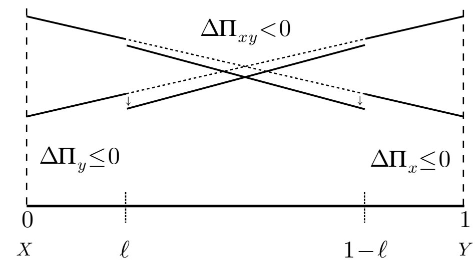
Proposition 1. *In the Hotelling model of demand with a retail sector, suppose that only consumers located from* $[l, 1-l]$, *where* $l \in [0, \frac{1}{2}]$, *are exposed to advertising messages that increase* t (*decrease cross-price elasticities*). *Then there exists* $l_l, l_h \in (0, \frac{1}{2})$ *such that*

(i) *for all* $l < l_l$, *firm* X*'s and firm* Y*'s profits increase and the retailer's profit decreases;*

(ii) *for all* $l_l < l < l_h$, *firm* X*'s, firm* Y*'s, and the retailer's profit decrease;*

(iii) *for all* $l > l_h$, *firm* X*'s, firm* Y*'s, and the retailer's profit decrease if* $(1 - \lambda_x - \lambda_x) > 0$ *and firm* X*'s and firm* Y*'s profits decrease and the retailer's profit increases if* $(1 - \lambda_x - \lambda_x) < 0$.[6]

Figure 2 **Ads that Decrease Cross-Price Elasticities for Consumers in** $[l, 1-l]$



Proposition 1, which is proved in the appendix and illustrated in Figure 2, contains the main results of the paper and has three parts. For $l < l_l$, it implies that when firms run ads in a communications medium that reaches consumers irrespective of their relative preference for one product over another, the firms are better off and the retailer is worse off when cross-price elasticities are reduced. This result accords with conventional wisdom, and it is useful because it suggests that, when advertising in traditional mass media, manufacturers should strive to decrease consumers' cross-price elasticities independent of whether they sell direct to consumers or through retailers.

4.1. Only Consumers with Moderate or Weak Preferences Are Exposed

When only consumers with moderate or weak preferences are exposed, however, we see from part (ii) of Proposition 1 that channel conflict is not inevitable. In this case, *all* firms' profits decrease with ads that

[6] We have assumed the market is fully covered whether or not the retailer sells both products. This assumption is inessential for our results. As the discussion below indicates, the change in each firm's profit depends only on what is happening to the valuations of the marginal consumer when both products are sold and the valuations of the marginal consumer when only product i is sold. As long as these marginal consumers are different, as they will be whether or not the market is always fully covered, our results continue to hold. If the market is fully covered, the latter marginal consumer is located at an end point. If the market is not fully covered, the marginal consumer when only firm i's product is sold is located in the interior. However, while this difference affects the locations of l_l and l_h, it does not affect the existence of the three qualitative regions denoted in Proposition 1.

reduce cross-price elasticities. When this case occurs, manufacturers in a distribution channel will be better off either not advertising or advertising in a way that increases cross-price elasticities, i.e., they will want to persuade the consumers in the middle that their respective product performs well on both product attributes, not just on its stronger attribute. It also follows that manufacturers should not object to retailer advertisements at the point of sale in the form of comparison charts that emphasize similarities between products.

These results challenge conventional wisdom in two ways. They suggest that channel conflict need not arise over the content of persuasive advertising messages, even when the sole purpose of the advertising is to reduce cross-price elasticities. They also suggest that manufacturers do not always gain from making their products appear to be less substitutable in the eyes of consumers. In contrast, manufacturers would want to run ads that decrease cross-price sensitivity if they were advertising through communications channels that reached all consumers. The difference in the two cases depends on the fraction of consumers that become exposed to the ad. When only consumers with moderate or weak preferences are exposed to the ads, each firm is better off trying to increase overall joint profit. However, when all consumers are exposed, firms will want to decrease consumers' cross-price elasticities because then it becomes more important for the manufacturers to reduce the retailer's outside option than it is to increase joint profit.

To understand part (ii), note that as l increases, the effect of the ads on the retailer's monopoly profit with each firm lessens until, for l sufficiently large, the change in the retailer's monopoly profit with each firm will be zero. On the other hand, the effect of the ads on overall channel profit is decreasing for all l regardless of how large. It follows that there exists $l = l_l$ such that the decrease in overall channel profit just exceeds in absolute value the decrease in the retailer's monopoly profit with each firm, implying that firm X and firm Y will be worse off with ads that decrease cross-price elasticities. For l larger than but sufficiently close to l_l, it follows that the change in the retailer's profit, which can be expressed as the change in overall joint profit minus the sum of the changes in each firm's profit, will also be negative. Thus, in this case, all firms will be worse off with ads that decrease consumers' cross-price elasticities.

4.2. Only Consumers with Weak Preferences are Exposed

When only consumers with weak preferences are exposed, we see from part (iii) of Proposition 1 that channel conflict may or may not arise, depending on the bargaining power of the retailer with respect to each firm. In this case, firm X's and firm Y's profits decrease with ads that reduce cross-price elasticities, whereas the retailer's profit decreases if and only if its bargaining power is sufficiently large. When this case occurs, we would expect retailers with lots of bargaining power to prefer that their product offerings be more substitutable, whereas we would expect retailers with little bargaining power to prefer that their product offerings be less substitutable. It follows that the former retailers should emphasize the similarities between products in their comparison charts, whereas the latter retailers should emphasize the products' differences.

As in the previous subsection, these results challenge conventional wisdom in two ways. They suggest that whether persuasive advertising messages that reduce cross-price elasticities trigger channel conflict or not may depend on the retailers' bargaining power with respect to each firm, with the larger retailers likely to have interests more aligned with the manufacturers than with the smaller retailers. They also suggest that retailers do not always gain when the manufacturers' products are made to appear more substitutable in the eyes of consumers.

To understand part (iii), note that if l is sufficiently close to 1/2, then only overall channel profit is affected. This is because consumers near 1/2 are less well-served by products that are perceived to be less substitutable. The retailer can either leave prices at the benchmark level and lose demand from consumers close to 1/2 or decrease prices to serve more or all consumers. In either case, overall channel profit decreases. The monopoly profit of the retailer and each firm, however, is unchanged. This is because the monopoly profits of the retailer with either firm is determined by the valuation of consumers who are close to 0 and 1. For ads that reach only consumers who are near the middle of the line, these valuations do not change. It follows that firm X's and firm Y's profits decrease with ads that decrease cross-price elasticities.

To understand the effect on the retailer's profit when $\Delta\Pi_{xy} < 0$ and $\Delta\Pi_j = 0$, note that

$$\Delta\pi_r^* = (1 - \lambda_x - \lambda_y)\Delta\Pi_{xy} + \lambda_y \Delta\Pi_x + \lambda_x \Delta\Pi_y. \quad (3)$$

It follows that $\lambda_x + \lambda_y < 1$ is necessary and sufficient for the retailer to be worse off with ads that decrease cross-price elasticities. This condition is satisfied if the retailer has sufficient bargaining power (small λ_i), but it is not satisfied, for example, if the manufacturers can make take-it-or-leave-it offers ($\lambda_i = 1$). In this latter case, the retailer is better off with ads that make the manufacturers' products appear to be less substitutable, contrary to conventional wisdom.

4.3. Extensions and Alternative Model Formulations

In this subsection, we consider some extensions and alternative model formulations.

Endogenous Choice of the Exposed Consumer Group. We have assumed thus far that l is exogenous. To make l endogenous, we need to do a couple of things. First, we need to add an initial stage of the game in which firms X and Y can choose both their advertising medium (which determines l) and their advertising content, which determines the direction of change in consumers' cross-price elasticities (which we denote by $e = e\uparrow$ if the elasticities increase or $e = e\downarrow$ if the elasticities decrease). Second, we need to specify the costs of both. We can do this with a general function $c_i(l, e, s_j) \geq 0$, where $c_i(\cdot, \cdot, \cdot)$ is the cost to firm i of its advertising campaign. This cost is, in general, a function of l, e, and firm j's strategy, s_j. Similarly, we can define firm j's cost of advertising as $c_j(l, e, s_i) \geq 0$.

Let $\pi_i(l, e; s_j)$ denote firm i's maximized profit net of advertising costs from the continuation game as a function of l, e, and firm j's strategy. Then, in stage 1, firm i's problem is

$$\max_{l,\,e}\big(\pi_i(l, e; s_j) - c_i(l, e; s_j)\big). \tag{4}$$

We know that $\pi_i(l, e\downarrow; s_j) > \pi_i(l, e\uparrow; s_j)$ if $l < l_l$, and $\pi_i(l, e\uparrow; s_j) > \pi_i(l, e\downarrow; s_j)$ if $l > l_l$. Thus, choosing $l > l_l$ and $e = e\uparrow$ is a best response for firm i given s_j if and only if

$$\max_{l\in(l_l,\,1/2)}\big(\pi_i(l, e\uparrow; s_j) - c_i(l, e\uparrow; s_j)\big) \geq \max_{l\in(0,\,l_l)}\big(\pi_i(l, e\downarrow; s_j) - c_i(l, e\downarrow; s_j)\big).$$

Analogously, we can determine firm j's optimal choice of l and e as a function of firm i's strategy, s_i. If the above displayed condition and its analogue hold simultaneously, then we have an equilibrium in which each firm finds it optimal to choose $l > l_l$ and $e = e\uparrow$.

This formalization demonstrates that firm i's optimal choice of advertising medium and content depends on both the relative and absolute costs of increasing versus decreasing cross-price elasticities and on the relative and absolute costs of the advertising medium itself. Thus, there exist equilibria in which firm i endogenously chooses advertising that increases consumers' cross-price elasticities.

Advertising Increases the Valuations of the Marginal Consumer. In our model thus far, advertising that decreases consumers' cross-price elasticities also reduces consumers' valuations. It is natural to ask whether our results would continue to hold if these two effects were unbundled. To see that they would, suppose that all advertising changes can be decomposed into two effects: a parallel shift upward of consumers' valuations ($\Delta V > 0$) and a positive or negative change in the slope of consumers' valuations ($\Delta t > 0$ or $\Delta t < 0$). Further suppose that the parallel shift upward always outweighs the change in the slope for the consumers receiving the ads, so that $\Delta V > |\Delta t|$. Then we can prove the following proposition.[7]

Proposition 2. *In the Hotelling model of demand with a retail sector, suppose that only consumers located from $[l, 1-l]$, where $l \in [0, \frac{1}{2}]$, are exposed to advertising messages that increase consumers' valuations and have $\Delta V > |\Delta t|$. Then there exists $l_l, l_h \in (0, \frac{1}{2})$ such that*

(i) *for all $l < l_l$, firm* X*'s and firm* Y*'s profits increase if $\Delta t > 0$ and decrease if $\Delta t < 0$.*

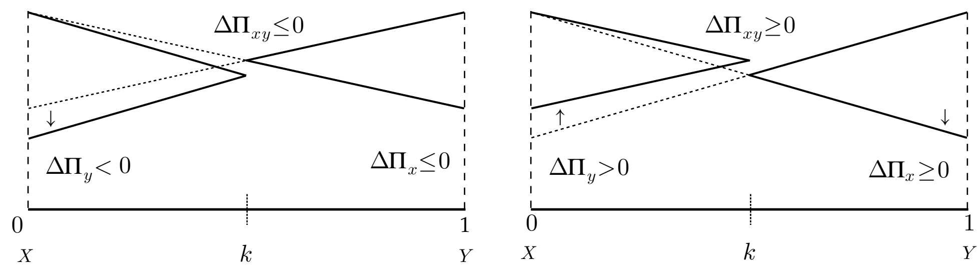
(ii) *for all $l > l_l$, firm* X*'s and firm* Y*'s profits increase. Given ΔV and $|\Delta t|$, there exists $l \in (l_l, \frac{1}{2})$ such that firm* X*'s and firm* Y*'s profits are higher if $\Delta t < 0$ than if $\Delta t > 0$.*

The effect of higher valuations for all consumers on the firms' profits is minimal if l is sufficiently small because the increase in $\Delta\Pi_{xy}$ is then almost fully offset by the increase in $\Delta\Pi_i$ (if $l = 0$, then $\Delta\Pi_{xy} = \Delta\Pi_i$). However, it takes on greater significance for larger l. For $l > l_l$, we see that firms X's and Y's profit will increase regardless of the change in t. Nevertheless, Proposition 2 suggests that even when the advertisements increase the valuations of all consumers who receive them, conventional wisdom is still suspect. Although profits increase in both cases when firms advertise to decrease cross-price elasticities, it is possible (case ii) they would increase even more if the advertisements were to increase cross-price elasticities.

Only Consumers with Strong Preferences Are Exposed. Lastly, we consider the case in which firms can target consumers that have strong preferences for their products (see Figure 3). For example, when Apple Computer advertises in "*MacAddict*," only consumers who favor Macintosh over PCs are likely to be exposed to these ads. Conversely, ads that appear in "*PC Magazine*" are likely to reach PC, but not Macintosh, users. We model this by assuming that only consumers located from $[0, k]$, where

[7] We offer here a sketch of the proof. A formal proof of Proposition 2 is available on request. Suppose all consumers receive the ads, so that $l = 0$. Then, the change in each manufacturer's profit is $\lambda_i(\Delta\Pi_{xy} - \Delta\Pi_i) = \lambda_i\Delta t/2$, implying that the change is positive if $\Delta t > 0$ and negative if $\Delta t < 0$. By continuity, these qualititative effects continue to hold for sufficiently small l. This establishes part (i). For larger l, e.g., when the ads only affect Π_{xy} but not Π_i, the change in firm i's profit is $\lambda_i(\Delta V - \Delta t/2)$. Given $\Delta V > |\Delta t|$, the change in firm i's profit for larger l is always positive, but it is more positive if $\Delta t < 0$ than if $\Delta t > 0$. This establishes part (ii).

Figure 3 **Ads That Decrease (Left) or Increase (Right) Price Elasticities for Consumers in** $[0, k]$



$k \in (0, 1]$, are exposed to an ad by firm X. Consumers' valuations are thus $V_x - z(t + \Delta t)$ and $V_y - (1 - z)(t + \Delta t)$ for $z \in [0, k]$, and $V_x - zt$ and $V_y - (1 - z)t$ for $z \in (k, 1]$. Then we can prove the following proposition (see Technical Appendix at http://mktsci.pubs.informs.org).

Proposition 3. *In the Hotelling model of demand with a retail sector, suppose that only consumers located from* $[0, k]$ *are exposed to advertising messages that increase* t *(decrease cross-price elasticities). Then, the retailer's profit decreases, and there exists* k_l, $k_h \in [0, 1]$ *such that*

(i) *for all* $k < k_l$, *firm* X*'s profit increases and firm* Y*'s profit is unchanged.*

(ii) *for all* $k_l < k < k_h$, *firm* X*'s profit increases and firm* Y*'s profit decreases.*

(iii) *for all* $k > k_h$, *firm* X*'s and firm* Y*'s profits increase.*

When the advertising medium is such that only consumers with strong preferences are exposed to firm X's advertising messages, Proposition 3 implies that firm X should strive to decrease consumers' cross-price elasticities. The intuition is the same as in the case of Observation 2 and part (i) of Proposition 1. By making the retailer's offerings less substitutable, firm X reduces the retailer's outside option (the monopoly profit of the retailer and firm Y), an effect that, in this case, always outweighs any adverse effect on overall channel profits.

However, unlike other cases, firm X's and firm Y's profits may change in opposite directions. Although each firm may want to expose consumers to persuasive ads that decrease cross-price elasticities, each may prefer that the other firm does not. The reason is that the set of consumers who will be exposed to the ads will in general not be the same in the two cases, and this may differentially affect a manufacturer's ability to extract surplus from the retailer, hurting it in one case, but helping it in another. In particular, the effect on firm Y's profit of ads by firm X that decrease cross-price elasticities depends on k. If k is sufficiently small, only consumers located near 0 are exposed to the ads. Because these consumers are located far from the marginal consumers who determine equilibrium profits (near 1/2) or the marginal consumers who determine the monopoly profits of the retailer and firm X (near 1), firm Y's profits are unaffected by ads that decrease cross-price elasticities for consumers located near zero. For k in an intermediate region (near 1/2), firm Y's profit decreases as a result of such ads because the valuations for consumers near 1/2 have fallen, and so have the prices that maximize overall channel profits and overall channel profits themselves. However, the valuations of consumers located at 1 have not changed, and therefore the monopoly profits of the retailer and firm X have not changed. Because $\Delta\Pi_{xy} < 0$ and $\Delta\Pi_x = 0$, the profit of firm Y is lower. Finally, if k is large enough, all or nearly all consumers are exposed to the ad. In this case, firm Y's profit increases as a result of the ad. The intuition is similar to that of part (i) of Proposition 1.

5. Concluding Remarks

We summarize our main conclusions in Table 1. They are: (1) manufacturers can be worse off from advertising that reduces the cross-price elasticity between their products; (2) channel conflict need not arise even when the sole purpose of advertising is to affect cross-price elasticities; and (3) depending on its bargaining power, a retailer can be better off when the products it sells are perceived to be less substitutable. These results depart from conventional wisdom and thus highlight the subtleties of analyzing the competitive effects of persuasive advertising.

Our paper also highlights two more general points. First, most academic and practitioners' intuition that a decrease in cross-price elasticities benefits competing firms is based on the case where firms sell directly to consumers. The reason for the intuition is that equilibrium prices (i.e., prices to the marginal consumer),

Table 1 **Change in Profit from Ads That Decrease Cross-Price Elasticities**

Consumer groups exposed to ads:	Firm X	Firm Y	Retailer
of strong, moderate, and weak preferences	+	+	−
of moderate and weak preferences only	−	−	−
of weak preferences only	−	−	−, +
of strong preferences only	+	no change	−
of strong and moderate preferences only	+	−	−

and hence profits, are decreasing in price elasticities. However, when firms sell through a retailer, this intuition no longer holds because the retailer internalizes all pricing decisions. As a result, the profit-maximizing equilibrium prices may fall as a result of the decreased substitution. Profits for the manufacturers, however, no longer depend on equilibrium prices alone. Instead, changes in manufacturer profit are driven by how price elasticities affect equilibrium prices (determined by the marginal consumers) *relative to* the hypothetical prices a retailer would set in the absence of the manufacturer's product.

Second, different kinds of marketing messages can affect the valuations of different groups of consumers—marginal consumers only, inframarginal consumers only, or both. The resulting change in profits for channel members depends on the group to whom the communication is directed and on the structure of the channel. As this paper has shown, there are important interaction effects that sometimes run counter to marketers' or economists' initial intuition. The general lesson is that one cannot infer that a particular type of communication will have the same effect on profits if it is targeted to a different group of consumers, even keeping the channel structure fixed. Nor can one predict the effect of a particular type of ad targeted to a particular group of consumers without taking into consideration the channel structure.

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Appendix

Proof of Proposition 1. Preliminaries: Recall that prior to any advertisements, $\Pi_{xy} = V - t/2$, $\Pi_x = V - t$, and $\Pi_y = V - t$. Define $\Pi_{xy}^{[l,1-l]}$ to be the maximized overall channel profit after consumers located in $[l, 1-l]$ have been exposed to advertising messages by firm X that change their perception of product substitutability from t to $t + \Delta t$. Define $\Pi_x^{[l,1-l]}$ and $\Pi_y^{[l,1-l]}$ analogously.

Let $\Delta\Pi_{xy} = \Pi_{xy}^{[l,1-l]} - \Pi_{xy}$ and define $\Delta\Pi_x$ and $\Delta\Pi_y$ analogously. Using (1) in §3.1 we can then write the profit changes of each firm as a function of advertising induced changes in t,

$$\begin{aligned} \Delta\pi_x &= \lambda_x(\Delta\Pi_{xy} - \Delta\Pi_y) \\ \Delta\pi_y &= \lambda_x(\Delta\Pi_{xy} - \Delta\Pi_x) \qquad \text{(A.1)} \\ \Delta\pi_r &= \lambda_x\Delta\Pi_x + \lambda_y\Delta\Pi_y + (1-\lambda_x-\lambda_y)\Delta\Pi_{xy}. \end{aligned}$$

Proof. Assume $\Delta t > 0$.

Maximized joint profit of the retailer and firm i. Let $l \in [\Delta t/(t+\Delta t), 1/2)$. For such l, $\max\{U_x(z), U_y(z)\} \geq V - t$ for all $z \in [0,1]$ and all admissible Δt. Recall that $p_i^m = V - t$ maximizes the retailer's profit in the absence of advertising when selling product i only. Because all consumers' valuations continue to exceed $V - t$ after having been exposed to advertising that decreases consumers' cross-price elasticities, $p_i^m = V - t$ continues to maximize the retailer's profit. Hence, $\Pi_i^{[l,1-l]} = V - t$, $i = x, y$, and $\Delta\Pi_i = 0$.

Now let $l \in [0, \Delta t/(t+\Delta t)]$. Then, for such l, we have that $\Pi_i^{[l,1-l]} = V - (t+\Delta t)(1-l)$, $i = x, y$. It follows that $\Pi_i^{[l,1-l]}$ is weakly monotonically increasing and continuous in l for all $l < 1/2$.

Maximized overall channel profit. To determine $\Pi_{xy}^{[l,1-l]}$, note that equilibrium prices can either be both weakly above $V - tl$, both weakly below $V - t(1-l)$, or one weakly above $V - tl$ and one weakly below $V - t(1-l)$.

Assume both prices are weakly above $V - tl$. Then, by the assumption of full coverage in the absence of advertising, we know that $p_x^* = p_y^* = V - tl$. At these prices demand for product X is l, and so is the demand for product Y. Hence, profits are $\Pi_{xy}^1 = (V - tl)2l$.

Assume both prices are weakly below $V - t(1-l)$. Then the maximization problem is identical to the one in §3.1 (2) with transportation cost $t + \Delta t$. Hence, prices are $p_x^* = p_y^* = V - (t+\Delta t)/2$. Because all consumers are served, profits are $\Pi_{xy}^2 = V - (t+\Delta t)/2$.

Assume that one price is weakly above $V - tl$ (say p_x w.l.o.g.) and one price is weakly below $V - t(1-l)$. Then, by the assumption of full market coverage, $p_x^* = V - tl$ and $p_y^* = V - (t+\Delta t)(1-l)$. At these prices, demand for product X is l, and demand for product Y is $(1-l)$. Because all consumers are served, profits are $\Pi_{xy}^3 = (V - tl)l + (V - (t+\Delta t)(1-l))(1-l)$.

Notice that Π_{xy}^1 and Π_{xy}^3 are monotonically increasing in l for all $l < 1/2$, and that Π_{xy}^2 is independent of l. Thus, because $\Pi_{xy}^{[l,1-l]} = \max\{\Pi_{xy}^1, \Pi_{xy}^2, \Pi_{xy}^3\}$, it follows that $\Pi_{xy}^{[l,1-l]}$ is weakly monotonically increasing and continuous in l for all $l < 1/2$.

Profit changes for small and large l and continuity arguments. Let $l = 0$. Because all consumers in the market are exposed to the ads, in equilibrium the solution to the retailer's problem is analogous to that in the text, where the transportation cost is $t + \Delta t$. Hence, $\Pi_{xy}^{[0,1]} = V - (t+\Delta t)/2$, and $\Pi_x^{[0,1]} = \Pi_y^{[0,1]} = V - (t+\Delta t)$, so that $\Delta\Pi_{xy} = -\Delta t/2$ and $\Delta\Pi_x = \Delta\Pi_y = -\Delta t$. Using (A.1), we get $\Delta\pi_x = \Delta\pi_y > 0$ and $\Delta\pi_r < 0$.

Let $l \in [\Delta t/(t+\Delta t), 1/2)$. We have shown above that for such l, $\Delta\Pi_i = 0$ and $\Delta\Pi_{xy} < 0$. Using (A.1), we get that $\Delta\pi_x = \Delta\pi_y < 0$ and $\Delta\pi_r = (1-\lambda_x-\lambda_y)\Delta\Pi_{xy}$. Hence, we have that $\Delta\pi_r < 0$ if $(1-\lambda_x-\lambda_y) > 0$, and $\Delta\pi_r > 0$ if $(1-\lambda_x-\lambda_y) < 0$.

By continuity and monotonicity of $\Delta\Pi_{xy}$, $\Delta\Pi_x$, and $\Delta\Pi_y$, there exist an $l_l < l_h < \Delta t/(t+\Delta t)$ such that $\Delta\Pi_i < \Delta\Pi_{xy} < \Delta\Pi_x + \Delta\Pi_y$ for $l \in (l_l, l_h)$ and $\Delta\Pi_{xy} < \Delta\Pi_i$ for $l \in [0, l_l)$. Hence, $\Delta\pi_x = \Delta\pi_y < 0$ and $\Delta\pi_r < 0$ for $l \in (l_l, l_h)$ and $\Delta\pi_x = \Delta\pi_y > 0$ and $\Delta\pi_r < 0$ for $l \in [0, l_l)$. Q.E.D.

References

Agrawal, Deepak. 1996. Effect of brand loyalty on advertising and trade promotions: A game theoretic analysis with empirical evidence. *Marketing Sci.* **15**(1) 86–108.

Bernheim, B. Douglas, Michael Whinston. 1985. Common marketing agency as a device for facilitating collusion. *RAND J. Econom.* **15** 269–281.

Bernheim, B. Douglas, Michael Whinston. 1998. Exclusive dealing. *J. Political Econom.* **106**(1) 64–103.

Bloch, Francis, D. Manceau. 1999. Persuasive advertising in Hotelling's model of product differentiation. *Internat. J. Indust. Organ.* **17** 557–574.

Chintagunta, Pradeep, Dipak Jain. 1992. A dynamic model of channel member strategies for marketing expenditures. *Marketing Sci.* **11**(2) 168–188.

Choi, Chan. 1991. Price competition in a channel structure with a common retailer. *Marketing Sci.* **10** 271–296.

Chu, Wujin. 1992. Demand signalling and screening in channels of distribution. *Marketing Sci.* **11**(4) 327–347.

Chu, Wujin, Paul R. Messinger. 1997. Information and channel profits. *J. Retailing* **73**(4) 487–499.

Coughlan, Anne. 1985. Competition and cooperation in marketing channel choice: Theory and application. *Marketing Sci.* **4**(1) 110–129.

Coughlan, Anne, Birger Wernerfelt. 1989. On credible delegation by oligopolists: A discussion of distribution channel management. *Management Sci.* **35**(2) 226–239.

Desai, Preyas. 1997. Advertising fee in business-format franchising. *Management Sci.* **43**(10) 1401–1419.

Desai, Preyas. 2000. Multiple messages to retain retailers: Signalling new product demand. *Marketing Sci.* **19**(4) 381–389.

Dixit, A., V. Norman. 1978. Advertising and welfare. *Bell J. Econom.* **9** 1–17.

Dukes, Anthony, Esther Gal-Or. 2003. Negotiations and exclusivity contracts for advertising. *Marketing Sci.* **22**(2) 222–245.

Grossman, Gene, Carl Shapiro. 1984. Informative advertising with differentiated products. *Rev. Econom. Stud.* **51** 63–81.

Ingene, Chuck, Mark Parry. 1995. Channel coordination when retailers compete. *Marketing Sci.* **14** 360–377.

Iyer, Ganesh. 1998. Coordinating channels under price and nonprice competition. *Marketing Sci.* **17** 338–355.

Jeuland, Abel, Steven Shugan. 1983. Managing channel profits. *Marketing Sci.* **2** 239–272.

Lal, Rajiv, Chakravarthi Narasimhan. 1996. The inverse relationship between manufacturer and retailer margins: A theory. *Marketing Sci.* **15**(2) 132–151.

Mathewson, G. Frank, Ralph Winter. 1984. An economic theory of vertical restraints. *RAND J. Econom.* **15** 27–38.

McGuire, Timothy, Richard Staelin. 1983. A industry equilibrium analysis of downstream vertical integration. *Marketing Sci.* **2**(2) 161–191.

Milgrom, Paul, John Roberts. 1986. Price and advertising signals of product quality. *J. Political Econom.* **94** 796–821.

Moorthy, K. Sridhar. 1987. Managing channel profits: Comment. *Marketing Sci.* **6**(4) 375–379.

Moorthy, K. Sridhar. 1988. Strategic decentralizations in channels. *Marketing Sci.* **7**(4) 335–355.

O'Brien, Daniel P., Greg Shaffer. 1997. Nonlinear supply contracts, exclusive dealing, and equilibrium market foreclosure. *J. Econom. Management Strategy* **6** 755–785.

Shaffer, Greg. 2002. Bargaining in distribution channels with multiproduct retailers. Working paper, University of Rochester, Rochester, NY.

Shaffer, Greg, Florian Zettelmeyer. 2002. When good news about your rival is good for you: The effect of third-party information on the division of channel profits. *Marketing Sci.* **21**(3) 273–293.

Tirole, Jean. 1988. *The Theory of Industrial Organization*. The MIT Press, Cambridge, MA.

Zhao, H. 2000. Raising awareness and signaling quality to uninformed consumers: A price-advertising model. *Marketing Sci.* **19** 390–396.