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Does manufacturer advertising suppress or stimulate retail price promotions? Analytical model and empirical analysis

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Abstract

Does manufacturer advertising for a brand stimulate or suppress retail price promotions? This study addresses this controversial issue. The authors develop an analytical model that shows that the relationship between manufacturer advertising and retail price promotion depends on the role of advertising. If advertising differentiates brands and suppresses consumer response to retail promotion, then the relationship is negative. But, if advertising is informative enough to increase consumer response to retail promotions, then the relationship is positive. A follow-up empirical analysis shows a strong positive relationship between category advertising expenditure and size of retail price discount, and between advertising and discount frequency. The finding supports the informative role of advertising in the context of retail price promotions. The implications of these findings and directions for future research are discussed.

Keywords: Price Promotion; Advertising; Retailing; Price Elasticity; Advertising-Promotion Tradeoff

Introduction

Does manufacturer advertising for a brand stimulate or suppress retail price promotions? This is an important issue in the current competitive environment characterized by substantial increases in sales promotions and steady declines in manufacturer advertising over the last two decades. For example, about 400 billion dollars worth of grocery products were sold in the year 2000. Of this, about 25% or nearly 100 billion dollars worth of goods were sold on deal to consumers (source: Information Resources, Inc. 2001). Retail promotions to consumers primarily involve price discounts, but also include displays, features, and special promotions. Retail price discounts are often triggered by manufacturers' trade deals.

While sales promotions have increased, the proportion of manufacturers' total promotional budget spent on advertising declined sharply in the 1980s, and has continued a steady decline in the 1990s (Hoyt 1997; PROMO News 1998; Scott 1992). Proponents of sales promotion interpret this change as the result of the increasing awareness of the power of price promotions. Supporters of advertising interpret it as the *cause* for the decline of national brands and the growth of price promotions. Their argument is that decline in advertising and increase in sales promotions result in weaker brand loyalty, lower manufacturer prices, and greater retailer power. Over the last two decades this debate has turned in to a major controversy with implications for marketing strategy and practice (see for example, Blattberg and Neslin, 1990; Jones 1995; Mela, Gupta and Lehmann, 1997; Sethuraman and Tellis, 1991 for discussion and research related to these issues).

The controversy revolves around the issue of whether advertising and sales promotions are *substitutes* or *complements,* and whether the use of one negatively influences the use of the other. This advertising versus sales promotion controversy parallels a much older one in the economics literature about advertising and prices. Many economists believe that advertising is a means for firms to build market

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power. Firms do so by differentiating their brands, creating brand loyalty, and making consumers insensitive to price differences (Comanor & Wilson, 1974). Thus advertising reduces price sensitivity and advertised brands can increase their prices, leading to a positive relationship between advertising and prices.

Other economists assume that advertising is information (Nelson, 1970, Nelson 1974). As such, advertising increases consumers' information about their choices, allowing consumers to comparison shop. Consumers become more price-sensitive and are better able to choose low-priced brands. As a result, firms compete on price and end up serving consumers with lower prices. It follows that advertising and prices are negatively related.

The controversy regarding the relationship between advertising and price sensitivity has spawned many empirical studies in marketing. (Kaul & Wittink 1995) and (Shankar & Krishnamurthi 1996) provide a detailed discussion of these studies. Both these reviews state that it is difficult to draw general conclusions from prior studies because (i) some studies support the differentiation theory while others support the informative role or information theory of advertising, and (ii) because there are significant differences in the nature of the studies.

There are relatively fewer studies dealing with the effect of advertising on prices. (Benham 1972) studied the impact of advertising on the price of eyeglasses and concluded that the presence of advertising is associated with lower prices. (Cady 1976) and (Kwoka 1984) also reached the same conclusion. Relatedly, (Steiner 1973, Steiner 1993) argues that advertising may increase the salience of brands sufficiently that retailers compete with each other to promote these brands in order to draw consumers into their stores and increase sales of these and other brands. As a result, heavily advertised brands tend to have lower retail margin and, possibly, lower retail prices. (Farris & Albion 1980) summarize the advertising-price literature and observe (Table 5) that higher advertising tends to be associated with higher factory prices but possibly lower retail prices.

None of the above papers, however, explicitly consider the relationship between *manufacturer advertising and retail price promotion.* Indeed, even though there is an extensive literature on promotion, only a few of them address the issue of the linkage between advertising and price promotion. (Sethuraman & Tellis 1991) analyze a monopoly model at the manufacturer level (with no retailers) and show that the decision to invest in advertising or price promotion depends on the ratio of price elasticity to advertising elasticity.

(Neslin, Powell & Stone 1995) develop a dynamic optimization model to understand the tradeoff between advertising and trade promotion. They use simulations and obtain useful results about the effect of several factors such as promotion sensitivity, purchase acceleration on a manufacturer's promotion and advertising plan. However, they focus on the manufacturer side only and consider a single manufacturer selling to an average retailer. (Agrawal 1996) examines the issue of balancing media advertising and trade promotion utilizing a game-theoretic model with two manufacturers who distribute their brands to consumers through a common retailer. They derive several interesting results about the effect of brand loyalty on advertising and trade promotion. (Shankar & Bolton 1999) empirically analyze promotion data from six product categories and find that advertising leads to better price/promotion coordination at the retail level.

The objective of our study is to contribute to the literature on price promotions by investigating the implications of information and differentiation theories of advertising on retail price promotion decisions. In particular, we investigate the following two questions using an analytical model and an empirical study.

1. Is the relationship between manufacturer advertising and depth of retail price discount positive or negative? That is, does higher level of advertising lead to larger retail price discount or smaller discount?
2. Is the relationship between manufacturer advertising and frequency of retail price discount positive or negative?

Insights into these relationships can help retailers decide which brands and categories to promote, and whether to offer deep or shallow discounts. These insights could also provide guidance to manufacturers regarding decisions concerning the incidence of price promotions.

In particular, we develop a formal model to show that the relationship between advertising and retail price promotion is mediated by the role that advertising plays. If advertising provides information and increases consumer response to price promotions, as theorized by (Nelson, 1970), then advertising and retail promotion will be positively related. On the other hand, if advertising intensifies brand loyalty by differentiation and decreases consumer response to retail promotions, as stated by (Comanor & Wilson, 1974), then advertising and retail promotion will be negatively related. So the actual relationship is an empirical issue. We test this relationship through an empirical analysis using a cross section of 82 grocery products.

The paper is divided as follows. The next section describes the analytical model and results. The third section presents an empirical test of the relationship between advertising and retail price promotion. The final section concludes by summarizing the implications and discussing the limitations and future research directions.

Analytical model and results

We analyze a parsimonious game theoretic model that explicates the relationship between advertising and retail price promotion by capturing the spirit of the differentiation (Comanor & Wilson, 1974) and information (Nelson,

1974) theories of advertising. In this section, we present the key elements of the model organized as follows: (i) Model assumptions, (ii) Equilibrium solutions, (iii) Effect of price sensitivity, (iv) Relationship between manufacturer advertising and depth of retail price discount, (v) Relationship between manufacturer advertising and frequency of retail price discount, and (vi) Summary of analytical results.

Model assumptions

We make five assumptions in our model structure.

1. We consider a market for a product category comprised of two manufacturers each selling one brand of the product category through a retailer, who sells both brands. Clearly, there are likely to be multiple brands and multiple retailers in the market. However, the differentiation and information theories of advertising relate predominantly to price competition (cross-price sensitivity) across brands within a store. Furthermore, at least in the grocery products market, which is the main focus of our study, brand switching within stores account for over 80% of total sales impact of price promotions (Gupta 1988; Bell, Chiang & Padmanabhan, 1999). Store switching is a relatively less important factor.
2. We assume that the two brands are "symmetric" in that they have the same costs and same response to marketing variables. Symmetry is a common assumption made in game-theoretic models that study price competition in the context of manufacturer-retailer channel structure (e.g., McGuire & Staelin, 1983; Choi 1996). Furthermore, our attempt here is to capture the spirit of differentiation and information theories of advertising. These theories relate simply to price competition between brands and not to asymmetries in these brands. Therefore, we use a symmetric model to gain initial insights into price promotion decisions. Incorporating asymmetry makes the model more cumbersome and may confound the effect of asymmetry with the effect of advertising.
3. Our focus is on assessing the impact of advertising on price promotion decision in the spirit of information and differentiation theories. Accordingly, we assume that the regular retail price p_i (i = 1,2), manufacturer wholesale price (w_i) and advertising outlay (A_i) are fixed while deciding on price promotion decisions. These assumptions also appear reasonable since regular price and advertising budgets are often decided prior to making price cut decisions. (Later, in §2.6, we discuss the situation where the manufacturer decides on advertising in conjunction with price discount decisions.) The resulting quantity sold at regular prices is denoted as q_i (i = 1,2). By assumption (2) of symmetry across brands: $p_1 = p_2 = p_r$ (say); $w_1 = w_2 = w_r$; $q_1 = q_2 = q_r$; gross retail margin at regular price, $g_r = p_r - w_r$; manufacturer margin at regular price, $m_r = w_r - c$, where c is the variable cost to manufacturer.
4. During the promotion period, first each manufacturer (i) determines the size of trade deal (t_i), that is, discount from regular wholesale price to be offered to the retailer. Given these trade deals, the retailer decides on the discount (d_i) to be passed on to consumers that would maximize the retailer's total category profits. The manufacturers know the retailer's decision rule and incorporate it into their decision making. In game-theoretic terms, each manufacturer acts as a Stackelberg leader (McGuire & Staelin, 1983; Coughlan, 1985).
5. We assume that the demand (q_{di}) for the brand i (i = 1,2) is linear in own discount (d_i) and competitive retail discount (d_j), given the regular price. In particular, we assume the following demand function

$$q_{di} = q_r + d_i + \theta(d_i - d_j)\ i, j = 1, 2;\ i \neq j\,, \qquad (1)$$

where $\theta \in (0.1)$ is a measure of the degree of cross-promotion sensitivity (or price competition) and q_r is the demand at regular price.

A demand function that contains a term for own price (discount) and another term that captures the effect of the difference between own price (discount) and competitor price (discount) is consistent with individual utility maximization behavior (Shubik & Levitan 1980) and used in (Raju, Sethuraman & Dhar 1995).[1] Note that when there is no discount, that is, $d_i = d_j = 0$, demand (q_{di}) equals the regular price demand, q_r.

Equilibrium solutions

The retailer sets d_1 and d_2 to maximize the following profit function, given regular prices and manufacturer trade deals t_1 and t_2:

$$\underset{d_1,d_2}{\text{Max}} \sum_{i=1}^{2} [(g_r + t_i - d_i)q_{di}] \qquad (2)$$

Solving this problem gives retail discount $\hat{d}_1$ and $\hat{d}_2$ as functions of trade deals t_1 and t_2 and of θ, q_r. Substituting these expressions in (1), we obtain $\hat{q}_{di}$ as functions of t_1 and t_2.

Manufacturer i's problem involves selecting t_i so as to maximize its own profits:

$$\underset{t_i}{\text{Max}}\ (m_r - t_i)\,\hat{q}_{di} \qquad (3)$$

The solution to problem (3) gives the equilibrium trade deal (t_1^* and t_2^*). Substituting the equilibrium trade deal in $\hat{d}_1$ and $\hat{d}_2$, we obtain the symmetric equilibrium retail price

Table 1
Equilibrium solutions

Variable	Notation	Expression
Retail price discount	d*	$\frac{(g_r + m_r)(1 + \theta) - q_r(3 + \theta)}{2(2 + \theta)}$
Manufacturer trade deal	t*	$\frac{m_r(1 + \theta) - (q_r + g_r)}{2 + \theta}$
Demand at discounted price	q_d^*	$\frac{(g_r + m_{r_r})(1 + \theta)}{2(2 + \theta)}$
Retail margin after discount	g_d^*	$\frac{g_r(7 + 3\theta) - (m_r + q_r)(1 + \theta)}{2(2 + \theta)}$
Manufacturer margin after discount	m_d^*	$\frac{g_r + m_r + q_r}{2 + \theta}$
Retail profits after discount	Π_r^*	$2g^*_d \cdot q^*_d$
Manufacturer profits after discount	Π_m^*	$m^*_d \cdot q^*_d$

Note:
g_r = retailer's gross margin at regular price
m_r = manufacturer's gross margin at regular price
q_r = demand at regular price
θ = cross-promotion sensitivity (measure of price competition)

discount and consumer demand. These equilibrium solutions are given in Table 1. The equilibrium obtained is the unique Stackelberg equilibrium. As in (McGuire & Staelin 1983) and (Raju, Sethuraman & Dhar 1995), we restrict our analysis to situations with non-negative discounts (d* and t*).

From Table 1, equilibrium retail discount (d*) and manufacturer trade deal (t*) both increase with their respective gross margins. These results are intuitive. If the manufacturer (or retailer) expects to get high margins from unit sales, he/she would have an incentive to offer deeper discount and increase brand sales, other things equal. Furthermore, both discounts decrease with regular price demand (q_r). This term represents the loss due to existing regular price consumers availing of the discount. The greater this potential loss, the less the incentive to offer big discounts. The key equilibrium result relates to the effect of price competition (θ), which we discuss next.

Effect of price sensitivity (θ)

From the expressions in Table 1, it can be shown that equilibrium retail price discount is higher for higher values of θ, that is, $\frac{\partial d^*}{\partial \theta} > 0$. This result is intuitive. As brand price competition increases, retailers would offer deeper discounts in equilibrium, other things equal. This deeper discount results in higher demand. A higher θ also leads to higher retail margin, resulting in higher profits for the retailer. In other words, from a discounting perspective, the retailer benefits when the price competition between brands within a store is higher. We formally state these results as:

Lemma 1: *When the cross-price sensitivity (θ) between brands in a store is higher*

(a) size of retail price discount is higher,
(b) retailer's margins are higher, and
(c) retailer's profits from discounting are higher.

From Table 1, the manufacturer's trade deal (t*) is also higher for higher values of θ. However, by differentiating the relevant expressions with respect to θ, it can be shown that manufacturer margin (m_d^*) and manufacturer profits (π_m^*) decrease with θ. We state these results formally as:

Lemma 2: *When the cross-price sensitivity (θ) between brands in a store is higher*

(a) size of manufacturer trade deal is higher,
(b) manufacturer's margin is lower, and
(c) manufacturer profits from discounting are lower.

These lemmas help us infer the relationship between advertising and retail promotion.

Relationship between manufacturer advertising and size of retail price discount

The informative role of advertising (Nelson 1970, Nelson 1974) suggests that advertising increases consumers' information about their choices. Armed with this information, consumers are motivated to do more comparison-shopping, thereby increasing sensitivity to retail price promotions (θ).

In contrast, the advertising equals market power argument (Comanor & Wilson, 1974) asserts that advertising differentiates the brands, creating brand loyalty, and making consumers less sensitive to price promotions (θ). Integrating these theories with lemmas 1 and 2, we develop the relationship between advertising and discount depth (i) within category and (ii) across categories.

Relationship within category

The relationship between advertising and retail discount depends on whether advertising increases price sensitivity or decreases it, as described in the following result.

Proposition 1

(a) If advertising equals information, an increase in advertising of brands within a category will result in a larger retail discount in that category, other things equal

(b) If advertising equals market power, an increase in advertising of brands within a category will result in a smaller retail discount in that category, other things equal

Relationship across categories

From the equilibrium solutions in Table 1, we can also infer the relationship between manufacturer advertising and retail price cut across categories. Let C be the set of all relevant product categories. For one category c $\in$ C, we can write the retail discount as (subscript c denotes the particular category, c):

$$d_c^* = \frac{(g_{rc} + m_{rc})(1 + \theta_c) - q_{rc}(3 + \theta_c)}{2\,(2 + \theta_c)} \tag{4}$$

For any two categories c, c′ $\hat{\in}$ c, the information theory would suggest that advertising $A_c > A_{c'} \Rightarrow \theta_c > \theta_{c'}$, other things equal. Extending lemma 1, $\theta_c > \theta_{c'} \Rightarrow d_c^* > d_{c'}^*$. Combining, when advertising equals information, $A_c > A_{c'} \Rightarrow \theta_c > \theta_{c'} \Rightarrow d_c^* > d_{c'}^*$. When advertising equals market power, $A_c > A_{c'} \Rightarrow \theta_c < \theta_{c'} \Rightarrow d_c^* < d_{c'}^*$. Thus, we have the following results:

Proposition 2

(a) If advertising equals information, other things equal, categories with higher advertising levels would have larger discounts than categories with lower advertising levels

(b) If advertising equals market power, other things equal, categories with higher advertising levels would have smaller discounts than categories with lower advertising levels

Relationship between manufacturer advertising and frequency of retail price discount

We do not directly incorporate frequency of discounts in our analytical model. However, we can infer the same from the profitability of price promotions. Following, (Raju, Sethuraman & Dhar 1995), we assume that the likelihood (or probability) of taking a particular action is proportional to the profitability of that action, that is, the greater the profits, the more likely it is that action would be taken.[2] In our promotion context, retailer's profits from discounting increases as θ increases. Thus, if advertising equals information and increases θ, then retailer's profits will increase with advertising and he would be more inclined to promote. Conversely, if advertising equals differentiation and decreases θ, then retailer's profits will decrease with advertising and s/he would be less inclined to promote.

The situation reverses for the manufacturer because its profits decrease with increase in θ. Thus, if advertising equals information and increases θ, then manufacturer's profits will decrease with advertising and s/he would be less inclined to promote. Conversely, if advertising equals differentiation and decreases θ, then manufacturer's profits will increase with advertising and s/he would be more inclined to promote.

The net effect of advertising on frequency of price cuts is ambiguous. However, it is likely that the competition between manufacturers will force them to promote according to the retailer's incentive. If one manufacturer does not offer a trade deal, then the other manufacturer will offer the trade deal and will take substantial sales away from the nondealing manufacturer. Thus based on retailer's incentive to promote, we have the following tentative results:

Proposition 3

(a) If advertising equals information, an increase in advertising of brands within a category will result in more frequent retail price cuts in that category, other things equal

(b) If advertising equals market power, an increase in advertising of brands within a category will result in less frequent retail price cuts in that category, other things equal

Proposition 4

(a) If advertising equals information, other things equal, categories with higher advertising levels would be more frequently discounted than categories with lower levels of advertising

(b) If advertising equals market power, other things equal, categories with higher advertising levels would be less frequently discounted than categories with lower levels of advertising

Manufacturer advertising decision

At this point, a pertinent question is what implication does information and differentiation theories have on the manufacturers' advertising decisions. If advertising increases or decreases price competition (θ), what should be the optimal advertising level? Isolating this effect, we can write the manufacturer's advertising decision problem (that takes into account the price promotion decisions) as

$$\underset{A}{\text{Max}}\ \Pi_m^*(A) - A,$$

where Π_m^* is as given in Table 1. The optimal A* solves the FOC

$$\frac{d\Pi_m^*(A)}{dA} - 1 = \frac{\partial \Pi_m^*}{\partial \theta} \cdot \frac{d\theta}{dA} - 1 = 0 \tag{5}$$

Note that if advertising equals information $\frac{d\theta}{dA} > 0$. From Lemma 2, $\frac{\partial \Pi_m^*}{\partial \theta} < 0$. Hence, the left hand side of Eq. (5) will never equal zero. In other words, the optimal action for manufacturer is not to advertise in this context if advertising increases brand price competition. If advertising equals differentiation, then $\frac{d\theta}{dA} < 0$ and optimal advertising is that A* which solves Eq. (5).

However, there are at least three effects of advertising on demand

a. direct effect of advertising on primary demand (increasing category sales),
b. direct effect of advertising on selective demand (increased market share through sales from competitors), and
c. indirect effect of advertising on demand through changes in price sensitivity.

The net profits arising from a combination of these three demand effects will determine the optimal advertising level.

Summary of analytical results

The above analysis shows that the relationship between advertising and retail price promotion cannot be asserted a priori but is an empirical issue. It depends critically on the role of advertising. If advertising differentiates brands and suppresses consumer response to retail promotion, then the relationship is negative. But, if advertising is informative enough to increase consumer response to retail promotions then the relationship is positive.[3] Thus empirical analysis is needed to throw further light on the problem.

Empirical analysis

This section assess the relationship between advertising, price sensitivity, and retail price promotion across categories (Results 2 and 4). We do not have within category data of the type needed to investigate Results 1 and 3.

Empirical model

Our theory (Result 2) states that the relationship between advertising and discount size is mediated through promotional price sensitivity (or consumer response to price promotions). In addition, we need to account for covariates that might influence the relationship. Our theory (Eq. (4)) says that, besides price sensitivity (θ), retail gross-margin (g_r), manufacturer margin (m_r), and average regular-price brand sales (q_r) affect size of discount. We use retail margin and brand sales as covariates in the discount size model. (We do not have data on manufacturer margin.)

The covariates in the promotional price sensitivity model are the same as in (Narasimhan, Neslin & Sen 1996): (i) category penetration (percentage of households purchasing the product), (ii) purchase cycle (interpurchase time), (iii) average purchase price, (iv) number of brands, (v) propensity to purchase on impulse, and (vi) ability to stockpile. (Narsimhan, Neslin & Sen 1996) state that promotional price elasticity would likely be higher in categories (i) that are purchased by a large number of households (high penetration), (ii) that are purchased more frequently, (iii) where the average purchase price is high, (iv) where the purchase is based on impulse, and (v) where stockpiling is easier. It is also possible that price competition is greater in categories with a larger number of brands.

Fig. 1 provides a description of the empirical model we use to test Result 2. The empirical model for testing Result 4 is the same as in Fig. 1 except that the dependent variable is discount frequency instead of discount size.

Data

Table 2 lists the variables used in the empirical analysis, their sources and descriptive statistics. Below, we describe the key variables.

Retail Promotion (Discount Size - DISCSIZE and Discount Frequency - DISCFREQ). Category level measures of retail price promotion are obtained from the Infoscan Report on Trade Promotions™ prepared by Information Resources, Incorporated (IRI). The report measures the sales response to price and promotional activities for several product categories, by analyzing over 45 million promotional weekly sales observations from over 2,400 Infoscan stores in 49 metropolitan markets during the year 1988. The report also records the average percentage price cut from regular prices (DISCSIZE) and total number of weekly price discounts (DISCFREQ) for each category.

Advertising Expenditure (ADEXP). Following (Hoch & Banerji 1993) and (Sethuraman 1992), the category advertising data (in total dollars) were obtained from information compiled by Leading National Advertisers (LNA) and presented in the BAR/LNA Report 1988.

Price Sensitivity (PRICELAS). As in (Raju, Sethuraman & Dhar 1995), category level, price sensitivity is obtained from the average promotional price elasticity reported in the Infoscan Report on Trade Promotions (1988).

Retail Gross Margin (MARGIN). We use the same gross margin data as the ones employed in (Hoch & Banerji 1993) and (Sethuraman 1992). Gross retail margins (expressed as a percentage of price) for 1988 are obtained from the Supermarket Business Annual Expenditure Survey, published in *Supermarket Business*, September 1989.

Category Sales (CATSALE). Category sales data were obtained from Infoscan Supermarket Review (1988) and provided by (Raju, Sethuraman & Dhar 1995).

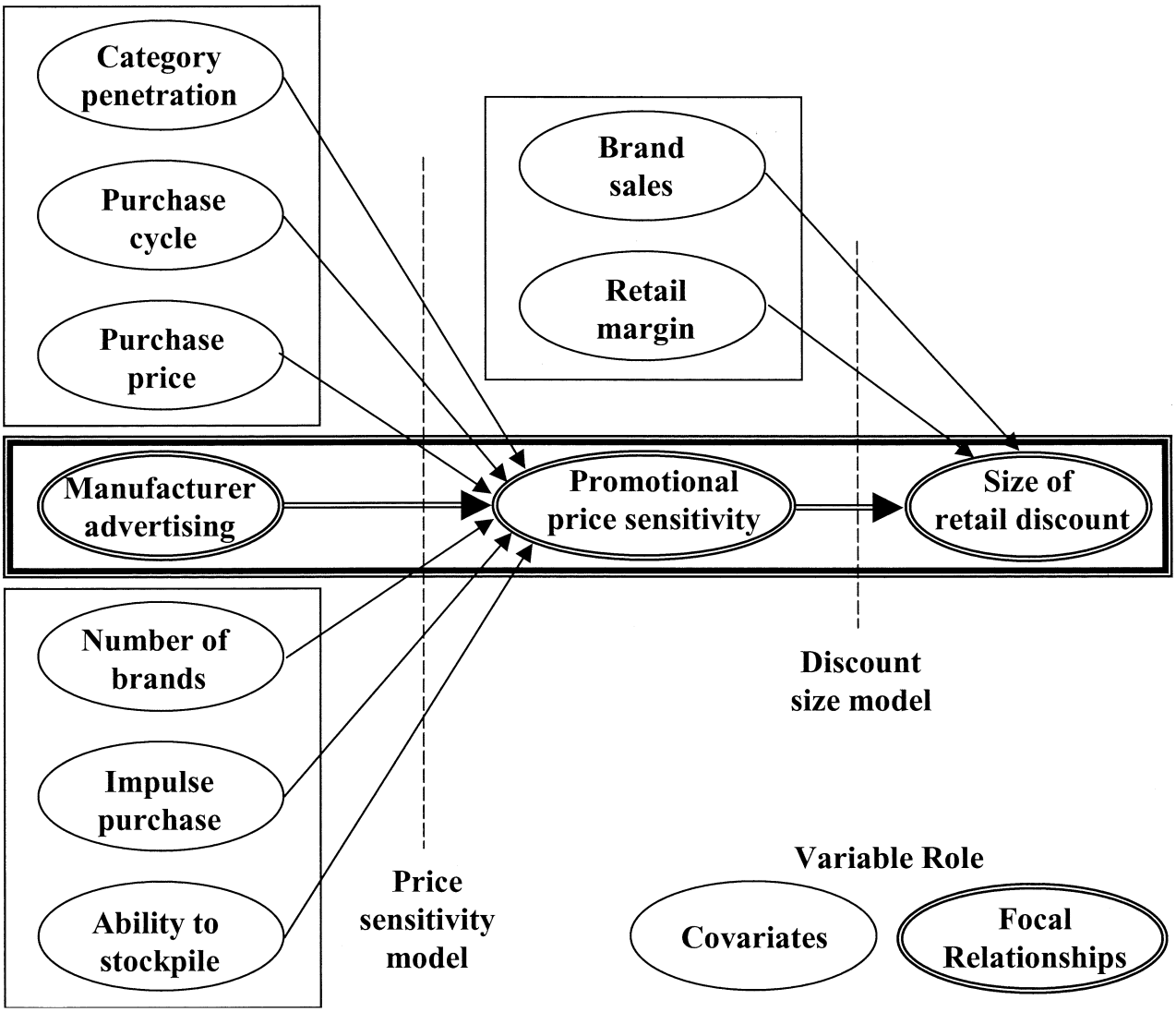

Fig. 1. Empirical model.

Number of Brands (NBRAND). Number of distinct brands in a product category was obtained from Infoscan Supermarket Review (1988) and provided by (Raju, Sethuraman & Dhar 1995).

Average Brand Sales (BRSALE). The average brand sales in a category is obtained by simply dividing the category sales by the number of brands in the category.

Consumer Purchase Variables. The variables –household penetration (PENETRATION), purchase cycle (PCYCLE), and average purchase price (PRICE) –are obtained from the Marketing Factbook (1988) and are the same as the ones used in (Narsimhan, Neslin & Sen 1996). The percentage of households purchasing an item in the category and the average number of days between purchases (purchase cycle) are obtained directly. The average price per purchase in a product category is computed by multiplying the price per unit volume and the number of units per purchase.

Impulse Purchase (IMPULSE) and Stockpiling (STOCK). Category level measure on propensity to purchase on impulse is obtained from a consumer survey reported in (Narasimhan, Neslin & Sen 1996). They measure impulse based on consumer response to two items: "I often buy this product on a whim." and "I typically like to buy this product when the urge strikes me." They use principal components analysis and use factor score to combine the two items to obtain an aggregate measure of the propensity to purchase on impulse. Measure of ability to stockpile is also obtained in the same manner.

In summary, category-level data on retail price promotion were obtained from Infoscan Report on Trade Promotions. All the other data were obtained from the same sources used in previously published research. Combining the various data sources, we have information on all model variables for 82 grocery products for the year 1988.[4]

Table 2
Variables used in empirical analysis-sources and means

Variable	Acronym	Source	Previous Research Where Used	Mean (Std. Dev.)
Discount Size (percent)	DISCSIZE	Infoscan Report on Trade promotion	—	12.9 (2.6)
Discount Frequency ('000)	DISCFREQ	Infoscan Report on Trade Promotion	—	509 (589)
Advertising Expenditure ($Million)	ADEXP	BAR/LNA Report	Hoch and Banerji (1993); Sethuraman (1992)	73.9 (82.0)
Promotional Price Elasticity (Absolute Value)	PRICELAS	Infoscan Report on Trade Promotion	Raju, Sethuraman and Dhar (1995)	2.64 (.56)
Retail Gross Margin (Percent)	MARGIN	Supermarket Business	Hoch and Banerji (1993)	22.1 (4.6)
Category Retail Sales ($Million)	CATSALE	Infoscan Supermarket Review	Raju, Sethuraman and Dhar (1995)	837 (743)
Number of Brands	NBRAND	Infoscan Supermarket Review	Raju, Sethuraman and Dhar (1995)	40.4 (43.0)
Household Penetration (Percent)	PENETRATION	Marketing Factbook	Narasimhan, Neslin and Sen (1996)	66.0 (27.0)
Purchase Cycle (Days)	PCYCLE	Marketing Factbook	Narasimhan, Neslin and Sen (1996)	64.9 (27.1)
Purchase Price ($)	PRICE	Marketing Factbook	Narasimhan, Neslin and Sen (1996)	1.98 (1.03)
Impulse Purchase	IMPULSE	Consumer Survey	Narasimhan, Neslin and Sen (1996)	−.05 (.43)
Ability to Stockpile	STOCK	Consumer Survey	Narasimhan, Neslin and Sen (1996)	−.01 (.36)

Estimation and results on discount size

The correlation between retail discount size and advertising expenditure is 0.31. This positive relationship suggests that advertising is likely to act as information leading to greater price sensitivity. To assess this further, we estimate the empirical model represented in Fig. 1.

$$\text{DISCSIZE} = a_0 + a_1\,(\text{PRICELAS}) + a_2\,(\text{MARGIN}) + a_3\,(\text{BRSALE}) + \text{Error} \quad (6A)$$

$$\text{PRICELAS} = b_0 + b_1\,(\text{ADEXP}) + b_2\,(\text{PENETRATION}) + b_3\,(\text{PCYCLE}) + b_4\,(\text{PRICE}) + b_5\,(\text{NBRAND}) + b_6\,(\text{IMPULSE}) + b_7\,(\text{STOCK}) + \text{Error} \quad (6B)$$

The equations are jointly estimated using two stage least squares. The results are in Table 3.

The R^2 for the discount size model is 0.19. As predicted in the theoretical analysis, coefficients a_1 and a_2 are positive and statistically significant ($p < .05$). That is, discount depth is higher in categories with higher promotional price elasticity and higher retail margin. Coefficient for brand sales is negative (as predicted) but not significant.

The R^2 for the price elasticity model is 0.26. Promotional price elasticity is significantly higher in categories with higher advertising expenditures, consistent with the informative role of advertising. In addition, price elasticity is higher in categories purchased by a larger number of households and products that can be stockpiled.

Multicollinearity does not appear to be a potential problem in identifying the effect of advertising on discount size. The (absolute) correlations among the independent variables in the discount size model (6A) are all less than 0.2. The correlation between advertising expenditure (the focal variable) and other independent variables in the price elasticity model (6B) are all less than 0.4. As was also found in (Narasimhan, Neslin & Sen 1996), the absolute correlation between household penetration and purchase cycle is somewhat high (0.6).

While our empirical models (Fig. 1 and Equations 6A-B) have been developed based on results from our

Table 3
Regression results
Table 3A: Equations 6A/7A (standardized estimates)

Independent Variables	Dependent Variables	
	Discount Size (Equation 6A)	Discount Frequency (Equation 7A)
Price Elasticity (PRICELAS)	.67***	.61***
Retail Margin (MARGIN)	.23**	.07
Brand Sale (BRSALE)	−.11	.16*
# of Brands (NBRAND)	N/A	.67***
R^2 (adjusted R^2)	.19 (.16)	.54 (.52)

Table 3B: Equations 6B/7B (standardized estimates)

Independent Variables	Dependent Variable: Price Elasticity
Advertising Expenditure (ADEXP)	.27**
Household Penetration (PENETRATION)	.31**
Purchase Cycle (PCYCLE)	−.20
Purchase price (PRICE)	−.02
# of Brands (NBRAND)	.14*
Impulse Purchase (IMPULSE)	.16
Ability to Stockpile (STOCK)	.22**
R^2 (adjusted R^2)	.26 (.19)

*** p<.01,
** p<.05,
* p<.10.
Number of observations = 82

analytical model and past literature (Narsimhan, Neslin & Sen, 1996), other more complicated models are possible. In particular, because our focus in this paper is on assessing the impact of advertising on consumer promotion, we considered advertising as an exogenous variable within our modeling context. One could posit that advertising is endogenous and that advertising is also determined by price elasticity. If this were the case, however, we would find a negative (not a positive) relationship between advertising and price elasticity. According to Dorfman and Steiner theorem, advertising (to sales ratio) is inversely related to price elasticity (see Farris & Albion, 1980, p. 21 for a similar argument). It may also be posited that category sales may influence both discount size (through price elasticity) and advertising (through advertising budget determination).

We observe a significant positive relationship between household penetration and price elasticity (Table 3). Categories with higher penetration generally have higher category sales (the correlation between the two variables is 0.56). Thus large (sale) categories would have higher price elasticity, leading to deeper discounts. Many firms set advertising budgets as a percentage of sales. Hence, category sales and advertising expenditure could be positively related. (In our data, the correlation between the two variables is 0.33). Thus the observed positive relationship between advertising and discount size may be due to category sales, which positively affects both advertising and price elasticity.

To account for this possibility, we replace dollar advertising expenditure (ADEXP) with advertising to sales ratio (ASRATIO) as the measure of advertising in Equation (6B). The category advertising to sales ratio is computed as the category advertising expenditure divided by category dollar sales. Dividing by category sales normalizes the advertising expenditures with respect to changes in category sales. The standardized estimate of ASRATIO in Equation (6B) is 0.26 and also significant at $p < .05$. Thus the basic results do not change.

Estimation and results on discount frequency

The correlation between discount frequency and advertising expenditure is 0.69, which is much higher than that between discount size and advertising expenditure (0.31). The correlation between discount size and discount frequency across categories is 0.46. The empirical model for testing the relationship between advertising and discount frequency is estimated using the following equations:

$$\text{DISCFREQ} = c_0 + c_1\,(\text{PRICELAS}) + c_2\,(\text{MARGIN}) + c_3\,(\text{BRSALE}) + c_4\,(\text{NBRAND}) + \text{Error} \quad (7A)$$

$$\text{PRICELAS} = d_0 + d_1\,(\text{ADEXP}) + d_2\,(\text{PENETRATION}) + d_3\,(\text{PCYCLE}) + d_4\,(\text{PRICE}) + d_5\,(\text{NBRAND}) + d_6\,(\text{IMPULSE}) + d_7\,(\text{STOCK}) + \text{Error} \quad (7B)$$

The only difference from the discount size model (6A) is that number of brands is used as an additional covariate in Equation (7A). Since category-level discount frequency is the number of times brands in a category are discounted, the larger the number of brands, the greater would be the total number of deals. The equations are jointly estimated using two stage least squares. The model results are in Table 3.

The R^2 for the discount frequency model is 0.54. Price elasticity is significantly positively related to discount frequency ($p < .05$). In addition, number of brands is strongly positively related to discount frequency, as expected.

The R^2 for the price elasticity model is 0.26. The results are the same as in Equation (6B). Promotional price elasticity is significantly higher in categories with higher advertising expenditures, consistent with the informative role of advertising.

Conclusion

Is advertising positively related to retail price promotion? Are nationally advertised categories also heavily price promoted at the retail level? We provide insights into these questions through theoretical and empirical analysis. Our research is triggered by the continuing controversy in the literature about whether advertising stimulates or suppresses retail price promotions. It parallels a much older debate in the literature about whether advertising provides useful information to consumers (Nelson 1970, Nelson 1974) or creates brand loyalty by brand differentiation (Comanor & Wilson 1974).

To gain insight into these issues, we develop a symmetric duopoly model that analyzes the relationship between advertising, trade promotion, and retail promotion. The analytical model shows that the relationship between advertising and retail price promotion depends on the role of advertising. If advertising differentiates brands and suppresses consumer response to retail price promotion, then the relationship is negative. That is, a higher level of advertising is associated with a smaller price discount and, possibly, less frequent price cuts. But, if advertising is informative enough to increase consumer response to retail promotions, then the relationship is positive. A higher level of advertising is associated with a larger price discount and, possibly, more frequent price cuts.

A follow-up empirical analysis shows a strong positive relationship between category advertising expenditure and size of retail price discount, and between advertising and discount frequency. These relationships are partly due to higher advertising being associated with higher promotional price elasticity. Thus our finding supports the informative role of advertising in the context of retail price promotions. It is also interesting to note that the informative theory

appears to be the "majority" view in the literature. Of the 18 studies listed in Table 1 of (Kaul & Wittink 1995), 9 support the informative theory, 7 support the market power theory, and 2 support both theories. Of the 11 studies listed in Table 1 of (Shankar & Krishnamurthi 1996), 5 support the informative theory, 3 support the market power theory, and 3 support both theories.

The implication for retailers is that they should, in general, be more willing to pass-through the trade deal offered by manufacturers and increase their frequency and depth of promotion for brands in highly advertised categories. If competition is predominantly across brands within a store, then, because advertising plays the informational role and increases price competition, manufacturers in highly advertised categories may need to offer greater trade deals in equilibrium.

Several limitations in our paper provide avenues for future research. On the analytical side, we have provided a parsimonious model for understanding the equilibrium relationship between advertising and retail promotion. The model can be extended in a number of ways to gain further insights. For example, we can relax the assumption of symmetry across competing brands, include store competition, and study situations with more than two brands.

Incorporating interstore competition is a particularly useful topic for future research. (Steiner 1973, Steiner 1993) argues that advertising may increase the salience of the brands and consumers will be attracted to stores that offer lower prices on these advertised brands. Therefore, stores compete on the basis of price and may promote advertised brands heavily, even if the manufacturers do not offer adequate trade deals. An extension of this logic is the notion of loss leader pricing. Popular brands are offered by the retailers at lower prices and used as loss leaders to build store traffic. Though past research indicates that brand switching within store accounts for the bulk of promotional sales, future analytical and empirical research can study the influence of store competition on the relationship among manufacturer advertising, trade promotion, and retail price promotion.

In our empirical model, we attempted to account for and eliminate potential loss-leader effect in the following way. It is reasonable to expect that price promotions intended to attract shoppers from other stores would be feature advertised. The Infoscan data set identified for each category the proportion of total price cuts that were featured and the average price cut during the featured periods. (About 20% of the price cuts are feature advertised.) From these data, we were able to calculate the discount size and discount frequency of unadvertised price cuts. If store competition is the dominant reason for the observed positive relationship between advertising and price discount, then if we exclude featured price cuts and consider only unadvertised price cuts, the positive relationship would not be observed. The correlation between manufacturer advertising and retailers' (unadvertised) discount size is 0.24, which is significant ($p < .05$), though slightly lower than 0.31 observed with all price cuts. The correlation between manufacturer advertising and retailers' (unadvertised) discount frequency is 0.57, which is also lower than 0.69 observed with all price cuts, but statistically significant ($p < .05$). In summary, by eliminating featured price cuts, we partially account for and eliminate store competition effect. Even after this adjustment, the relationship between advertising and discount size/discount frequency is positive, though the strength of the relationship is lower.

On the empirical side, our analysis is at the category level based on data from one year. Cross-category studies may be associated with potential endogeneity problems. We have attempted to address the endogeneity problem in several ways as described earlier. Nevertheless, some endogeneity problems may still remain unaddressed. Future researchers can test the robustness of the positive relationship between advertising and retail price promotion by analyzing brand-level data and by investigating how changes in advertising within a brand increases its promotional price sensitivity, deal depth and deal frequency.

We recognize that the data we use for empirical testing is somewhat dated, though we do not believe the relationship we explore is time-dependent. We were unable to obtain a more recent Infoscan Report on Trade Promotions, or a similar data set that provides information on the key variables of interest –discount depth, discount frequency, and promotional price elasticity at the category level measured in the same year for the same (national) market. Testing the relationships between advertising and retail promotion with a more recent data set would be a useful avenue for future research.

Finally, we are not able to test the results on trade deals (Lemma 2) due to lack of data. Empirical analysis of the relationship between manufacturer advertising and trade deal can provide useful insights into the manufacturer's advertising-price promotion tradeoff.

Notes

1. The demand function used by (Raju, Sethuraman & Dhar 1995) can be written as $q_i = 1 - p_i + \theta (p_i - p_i)$. Substituting $p_i = p_r - d_j$, $p_j = p_r - d_j$ and noting that p_r and θ are constant, we can rewrite the demand function as $q_i = q_r + p_i + \theta (d_i - d_j)$, where $q_r = 1 - p_r$.
2. The logic behind this assumption is that managers will take action if the expected profits exceed some threshold value (to cover investment costs or expected returns). The larger the profits, the more likely that the realized profit will exceed the threshold value.
3. It can also be shown that these results hold even if only one of the manufacturers is promoting in one

period instead of both manufacturers promoting in the same period.

4. Data sets are combined based on product nomenclature. In several cases, one-to-one matches are obtained. In some cases, where there is no clear match, we used our judgment in matching the categories by inspecting the brand names. Where there is some uncertainty about the match, those observations are deleted.

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