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The authors consider the effects of three marketing communication activities on nonproduct based differentiation. Specifically, they examine whether advertising, sales force, and promotion activities increase a firm's ability to differentiate and thus shield itself from future price competition. They suggest that own-price elasticity represents a measure of differentiation and examine the effects of marketing communication activities on own-price elasticities for a large number of consumer (durable and nondurable) businesses. They make a series of predictions about future differentiation outcomes based on the likely uniqueness of the communication message. The obtained results are compatible with their basic premise that, by providing unique and positive messages, a firm can insulate itself from future price competition, as witnessed by less negative future price elasticities. Conversely, results indicate that nonunique messages can decrease future differentiation, for example, price promotions for firms that price above the industry average lead to more negative future price elasticities.

Mastering the Mix: Do Advertising, Promotion, and Sales Force Activities Lead to Differentiation?

The task of the marketing manager is to develop and execute a marketing plan that makes the firm's product offerings both different from and superior to competitive offerings, thereby allowing the firm to shield itself from competition. One method of accomplishing this task is to design products with unique and desired attributes. However, once introduced to the marketplace, product design changes can be costly in terms of both time and money. Consequently, marketing managers often attempt to alter customer perceptions regarding the uniqueness and desirability of their existing product offerings via other elements of the marketing mix (e.g., advertising, promotions, personal selling). We focus on how and when these nonproduct activities lead to differentiation and therefore reduced price competition.

Marketing texts and the writings of practitioners often take the position that marketing actions such as advertising, promotions, and personal selling lead to increased differentiation. However, the empirical evidence for the efficacy of such beliefs is weak. Specifically, evidence on the effectiveness of sales force activities as a source of differentiation is almost nonexistent, and the results for advertising and promotion are equivocal. As discussed in more detail subsequently, some empirical studies suggest that increases in advertising expenditures increase differentiation (i.e., reduce price competition), whereas others report the opposite finding. For promotions, some studies suggest this marketing action has no effect on differentiation, whereas others suggest negative effects. No studies suggest that promotional spending yields positive differentiation benefits.

Not only is there equivocal empirical evidence, there also exist two conflicting economic theories on the relationship between marketing communications and differentiation. The first suggests that communications, per se, induce differentiation, thus reducing price competition and raising barriers to entry (Bain 1956). This theory is consistent with the generally held belief in marketing that communications help position a product, enhance its positive features, create a positive image, and generally influence consumers to purchase a product.

The second economic theory runs counter to the beliefs of most marketing practitioners by taking the view that because communications inform consumers about price and specific product attributes, these communications reduce consumers' search costs and thus differentiation (Nelson

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1974). More specifically, this theory holds that because consumers have more product information, price becomes a more salient and effective basis for product comparison. Consequently, the market becomes more responsive to price, leading to price competition and reduced differentiation.

In spite of the differing theoretical predictions about the effects of communications on differentiation (for more discussion of these economic theories see Comanor and Wilson 1979; Farris and Albion 1980; Tirole 1988), both schools of thought recognize that one can measure these predicted effects via the firm's own-price elasticity (Comanor and Wilson 1979). We elaborate on this link between elasticities and differentiation in the next section.

More recently, in discussing the concept of brand or corporate equity, Keller (1993) suggests that when consumers have positive, unique, and accessible associations with the brand or corporation, the firm can take marketing actions (such as increasing price) more effectively. In our research, we use this conceptualization to predict which of the two countervailing economic views of communication's impact on differentiation hold for a given situation. We do this by looking at the type of information normally communicated by advertising, promotions, and the sales force under three different conditions—when the firm's policy is to price (1) above the industry average, (2) equal to or somewhat below the industry average, and (3) far below the industry average. We then develop specific hypotheses for these price policy conditions with respect to when and if a firm's prior advertising, promotions, and sales force communications shield the firm from future price competition.

In testing our theory, we address two major analytic problems facing empirical work in this area. First, by using *prior* levels of marketing action activity to predict *current* firm price elasticity, we can ascertain causality better. This is important because a firm's current own-price elasticity affects its optimal level of advertising (Dorfman and Steiner 1954). Thus, showing that firms with high levels of advertising have more inelastic demand functions does not prove advertising causes less negative price elasticities, because firms with more inelastic demand should advertise at higher levels, all else being equal. Blattberg and Neslin (1990) express similar concerns about the possibility of reverse causality confounding interpretation of the effects of promotion spending. Specifically, they argue that weak brands (i.e. those brands with few unique, positive, and accessible associations) sometimes attempt to remain competitive by increasing promotion spending. If this is true, an analysis showing that firms that promote heavily in a given period also have more elastic demand functions in the same period cannot be used to prove promotions cause more negative price elasticities.

A second major analytic problem associated with empirically determining the effects of communication activities on market responsiveness to price involves the trade-off between the generalizability of the results and controlling for omitted variables. As we discuss subsequently, research on the effects of communications on price responsiveness ranges from experimental analysis for single brands to cross-sectional analysis across a wide variety of industries. The former approach allows tight controls for unmeasured factors, but may preclude generalizability. The latter yields results that hold for a wide range of situations but makes the estimated results susceptible to bias (Schmalensee 1989) due to a wide variety of unmeasured and uncontrollable effects (Boulding 1990; Jacobson 1990).

In our approach, we address the causality, unobserved variables, and generalizability problems by using a database that is both longitudinal and cross-sectional. The longitudinal aspect of the data enables us to address the causality problem directly by using temporally ordered variables. Specifically, we measure the effects of marketing actions taken in period t–1 on the firm's price elasticity at time t. Such an approach rules out reverse causality. The longitudinal nature of the data also enables us to minimize potential bias due to unobserved variables. This is done by utilizing an analysis technique that controls for all fixed, random, and first-order autoregressive unmeasured factors that could otherwise bias our obtained estimates.[1] Finally, the cross-sectional nature of the data enables generalizability because we test our hypotheses over a wide range of industries and situations. With this said, the reader should recognize that the findings we report represent the "average" result for businesses in our sample and exceptions certainly exist to the general results we obtain.

In summary, we set out to do the following:

1. Review prior empirical work assessing the relationship between marketing communication actions and market responsiveness to price and then provide a unifying explanation for the seemingly diverse set of findings regarding this relationship;
2. Clarify the concept of differentiation as viewed by an economist and a marketer;
3. Develop a theory of when marketing communications reduce or increase price elasticity in absolute value;
4. Use a known method for analyzing longitudinal/cross-sectional data, which directly addresses the issues of causality, generalizability, and omitted variables; and
5. Answer the question of whether prior expenditures on advertising, promotion, and sales force activities lead to more or less differentiation and thus higher or lower current levels of price elasticity.

A CONCEPTUALIZATION OF DIFFERENTIATION/

Our interest is in establishing the relationships between three types of marketing communications and the ability of a firm to differentiate its offerings from those of its competitors. To do this, we first must make explicit what we mean by differentiation. A standard marketing approach is to define differentiation in terms of the degree to which customers perceive the firm's offering to be different from that of the competitors'. Using this approach, differentiation is quantified using concepts such as perceptual space, product positioning, and multiattribute decision making.

Though such concepts are useful in helping firms differentiate their offerings, they do not provide an easy metric

[1]As a caveat, we note that our empirical analysis does not completely eliminate the possibility of unobserved variables biasing our estimates—no empirical analysis can make this claim. However, these unobserved variables must fall into some category other than fixed, random, or first-order autoregressive.

for determining the extent to which a firm successfully executes this task. Consequently, we take the approach of focusing on an "output" measure of differentiation, that is, the degree to which a firm is able to obtain high margins. Specifically, we use Lerner's (1934) definition of the degree of firm monopoly power, which, in economic terms, is synonymous with the degree to which the firm is differentiated (McTaggart and Mankins 1992). This leads us to denote the degree of differentiation to be D:

$$(1) \qquad D = \frac{P - MC}{P},$$

where P is price and MC is marginal cost. Thus, higher values of D imply a greater ability to obtain higher margins and therefore profits, all else being equal.

We choose this definition of differentiation for several reasons. First, it directly reflects economic value, that is, percentage of sales price that is profit before fixed costs. Second, Nicholson (1972) shows that for a profit-maximizing firm, this measure of differentiation is equal to the inverse of the absolute value of its price elasticity, that is,

$$(2) \qquad D = \frac{1}{|\varepsilon|},$$

where $\varepsilon = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q}$,

and Q is quantity.

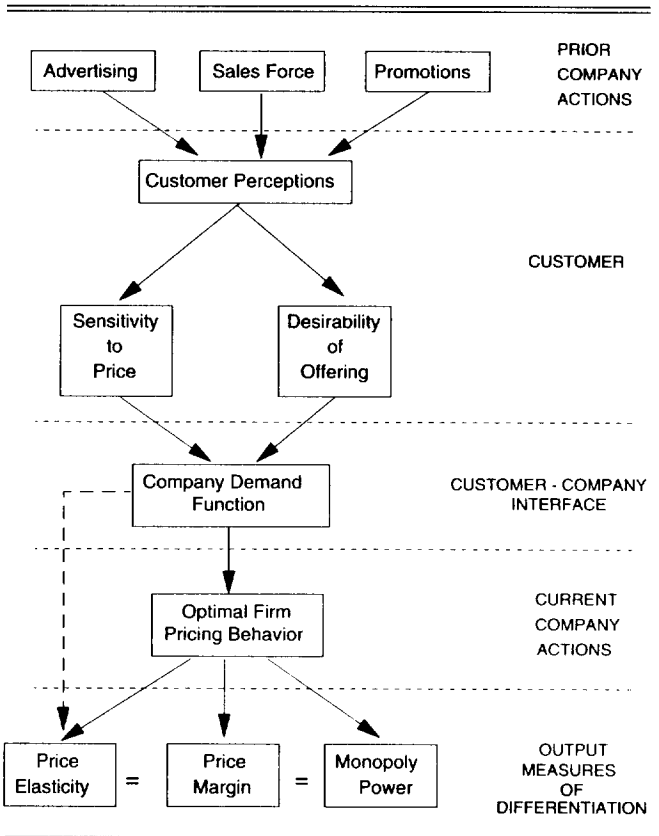
Thus, for firms in equilbrium, determining their price elasticity provides a direct measure of their degree of differentiation.[2] Consequently, a firm with a less price elastic demand function (i.e., a smaller absolute own-price elasticity) will be more differentiated and thus have the opportunity to earn higher margins and profits. Third, as discussed next, one can link our measure of differentiation with the firm's prior actions and the effects of these actions on customer perceptions.

Our general conceptualization of the link between the firm's communications and our measure of differentiation is summarized in Figure 1. We start with the basic marketing concept of differentiation by assuming that brands can be located in consumers' perceptual space (e.g., Hauser and Shugan 1983). Next, we observe that these locations in perceptual space influence both the brand's sensitivity of sales to changes in price and the overall desirability of the product at a given price. In combination, these two phenomena are reflected in the demand function facing the firm.

We operationalize the sensitivity of sales to changes in price (hereafter referred to as price sensitivity) as the slope of the demand function, that is, $\partial Q/\partial P$. Furthermore, we operationalize "desirability" as a shift term in the demand function. We assume that communications alter customer perceptions of a firm's offering and therefore these two aspects of a firm's demand function. More specifically, communication strategies alter a brand's position in perceptual space

[2]Ornstein (1975) also notes the relationships given in Equations 1 and 2. However, he cautions that these derivations are based on firm/market level analysis, and may not hold if one conducts industry level analysis. Importantly, our empirical results are not susceptible to this problem given the level of aggregation in our analysis.

Figure 1
A CONCEPTUAL MODEL OF NON-PRODUCT BASED DIFFERENTIATION



by either affecting the salience of a specific product dimension or changing the customer's perceptions of a brand along a dimension (Assael 1992). In both situations the intended result is to ensure that customers develop more positive and unique brand associations for the brand of interest. Such a conceptualization is compatible with the premise that if a firm is to obtain market power via differentiation, it must ensure that its offering possesses attributes that customers value and perceive to be unique and the competition either cannot or does not wish to match. This is also in concert with Keller's (1993) conceptualization of brand equity, which states that a brand has equity if consumers have positive, unique, and accessible brand associations.

We believe that if communication actions produce unique, positive, and accessible associations in the minds of the customers, they also will increase the customer's utility (i.e., desirability) for the brand, thereby shifting the firm's demand curve outward at a given price. The influence of communication messages on price sensitivity is less clear. This is because the message may stress price as well as nonprice information. In the former instance customers should become more sensitive to price changes, and in the latter, the reverse should hold. We discuss this issue subsequently in more detail.

Finally, we note that customers' perceptions of the firm's offering can be captured by two "output" measures—price sensitivity and desirability. These two measures in turn can

be expressed in terms of a single summary measure of the demand function facing a firm: own-firm price elasticity, a measure that captures both the level of and change in sales. It is this fact, along with the one-to-one correspondence between price elasticity and D (margin divided by price) that led us to our measure of differentiation. With this said, we note with some emphasis that price elasticity is not the same as price sensitivity. In discussing prior research findings we highlight the importance of this point.

In summary, we use price elasticity as our measure of differentiation because it represents an excellent output measure of the value of prior communication actions. Though this is more traditionally an economic view of differentiation, Figure 1 makes clear that the economic and marketing perspectives of product differentiation are not in opposition but simply represent different stages in the differentiation process. In particular, this discussion emphasizes the link between the input measures associated with positioning a brand to be unique on one or more desired product attributes and the output measures of being able to obtain higher margins (i.e., obtain higher values of D). Moreover, because firm profits are increasing in monopoly power (differentiation), all else being equal, it is not surprising that several prior studies have addressed the linkage between marketing actions and some measure of market response to price.

SYNTHESIS OF CURRENT KNOWLEDGE/ HYPOTHESIS DEVELOPMENT

Advertising Effects

We place prior research on the effects of advertising on market response to price into three groups: (1) naturally occurring cross-sectional experiments, (2) naturally occurring "within" experiments, and (3) controlled "within" experiments.

Several analyses have used a cross-sectional design to explore the linkage between advertising and price elasticity (or profit, because it is increasing with less negative price elasticities) over a range of firms or industries (e.g., see Comanor and Wilson 1974; Farris and Reibstein 1979; Lambin 1976; Porter 1976). Although these analyses used covariates to control for differences across the units of analysis, none of the previously cited cross-sectional studies could control for all unobserved variables that likely affect both the firm's sales and advertising and/or price levels. Thus, as noted previously, such analyses can yield biased estimates. Consequently, it is not surprising that these studies yield mixed results. Some indicate increases in advertising expenditures are associated with increases in the firm's price elasticity (or surrogates for price elasticity) and others show the converse.

Other sets of studies used a "within" analysis design to circumvent the problems of unobserved firm- or industry-specific effects by restricting attention to a brand, firm, or industry (e.g., Gatignon 1984; Kanetkar, Weinberg, and Weiss 1992; Simon and Kucher 1992; Wittink 1977). Although the within aspect of these studies controls for unobserved firm- or product category-specific fixed effects, these studies are still susceptible to unobserved random or autoregressive effects. Thus, it is not surprising that these studies show mixed results with respect to effects of advertising on price elasticities.

Finally, there is a set of fully controlled experiments that assess the effects of advertising on the market responsiveness to price. The first, conducted by Staelin and Winer (1976), reports the results of a heavy-up nonprice advertising experiment for a frequently purchased grocery product using split-cable television. They found a noticeable decrease in the absolute value of the firm's price elasticity in the "heavy-half."

A second heavy-up television advertising experiment was reported by Prasad and Ring (1976). Using different linear market share demand functions for the control and heavy-half groups they report the heavy-up sample yielded a more negative price coefficient. Some researchers have used these price estimates as evidence that increased advertising led to increased price sensitivity (e.g., Hauser and Wernerfelt 1989; Kanetkar, Weinberg, and Weiss 1992). We are unwilling to make such an inference because the two estimated demand models contain very different, and collinear, independent variables. Prasad and Ring also report comparable models across the two samples, though they do not include a main effect of price. Direct comparison of the price by television interaction across the two halves of the sample implies that the heavy advertising half was less price sensitive (i.e., the absolute value of the price by television interaction estimate is smaller for the heavy-up sample).

A third advertising study reported by Eskin and Baron (1977) involves four different controlled experiments in which both the product's nonprice advertising and price were varied (across city sites). Using a linear model, the authors find a statistically significant negative price by advertising interaction (i.e., higher advertising increases the negative effect of price on quantity sold) for three of the four products analyzed. Although the authors do not directly say this, their results have been interpreted by others to imply that heavier levels of advertising lead to increases in price sensitivity (e.g., Krishnamurthi and Raj 1985), or increases in the absolute value of the own-price elasticity (e.g., Hauser and Wernerfelt 1989).

Finally, Krishnamurthi and Raj (1985) present results from another controlled "heavy-up" split-cable nonprice advertising experiment. Using a log-linear demand model, their results indicate that increased advertising led to a significant decrease in responsiveness to firm price; that is, the own-price elasticity became less negative.

At first glance, these four controlled experiments do not appear to provide a consistent pattern of results. Due to estimation procedures, the Prasad and Ring results are subject to multiple interpretations. The other three studies appear to yield mixed results, with two brands showing a decrease in price elasticities and three brands showing an increase in price sensitivity with increased levels of advertising. We believe, however, that there is a unifying explanation for the results from these three studies. Both the Staelin and Winer and Krishnamurthi and Raj studies report that advertising decreases price elasticities in absolute value. In contrast, Eskin and Baron estimated linear demand models and re-

ported the price by advertising interaction coefficients. However, this is not the elasticity value of the effect but instead represents price sensitivity. This distinction is important, because price sensitivity captures only the slope of the demand curve and not the intercept. Thus, when the demand curve is linear (as it was in the Eskin and Baron study) and increased advertising results in increased sales (i.e., the linear demand curve is shifted outward) for all prices considered, the outward shifted demand curve is less price elastic regardless of the slopes of the two functions. (For a proof of this assertion, see Appendix A.) Interestingly, such an outward shift in demand occurred in the increased advertising condition at all levels of price tested for the three brands reporting increased price sensitivity. Consequently, even though the increased advertising increased price sensitivity, the net effect of the heavy advertising was to decrease the firm's price elasticity in absolute value. Thus, all three of the fully interpretable advertising experiments indicate that increased advertising leads the firm to be more differentiated—that is, have less elastic demand.

We believe the strongest evidence on the effects of advertising on price elasticities comes from controlled experiments. These results, all based on nonprice advertising, indicate support for the contention that advertising increases differentiation. These results are supported further by consumer-level laboratory experiments, which indicate that price elasticities decrease when consumers receive nonprice (brand names and quality ratings) information (Huber, Holbrook, and Kahn 1986; Sawyer, Worthing, and Sendak 1979). They are also compatible with the concept that successful brand positioning requires consumers to perceive the brand to be unique and superior on relevant product attributes. Thus, nonprice advertising messages should cause consumers to have more positive, unique, and accessible associations with the firm's offering. As a result of these associations, the firm will be less vulnerable to price competition.[3] As will become apparent when we discuss our data, we do not observe the actual content of the ads, only the pricing strategy of the firm. We use as our proxy for nonprice advertising the fact that the firm charges an above average price. Our logic in the use of this proxy is that firms are unlikely to draw attention to price in their advertisements if the firms' prices are higher than the industry average. Consequently, we state the following hypothesis in terms of firms charging above average prices and test this hypothesis using a sample of such firms.

H_{1a}: All else being equal, for firms charging above average prices, increases in advertising in period t–1 will result in more differentiation for the firm's product, that is, a less negative price elasticity in period t.

Thus far our discussion has concentrated on nonprice advertising. We next consider what happens when a firm decides to "compete on price" by making the price attribute more salient.[4] Can such a firm increase its differentiation while still increasing consumers' awareness and sensitivity to price?

To explore this issue, assume the firm has a low price relative to competition and faces the demand function $Q = a - bP$, where b captures the customers' sensitivity to price. Also assume that consumers treat price as one of the attributes of the product in determining their assessment of overall value (utility). Now let the firm reposition the brand by making price a more salient product attribute in the minds of customers. As a result, low price becomes a more valued attribute (i.e., it is weighted more than other attributes). Consequently, the low-priced brands increase in "value" relative to the high-priced brands. Let the net effect of this repositioning be to shift the firm's demand curve outward for all prices and increase the slope of the demand curve. Represent this outward shifted but steeper demand function as $Q = m(a + bP) + s$, where $m > 1$ and $s > 0$. Then the new price sensitivity, $\partial Q/\partial P$, is mb, and the new intercept is ma + s. Interestingly, even though the price sensitivity is larger (i.e., $mb > b$), as we show in Appendix A for this linear demand case, the absolute value of the price elasticity at any given price is lower. Thus, it is possible for a firm to position itself as the low-priced brand, make customers more sensitive to price, and still increase its differentiation (reduce its price elasticity)—provided the outward shift in demand is great enough.

Of course, the viability of this strategy rests on the firm being able to ensure that such a course of action is not matched by competitors; in other words, the communication must be unique. This suggests that only firms with a sustainable cost advantage can attempt such a strategy. Because at most one firm per market can have the low-cost advantage, we have mixed beliefs on the value of price advertising in achieving differentiation for the set of firms charging average or below-average prices. Although there may be instances in which a firm can use price advertising to compete successfully on value, it is also possible that low-price information will be matched by competition and not be unique. Moreover, given the possibility of price-quality covariation, a low-price message may lead consumers to make negative attributions for some or all of the nonadvertised attributes.

Given our data, we are unable to determine the content of the ad message or the sustainability of a firm's cost position within its industry. We certainly expect that some low-priced firms may utilize nonprice-based advertising. In addition, we can imagine instances in which firms with low prices use price advertising to obtain unique positioning successfully. However, we also believe instances exist in which firms unsuccessfully utilize a low-price message (i.e., prices are matched by competition). Because of these last two possibilities, we partition the average price and below group into two subsets. One subset is composed of

[3]We note the similarity of this prediction to conjectures made by Hauser and Wernerfelt (1989). They suggest that advertising used for positioning purposes (i.e., making the brand more unique) will decrease price sensitivity. Conversely, they suggest that "relevant set" advertising (i.e., making the brand less unique by emphasizing that it belongs within a set of brands) will increase price sensitivity.

[4]Treating price as an attribute in perceptual space is somewhat peculiar because price is also an element of the demand function. However, marketers often have included price as part of a customer's utility function (see almost any conjoint study). We find it useful to follow such a practice in the following discussion.

those firms charging very low prices relative to their industry average. In subsequent discussion we refer to this subgroup as the "lowest" price group, and make the (directly unverifiable) assumption that this group is most likely to consist of firms with a sustainable cost advantage relative to the other subgroups in our analysis. The second subset consists of the remaining firms in the average price and below grouping. In subsequent discussion we refer to this subgroup as the "average/lower" price group, and make the (directly unverifiable) assumption that these firms are unlikely to posess a sustainable low-cost advantage within their industries. The basis for these assumptions is that, all else being equal other than costs, equilibrium behavior suggests a one-to-one correspondence between prices and costs; that is, within an industry the lowest cost firm will have the lowest-price and so on.

We next state our hypotheses for these two subgroups. Not knowing the advertising content makes these hypotheses somewhat speculative. We believe that firms in both groups will use a mixture of price and nonprice communications. However, we note that a price message can lead to differentiation only if it is unique, that is, the firm has a sustainable cost advantage. Because we do not predict a sustainable cost advantage for the average/lower price group, advertising will be less effective, on average, as a source of differentiation for these firms relative to firms that do not feature prices in their advertising. Consequently, we state our hypothesis on the effects of advertising on price elasticities for firms in the average/lower price group relative to the effects for firms charging above average prices. Specifically,

H_{1b}: All else being equal, for firms in the average/lower price group, increases in advertising in period t–1 will result in less differentiation for these firms' products than for firms charging above average prices.

In contrast to the average/lower price group, both price and nonprice messages can lead to differentiation for the lowest price group. For firms in the lowest price group, a price message can constitute a unique and sustainable advantage. Consequently, we expect no difference in the effects of advertising on price elasticities for firms in the lowest price group relative to firms charging above average prices. More formally,

H_{1c}: All else being equal, for firms in the lowest price group, increases in advertising in period t–1 will result in the same level of differentiation for these firms' products relative to firms charging above average prices.

Promotion Effects

In contrast with the debate over positive or negative effects of advertising on differentiation, the debate over promotions seems to be whether they yield a negative effect. Many marketing practitioners and academics believe promotions communicate negative product associations. For example, Dodson, Tybout, and Sternthal (1978) postulate that the use of promotions lowers a consumer's brand evaluation. However, others argue that these effects, if present at all, are very short-lived (Davis, Inman, and McAlister 1992; Neslin and Shoemaker 1989).

The limited empirical findings provide results that support both points of view. Most of these studies are at an individual consumer level and employ within-brand or category analysis. Moreover, these studies differ from the advertising studies in that most do not look at the effects of promotions on price sensitivities directly, but rather some measure of the consumer's utility. For example, Guadagni and Little (1983), using a logit formulation, show that a household's utility decreases when the product is purchased on promotion. However, subsequent analyses of these data using a different estimate of loyalty (Lattin 1989; Srinivasan and Kibarian 1989; Tellis 1990) result in this effect being insignificant.

A second individual level analysis reported by Davis, Inman, and McAlister (1992) uses a controlled experiment to look at product evaluations before and after brands were promoted heavily. In all cases, no significant differences were found between changes in the control brand evaluations over time and changes in evaluations of the promoted brands over time. Thus, the authors conclude that "promotion does not have a negative effect on brand evaluation."

At a more macro level, Dodson, Tybout, and Sternthal (1978) look at panel data and conclude that the aggregate probability of repurchasing a brand decreases after it is promoted. Neslin and Shoemaker (1989) suggest that these findings could be because promotions attract a disproportionate number of buyers who have low off-promotion purchase probabilities. Thus, by aggregating across individuals, lower repeat purchase probabilities will be observed even though households do not change their evaluations of the product.

Finally, McAlister and Zenor (1992) report the results of an analysis of the effects of the magnitude of store-level promotional activity on the price elasticities of brand sizes within a particular retail chain. Using store-level scanner data, they find that when the retailer provided extraordinarily high levels of retail-level promotional support for a brand size (in terms of displays) over the given year analyzed, the absolute value of the price elasticity was larger than average for the brand size. Conversely, in situations in which the retailer provided extraordinarily low levels of retail-level promotional support for a brand size, the absolute value of the price elasticity was smaller than average. The authors, however, point out that their analysis is not able to determine cause and effect—in other words, did the retailer provide more promotional support because the store's customers are more sensitive to price changes or did the extra activity cause the customers to become more sensitive to price?

Given these mixed findings, we fall back to the concept of unique, positive product associations to make an unambiguous prediction regarding the effects of promotion on the firm's price elasticity. We start with the observation that promotional activities primarily communicate pricing information, that is, price reductions. We next consider the implications of this message for firms in our three price categories.

Firms that charge above average prices are assumed not to have a unique, sustainable price advantage. For these firms, promotional activities focus consumers' attention on

price, an attribute possessed by all brands. By providing such information, the seller lowers the customers' search costs, a factor believed to lead to lower differentiation (Nelson 1974). Also, even though lower prices are in general perceived to be better than higher prices, price reductions may convey negative associations, especially if price and quality covary in the minds of the customers. In summary, we see promotional activities making brand/firm price associations more salient and accessible. Such associations tend not to be unique and may not be all that positive for firms in the above average price group. Thus, for firms in this group, we predict decreases in differentiation due to promotional activity. More formally, this intuition leads to our second hypothesis:

H_{2a}: All else being equal, for firms charging above average prices, increases in promotions in period t–1 will result in less differentiation for the firm's products, that is, a more negative own-price elasticity in period t.

As noted in previous discussion, we do not expect firms in the average/lower price group to posess a sustainable cost advantage. As such, a price message from these firms would not result in unique, positive associations in the minds of consumers. Consequently, we expect no difference in effects of promotional activities on price elasticities for this group relative to the above average price group:

H_{2b}: All else being equal, for firms in the average/lower price group, increases in promotions in period t–1 will yield the same differentiation effects for these firms' products relative to firms charging above average prices.

In contrast, price-related promotional activity may provide unique and positive information if a firm has a sustainable competitive cost advantage. Because some firms in the lowest price group may have such an advantage, the effect of promotions on price elasticities should be more positive for this group than firms with above average prices. Thus, we postulate the following:

H_{2c}: All else being equal, for firms in the lowest price group, increases in promotions in period t–1 will result in less of a decrease in differentiation than for firms charging above average prices.

Sales Force Effects

To the best of our knowledge, no systematic empirical evidence exists on the effects of sales force expenditures on own-price elasticity, nor are there any specific theories regarding these effects. Consequently, we take as our starting point that the basic task of the sales force is to "close" the sale. If the price of their product is less than competitors' prices, salespeople will tend to stress this point in their communication activities. Alternatively, if the price of their product is higher than competitors, salespeople will in all likelihood focus on unique, value-adding nonprice features in their communication activities. Placed in the context of our conceptual framework, we conjecture that higher expenditures on nonprice-focused sales force activities should lead to more positive, unique, and accessible associations, and thus better isolate the firm from price competition. Thus, with a nonprice focus, we predict that increased differentiation due to communication activities holds. More formally,

H_{3a}: All else being equal, for firms charging above average prices, increases in sales force activities in period t–1 result in greater differentiation for the firm's products, that is, a less negative own-price elasticity in period t.

For firms with lower price policies, the degree of effectiveness depends on whether the pricing communications are viewed to be positive and unique. As noted before, we assume the sales force for below average price firms will tend to focus on price in their communications. On the basis of previously stated logic, these price-oriented messages will make the firm's future price elasticity more negative than if the messages were nonprice oriented unless the firm has a sustainable cost advantage. Because we do not expect firms in the average/lower price group to possess such a cost advantage, we postulate the following:

H_{3b}: All else being equal, for firms in the average/lower price group, increases in sales force activities in period t–1 will result in less differentiation for these firms' products than for firms charging above average prices.

In contrast, firms in the lowest price group may have a sustainable cost advantage. If so, price messages for these firms should result in no less differentiation than nonprice messages produce for firms charging above average prices:

H_{3c}: All else being equal, for firms in the lowest price group, increases in sales force activities in period t–1 will result in the same level of differentiation for these firms' products relative to firms charging above average prices.

All these hypotheses derive from our beliefs about message content and uniqueness for the three communication activites and price groups. To assist the reader in sorting out these hypotheses, Table 1 provides a summary of these beliefs and the resulting testable predictions.

DATA AND MODEL

We use the PIMS database to test our hypotheses. The cross-sectional aspect of the database enables us to develop generalizable results, and the time-series dimension enables us to address the unobserved variable problem and the causality issue. We select as our sample all consumer goods manufacturers, because advertising, promotion, and sales force activities are frequent elements in the marketing mix for these types of businesses. This results in a sample consisting of 4789 observations (before estimation).

As stated previously, PIMS provides no information as to the content of the communications activities. However, we do have information on the firm's price level relative to competition. We make the logical assumption that firms charging above average prices are likely to use nonprice appeals in their advertising copy and sales force presentations. Similarly, we argue that firms with high relative prices use promotions to compete on price whenever necessary and thus, when used, promotions make price a more salient attribute. With respect to firms with average or below average prices, we acknowledge that they are more likely to feature price in their communications because it has the potential of being a superior attribute (relative to competition). However, it is also possible for them to use nonprice attribute communciations. Finally, we assume that firms charg-

Table 1
SUMMARY OF HYPOTHESIZED EFFECTS

Firm's Pricing Position	*Communication Activity*	*Conjectured Message Content*	*Conjectured Uniqueness (Sustainability)*	*Implied Result*	*Outcome Designation*
Above avg.	advertising	nonprice	likely	increased differentiation	A
	sales force	nonprice	likely	increased differentiation	B
	promotion	price	not likely	reduced differentiation	C
Avg./lower	advertising	nonprice/price	nonprice—likely if price—not usually	less than A	D
	sales force	mostly price	nonprice—likely if price—not usually	less than B	E
	promotion	price	not likely	same as C	F
Lowest	advertising	nonprice/price	nonprice—likely if price—likely	same as A	G
	sales force	price	likely	same as B	H
	promotion	price	likely	more than C	I

Hypotheses

H_{1a}: A > 0	H_{1b}: D < A	H_{1c}: G ≈ A
H_{2a}: B > 0	H_{2b}: E < B	H_{2c}: H ≈ B
H_{3a}: C < 0	H_{3b}: F ≈ C	H_{3c}: I > C

ing the lowest prices are most likely to have a sustainable cost advantage.

We acknowledge that though perhaps logical, these assumptions are not directly testable using PIMS data. However, we can indirectly test our "communication content" and "sustainable cost advantage" conjectures. In particular, we can see whether the obtained results for the three price samples are consistent with all parts of our hypotheses. Consequently, we partition our sample by the business unit price relative to the average competitive level in its served market. This results in a sample of 446 above average price business units, an average/lower price group of 297 business units, and 83 business units in the lowest price group.[5]

Unit of Analysis

Because we use PIMS data, we explore the impact of business unit actions on business unit price elasticity. Thus, our unit of analysis is less macro than that of those who study firm or industry effects (e.g., Comanor and Wilson 1974; Porter 1976) but more aggregated than that of those researchers whose unit of analysis is the brand (e.g., Lambin 1976; Krishnamurthi and Raj 1985; Wittink 1977) or store-brand size (McAlister and Zenor 1992). We acknowledge that a business unit may have more than one branded product, and thus the aggregated demand function we estimate is an amalgam of the individual product demand functions. However, this aggregated function still provides insights into the effects of the firm's past actions on its ability to raise its average price in the future. Also, such an aggregation has an advantage in that it does not force us to allocate marketing action expenditures arbitrarily to specific brands in situations in which the business unit's communication messages affect the customers' perceptions for more than one brand.

[5]The lowest price group consists of business units in the bottom 10% of our sample in terms of prices relative to the industry average.

Demand Model

We follow the lead of Krishnamurthi and Raj (1985) and assume a firm's demand can be represented in terms of a constant price elasticity model. We expand on this formulation in two ways. First, we allow each firm to have a unique price elasticity. Second, we allow the firm's demand in period t to be shifted by (1) a vector of specific observed firm actions X_{it} (i.e., advertising, sales force, and promotion activities) and unobserved fixed firm actions α_{2i}* (e.g., product design, quality, channel structure); (2) observed competitive factors C_{it} and unobserved fixed competitive factors γ_{2i}*; and (3) a vector of other unobserved fixed factors F_i* and an unobserved stochastic factor ϵ_{it}. More formally, we represent the firm's demand as

$$(3) \qquad Q_{it} = P_{it}^{\beta_0 + \beta_1 X_{it-1} + \beta_{2i}^* e^{\alpha_1 X_{it} + \alpha_{2i}^* + \gamma_1 C_{it} + \gamma_{2i}^* + F_i^* + \epsilon_{it}}}$$

where Q_{it} is the quantity sold in units for firm i at time t, P_{it} is the firm's average price for these units, and ϵ_{it} is assumed to be i.i.d. We later relax this stochastic error assumption by testing for a first-order autoregressive process, that is, $\epsilon_{it} = \rho\epsilon_{it-1} + u_{it}$, $-1 < \rho < 1$, and u_{it} is assumed to be i.i.d.

Equation 3 has two important characteristics. First, it partitions a firm's price elasticity into two components. The component $\beta_0 + \beta_1 X_{it-1}$ captures the average price elasticity for any firm with past communication actions X_{it-1}, and the term β_{2i}* captures the firm-specific component of the price elasticity. In this way we acknowledge that every firm can have a completely unique price elasticity (although Equation 3 makes the implicit assumption that all firms have the same form of demand function). We use the first component to test directly whether the average firm's price elasticity is affected by past marketing actions. We do this by assessing the sign and magnitude of the coefficient vector β_1. We control for the unobserved component β_{2i}* by using instrumental variables.

Second, by including α_{2i}*, γ_{2i}*, F_i*, and ϵ_{it} in the demand function, we explicitly acknowledge that factors other than the observed measures (i.e., X_{it} and C_{it}) affect the

firm's demand. Examples of such unobserved factors might be special product characteristics (captured by α_{2i}*), special characteristics associated with the competitive environment (captured by γ_{2i}*), the firm's managerial expertise (captured by F_i*), and random shifts in the competitors' prices (captured by ϵ_{it}). The challenge during estimation is to control for these factors, because none of them is observed. We control for α_{2i}*, γ_{2i}*, and F_i* by deriving estimation equations that do not include any of these fixed, but unmeasured, factors. We eliminate potential bias from the stochastic error via instrumental variables, that is, two-stage least squares estimation.

Empirical Model

We do not estimate Equation 3 directly for two reasons. First, as alluded to previously, many of the factors postulated to affect demand are not directly available from the PIMS data. Any attempt to estimate Equation 3 that ignores these unmeasured factors could lead to biased estimates of the measured factors. However, as shown by Boulding and Staelin (1990, 1993), it is a straightforward procedure when using longitudinal data to remove or control for unobserved variables that are fixed, random, or first-order autoregressive. Because this technique is explicated elsewhere, we only briefly state how this is accomplished.

A second reason for not estimating Equation 3 directly is that the PIMS data do not contain direct measures of Q_{it} or P_{it}. This is because PIMS firms were unwilling to divulge accounting information such as prices, profits, and sales. The solution to this resistance was to ask each participating business unit to multiply all dollar values by a unique, firm-specific constant. For years, researchers interested in using PIMS financial measures removed this firm-specific factor by employing ratios of two financial measures, thereby "cancelling out" the firm-specific disguise factor. Recently, however, two different approaches have been proposed for removing this disguise factor. Importantly, these approaches enable one to directly incorporate nonratio financial measures into the analysis while still preserving the confidentiality of an individual firm's proprietary information. One approach, devised by Hagerty, Carman, and Russell (1988), uses a log transformation in conjunction with firm dummy variables to control for the firm-specific disguise factor. A second approach, originally proposed by Moore and Boulding (1987) and implemented by Boulding and Staelin (1990, 1993) and Boulding and Lee (1992), uses a combination of log and differencing transformations to remove the disguise factor. Here, we use the latter approach.

To explain this procedure better, we use an accounting measure available in the PIMS data, disguised total revenue (DTR_{it}). This measure is identical to D_i*TR_{it}, where D_i is the (unknown) disguise factor for firm i and TR_{it} equals actual total revenue (i.e., $DTR_{it} \equiv D_i$*TR_{it}). Taking logs and first differences, it is easy to show that $\ln TR_{it} - \ln TR_{it-1} \equiv \ln DTR_{it} - \ln DTR_{it-1}$, that is, the measure of the difference of the logs of the actual total revenue of a firm equals (and thus can be measured by) the difference of the logs of the disguised measures.

Following this general procedure of taking logs and then first differencing, Boulding and Staelin (1993) and Boulding and Lee (1992) show

$$(4)\quad \ln Q_{it} - \ln Q_{it-1} \equiv \ln DTR_{it} - \ln DTR_{it-1} - \ln PI_{it} + \ln PI_{it-1}$$

$$(5)\quad \ln P_{it} - \ln P_{it-1} \equiv \ln PI_{it} - \ln PI_{it-1},$$

where DTR_{it} and PI_{it} are measures available in the PIMS data, and PI_{it} is the firm's price index representing the ratio of the firm's current price compared with the firm's base price, that is, $PI_{it} = P_{it}/P_{i\,Base}$. Consequently, the log of price can be written as

$$(6)\quad \ln P_{it} = \ln PI_{it} + \bar{K} + K^*_i,$$

where K_i* equals $\ln P_{iBase} - \bar{K}$ and is an unobserved firm-specific constant, and $\bar{K}$ is the average of $\ln P_{iBase}$ over the total sample.

We use these relationships and the approach outlined by Boulding and Staelin (1990) to simultaneously remove the influence of the fixed (unobserved) effects, α_{2i}*, γ_{2i}*, and F_i* and the disguise factor, D_i. We do this by taking logs and first differences of Equation 3, yielding

$$(7)\quad \ln Q_{it} - \ln Q_{it-1} = \beta_0(\ln P_{it} - \ln P_{it-1}) + \beta_1(X_{it-1}\ln P_{it} - X_{it-2}\ln P_{it-1}) + \beta_{2i}\text{*}(\ln P_{it} - \ln P_{it-1}) + \alpha_1(X_{it} - X_{it-1}) + \gamma_1(C_{it} - C_{it-1}) + \epsilon_{it} - \epsilon_{it-1}.$$

Substituting the righthand sides of Equations 4, 5, and 6 into Equation 7 yields an equation devoid of the fixed effects and in terms of all observable factors, except K^*_i, β_{2i}* and ϵ_{it} and $i\epsilon_{t-1}$, that is,

$$(8)\quad \ln DTR_{it} - \ln DTR_{it-1} - \ln PI_{it} + \ln PI_{it-1} = \beta_0(\ln PI_{it} - \ln PI_{it-1}) + \beta_1(X_{it-1}\ln PI_{it} - X_{it-2}\ln PI_{it-1}) + \alpha_1(X_{it} - X_{it-1}) + \gamma_1(C_{it} - C_{it-1}) + \beta_1\bar{K}(X_{it-1} - X_{it-2}) + \omega_{it},$$

where ω_{it} is a new error term equal to $\beta^*_{2i}(\ln P_{it} - \ln P_{it-1}) + \beta_1 K^*_i(X_{it-1} - X_{it-2}) + \epsilon_{it} - \epsilon_{it-1}$.

Equation 8 is our estimation equation. As such, several features need further discussion. First, note that this estimating equation enables direct estimation of our parameters of theoretical interest, β_0 and β_1, found in the structural model given by Equation 3. However, because the error term, ω_{it}, contains unobserved effects that might be associated with the independent variables in Equation 8, none of these estimates are assured of consistency unless we control for potential correlation of our regressors with this error. Because our interest is primarily in the price elasticity effects (i.e., β_0 and β_1), we center our attention on getting consistent estimates of these two coefficients.[6] We do this by instru-

[6]We do not use instruments for the other terms (i.e., $(X_{it} - X_{it-1})$, $(C_{it} - C_{it-1})$ and $(X_{it-1} - X_{it-2})$) even though a Hausman test (1978) indicates that they are endogenous. When we did instrument these terms, the standard errors for all the coefficients became large. This is mainly because we needed to rely on the same information for all our instruments. Moreover, if we treat these three terms as part of the error term, we substantially decrease the efficiency of our estimating equation. Consequently, we took the pragmatic approach of acknowledging that we possibly have biased estimates for the (uninteresting) coefficients of α_1 (the main effects for the current marketing communication variables), γ_1 (the main effects for competitive conditions), and $\beta\bar{K}$ (the joint effect of the interaction variable of interest and the mean level of $\ln P_{iBase}$ over the total sample). However, in doing so we obtain consistent and efficient estimates of the price elasticity coefficients of theoretical interest in this research.

menting the price and price interaction terms using instruments from period t–2 and earlier (i.e., we use two-stage least squares estimation in which price and the price interaction terms are considered endogenous). This ensures independence of the price terms in the model from the two stochastic error components and the unobserved firm-specific price component (i.e., the term $\beta^*_{2i}(\ln P_{it} - \ln P_{it-1})$). However, such a procedure does not guarantee consistency because ω_{it} potentially contains information from t–2 (i.e., the term $\beta_1 K^*_i(X_{it-1} - X_{it-2})$). Consequently, we later test whether our instrumental variable estimates based on the t–2 instruments suffer from exogeneity bias. We also later test whether our "random" error factors contain an unobserved dynamic process that is first-order autoregressive.

In summary, the procedure outlined previously does the following:

1. Enables us to use financial measures not directly measured by PIMS as both independent and dependent variables;
2. Removes the effects of the unobserved fixed factors α_{2i}^*, γ_{2i}^*, and F_i^* through first differencing;
3. Controls for the effects of unobserved random factors by using instrumental variables;
4. Enables us to test for exogeneity bias and a first-order autoregressive error structure.

The price one must pay to accomplish this is to "throw out" data. As noted, we start out with 4427 observations. After controlling for fixed and random unobserved factors, we are left with 2774 observations.[7] If exogeneity bias exists due to use of t–2 instruments, the solution (use of t–3 instruments) entails losing an additional observation for each business unit. Similarly, if a significant autoregressive process exists, the solution (ρ – differencing the data) again entails losing an additional observation for each business unit.

Independent Measures Other Than Price

PIMS contains two different measures of the SBU's communication activities. The first is total dollar expenditures (disguised) for advertising, promotion, and sales force activities. The second is the business unit's expenditure level relative to the average competitive level for these activities measured on a 5-point scale. We elect to use the latter measures because our conceptualization of how a firm's marketing actions affect market response to price operates through consumers' associations. Because these associations occur within the context of competing messages, the relative measures seem more appropriate. Such a conceptualization is compatible with empirical results showing that the effects of firm advertising (Gatigon 1984) and promotions (Kahn and Louie 1990) are moderated by competitive actions.

In Equation 3 we make the arbitrary assumption that past marketing actions are subscripted as period t–1. In our database this represents a year lag. However, it is possible that this lag is too long (or too short). Common sense drives us to believe that customers' associations are most affected by expenditures made within the last few months. Because our measures are annual, we approximate expenditure levels of less than a year old by a weighted average of this year's and last year's expenditures. Given the infinite number of weighting schemes one could use, we somewhat arbitrarily pick three: (1) 100% weight on the current year expenditures (current model); (2) equal weight on the current and prior year expenditures (half-year lag model); and (3) 100% weight on prior year expenditures (one-year lag model).[8]

Equation 3 also acknowledges the impact of industry-wide marketing factors on the firm's demand. As noted previously, the estimating equation controls for all such effects that are fixed over time. Thus, we need concern ourselves only with changes in environmental and competitive factors. Factors that come to mind are changes in consumers' taste for the product class, demographic trends, and economic cycles. Because these factors are expected to affect the sales of all the competitors in the industry in the same direction, we include the dollar sales of the firm's competitors to capture such effects. Although this variable is disguised, the log-first difference transformation eliminates the disguise factor.

Finally, note that we state the b and c portions of our hypotheses as contrasts to the above average price group. Consequently, we modify Equation 8 so we can test simultaneously all nine of our hypotheses. We do this by including all the variables specified in Equation 8 as well as interacting these variables with dummy variables that reflect whether the business unit is in either the average/lower or lowest price groups, and then estimating this modified Equation 8 over the total sample of business units. Consequently, the coefficients not interacted with these dummy variables represent the estimates for firms charging above average prices, and the variables interacted with the dummy variables represent the difference in estimates for the average/lower and lowest price firms relative to the above average price firms.[9] The above average price estimates enable us to test H_{1a}–H_{3a}, the average/lower price change estimates enable us to test H_{1b}–H_{3b}, and the lowest price change estimates enable us to test H_{1c}–$H3_c$. These estimates are reported in Table 2.

Results

Our primary interest is in the sign and magnitude of the β coefficients, especially the individual elements of the β_1 vector (i.e., the three interaction coefficients) found in Equation 3. As discussed previously, we can obtain consistent estimates of these parameters by estimating Equation 8 after instrumenting the price regressors, assuming that there is no significant unobserved autoregressive process or correlation between the instrumented price regressors and our estima-

[7]To reduce ambiguity about a business unit's pricing policy, we omit 175 observations in which the business unit changes from above average to below average price (or vice versa) in consecutive years. Including these observations does not change signs or significance levels of the estimates.

[8]Note that in the current model the price elasticity becomes $\beta_0 + \beta_1 X_{it} + \beta_{2i}^*$ (versus $\beta_0 + \beta_1 X_{it-1} + \beta_{2i}^*$). Substituting through results in the coefficient for the regressor $(X_{it} - X_{it-i})$ being $\alpha_1 + \beta_1 \bar{K}$ in Equation 8 (versus α_1). As a result, there is no direct estimate for the main effect of the current marketing actions, that is, α_1. This is also true for the half-year lag model.

[9]Note that one can calculate the actual estimates for the nonhigh price groups by summing the change estimates with the above average price estimates. Standard errors for these summed coefficients are available from the authors on request.

Table 2
ESTIMATES OF STRUCTURAL PRICE ELASTICITY PARAMETERS FROM EQUATION 3[a,b]

	Model Lag Structure								
	One Year			*Half Year*			*Current*		
Price Coefficients[c]	*Above Avg. Price*	*Avg./Lower Price Chg.*	*Lowest Price Chg.*	*Above Avg. Price*	*Avg./Lower Price Chg.*	*Lowest Price Chg.*	*Above Avg. Price*	*Avg./Lower Price Chg.*	*Lowest Price Chg.*
Price Main Effect (β_0)	−2.280*** (.697)	1.165 (1.330)	−.438 (1.992)	−2.294*** (.708)	1.146 (1.365)	.533 (1.853)	−2.297*** (.710)	1.048 (1.376)	1.665 (1.833)
Interactions: (β_1)									
Advertising	.149* (.116)	−.131 (.204)	.155 (.273)	.220** (.124)	−.179 (.231)	−.022 (.300)	.292** (.127)	−.223 (.255)	−.236 (.308)
Promotion	−.237* (.145)	−.067 (.260)	.656** (.329)	−.280** (.146)	−.041 (.266)	.549** (.326)	−.310** (.143)	−.016 (.266)	.438* (.311)
Salesforce	.412*** (.171)	−.506* (.332)	−.227 (.475)	.391** (.178)	−.477* (.355)	−.306 (.509)	.349** (.182)	−.421 (.372)	−.375 (.518)
Overall model $F_{33,2741}$[c]		23.7***			23.6***			23.6***	

*significant at .10 level.
**significant at .05 level.
***significant at .01 level.
[a]Standard errors in parentheses.
[b]Main effects for current and lagged advertising, promotion, and sales force activities, along with $ sales of competitors, are not reported because they are either uninterpretable reduced forms or potentially biased estimates. These estimates are available from the authors on request.
[c]We do not report R^2 values because estimation prevents this statistic from being fully interpretable.

tion error term. With respect to the first point, no estimated value of ρ (see Boulding and Staelin 1993 for details on this procedure) in the three models presented in Table 1 is significantly different from zero (Current: $\chi^2s_1 = .75$; "Half-lag": $\chi^2_1 = 1.76$; One year lag: $\chi^2_1 = 1.76$). Another concern for the one-year and half-year lag models is the possibility of exogeneity bias.[10] We test for this by seeing if the instrumental variable estimates based on three-year lags, which guarantee independence from our empirical model error term, reach significance when included in a model containing the instrumented variables based on two-year lags (Hausman 1978). Given this lack of significance (Half-year lag: $F_{4,1216} = .63$; One-year lag: $F_{4,1216} = .44$), we feel comfortable using instruments based on periods t–2. Such a procedure helps maintain adequate sample sizes.

Before reporting on our hypotheses, we note that the price elasticity estimates compare favorably with price elasticities reported in the literature (e.g., for the average business unit in the above average price sample this value equals –1.3). Neslin and Shoemaker (1983) summarize a variety of studies and report an average elasticity associated with experimental work equal to –1.74, and an average elasticity associated with time-series analysis equal to –1.90. Using a meta-analysis of price elasticities, Tellis (1988) reports a mean elasticity of –1.76, a mode of –1.6, and a standard deviation of 1.74. For a sample of 203 PIMS business units, Hagerty, Carman, and Russell (1988) report a price elasticity of –.99 with a coefficient of variation equal to 2.00. Consequently, we find our price elasticity estimates consistent with prior empirical research.

[10]In the "current" model the term $\beta_1K_i*(X_{it-1} - X_{it-2})$ (which appears in the one-year lag estimation error term) becomes $\beta_1K_i*(X_{it} - X_{it-1})$, that is, there is no longer information from t–2 in this term.

With respect to our hypotheses, we start by examining the "Above Average Price" columns in Table 2, which enable us to test H_{1a}–H_{3a}. These results indicate that, independent of the lag structure specification, advertising and sales force expenditures significantly decrease the negativity of the own-price elasticity, and promotion expenditures increase the negativity of the price elasticity. Interestingly, the magnitude of the effects for advertising and promotion decrease with the length of the lag used, and the sales force effect increases. To see whether we can infer anything from this pattern, we test whether the current effects differ significantly from the full-year lagged effects. We do this by comparing the half-year estimates, which constrain the current and lagged effects to equality, with a model containing both current and lagged interaction effects. We reject the constraint of equality at the .10 level ($F_{6,2753} = 1.93$). Thus, it appears that current advertising and promotion activities are more likely to affect customers' perceptions, whereas sales force communications have stronger long-term effects. Perhaps more importantly, in spite of the conclusion that these effects change with the lag structure, we note the consistent direction of the effects. This consistency suggests that the "current effect" estimates are not totally due to the reverse causality arguments appearing in the literature.

The "Average/Lower Price Change" columns in Table 2 enable us to test H_{1b}–H_{3b}. Specifically, these hypotheses suggest advertising and sales force activities should produce less differentiation, and promotion activities should show no difference in differentiation when contrasting average/lower price group effects to the above average price group effects. Thus, the advertising and sales force coefficients in these columns should be negative, and the promotion coefficients should be zero. The last hypothesis is somewhat

problematic, because it implies accepting a null result as support for the hypothesis. With this said, the results in Table 2 indicate that promotion coefficients in the "Average/Lower Price Change" columns cannot be distinguished from zero. We also find, as expected, that the advertising and sales force coefficients are negative. However, only the sales force coefficients reach significance. We believe that the lack of significance on the advertising coefficients indicates that at least some average/lower price firms successfully used advertising to establish positive and unique associations (e.g., they engaged in nonprice advertising) in consumers' minds. Finally, we again note the consistency of results across the three lag structure specifications.[11]

The "Lowest Price Change" columns in Table 2 enable us to test H_{1c}–H_{3c}, which suggest no change in differentiation effects for advertising and sales force activities, whereas promotion activities should produce increased differentiation in contrast to the above average price group. Thus, the advertising and sales force coefficients in these columns should be zero, and the promotion coefficients should be positive. Again, we note the difficulty of accepting null results. However, none of the advertising and sales force coefficients in these columns can be distinguished from zero. We also find significant support for our prediction of a positive promotion coefficient. These results hold across all lag structure specifications.

DISCUSSION

We evaluate the impact of communication activities on differentiation by asking whether these activities yield accessible, positive, and unique associations in the minds of consumers. All three communication activities we consider are designed to increase the accessability of consumer associations. Also, we assume the senders choose messages they perceive to be positive. Thus, the key question is whether the message is perceived to be unique by the receiver. Using a price partitioning of our sample we make conjectures with respect to message content and the likelihood that this content will be unique. As a caveat, we note that these conjectures are directly unverifiable. However, they lead to nine precise predictions that can be tested in our empirical analysis. All six of the directional predictions are supported, five with significance. In addition, we accept all three of our null predictions. This increases our confidence about our conjectures. As a further caveat, as noted previously, our results represent average effects and therefore may not hold in every instance. However, we stress that the obtained results are compatible with our basic premise that by providing unique and positive messages a firm can insulate itself from future price competition, as witnessed by its ability to get higher future price margins.

We believe the substantive implications of our research are of great interest in that they provide significant support for the belief that when firms increase their unique communication activities this leads to a future increase in brand differentiation. Conversely, when firms increase their nonunique communication activities, this leads to a future decrease in brand differentiation. Importantly, these findings extend the previously reported experimental results associated with a few consumer nondurable package goods to a wide range of consumer goods businesses and situations, that is, both nondurables and durables. Our work also extends the scope of communication activities considered. Most prior research examines effects of advertising and promotion activities on future price responsiveness. We expand this set to include sales force activities. Also, unlike prior cross-sectional analyses, our analysis controlled for any omitted fixed, random, or first-order autoregressive factor. Consequently, we can ascertain that our findings are not due to such omitted variables. Furthermore, because we use lagged measures for the marketing actions, we can confidently rule out the reverse causality explanation, that is, the price elasticities caused the marketing actions. Our use of lagged marketing actions also enables us to state unambiguously that short-term actions have long-term implications.

Our results extend prior research in this area in another important way: They indicate that differentiation is less a function of whether message content is price or nonprice than of message uniqueness. For example, Table 1 indicates that a price-oriented message for all three communication activities for the lowest price group is likely to be unique because this group is assumed to have a sustainable low-cost advantage. In support of this conjecture we find that advertising and sales force activities for this group are no different in terms of yielding differentiation than the advertising and sales force activities for the above average price group. Furthermore, promotion activities for the lowest price group enhance future differentiation relative to the above average price group. This is because, as Table 1 indicates, the promotion message is price oriented for both these groups, but unique only for the lowest price group.

Our results also highlight the dangers of a price message that is not unique. Table 1 indicates that this is most likely to happen for promotion activities in all but the lowest price group and for sales force activities in the average/lower price group. The results reported in Table 2 provide support for both of these conjectures.[12]

Overall, what are the strategic implications of our results? First, as a caveat, our analysis does not consider fully intertemporal issues in profit maximization. Thus, for example, it is possible for a profit-maximizing firm to determine that its optimal decision is to increase its promotion expenditures in period t to enhance market expansion, even though such a decision will increase its price elasticity in subsequent periods. More generally, if firms are out of short-run equilibrium, then Equation 2 does not hold—that is, the firm's price elasticity is not an equivalent measure of differentiation. However, we reduce the possibility of out-of-equilibrium behavior affecting our estimation by limiting our sample to observations in which the business unit maintains the same pricing policy (i.e., above versus average or below) at times t and t–1. Furthermore, in spite of these caveats, the research herein makes clear that when a firm evaluates the implications of an advertising, sales

[11]For the "current" lag structure, the sales force coefficient falls just outside the .10 level of significance ($p = .13$).

[12]Summing together the above average and average/lower price sales force coefficients indicates that sales force activities for the average/lower price group reduce future differentiation.

force, or promotion action, it also must consider the long-term implications of this decision. A clear implication of this research is that marketing communication activities do alter the firm's subsequent ability to insulate itself from price competition.

We conclude by putting our conceptualization and empirical findings into context. We note that our conceptualization explicitly delineates two types of effects that a communication can have when it alters a brand's positioning. First, it can affect the desirability of the brand relative to other competitive offerings. Second, it can affect the salience of price and thus the brand's price sensitivity. Managers (and researchers) often evaluate the effectiveness of a communications campaign in terms of the main effects of the campaign (i.e., the shift in demand). However, this focus can be highly misleading. Our conceptual model of differentiation indicates that managers also must consider the long-term effects of the campaign on price sensitivity, because both desirability and price sensitivity affect the firm's ability to earn future profits. Therefore, managers should not isolate their attention on shifts in demand. Instead, as we show, they should use a measure such as price elasticity, which captures the influence of both desirability and price sensitivity.

With respect to empirical findings, our results certainly will add fuel to the fire for the argument that advertising activities are undervalued relative to promotional activities given a long-run view. However, our long-run effect is somewhat different than that normally considered when comparing the value of advertising and promotion activities. The typical argument has been that advertising yields longer carryover effects than promotions. Consequently, the reasoning goes that one should use a longer time horizon to evaluate advertising effects relative to promotion effects. Our results, however, imply that for firms pricing above the industry average current advertising (and sales force) activities increase future differentiation and decrease future price competition, whereas current promotion activities decrease future differentiation and increase future price competition. Thus, though the carryover issue addresses the relative size of main effects due to marketing actions, our research addresses the net effects of these actions on both price sensitivity and shifts in demand, and thus the firm's ability to insulate itself from future price competition.

With respect to sales force communication implications, our results highlight an important control function in sales force management. Given downward sloping demand and a below average price position, sales force members will want to call attention to price in their communication activities. However, unless the price position is unique, the communication activity will not provide future differentiation benefits. Therefore, managers should consider how to get sales force members to understand and communicate the unique selling proposition for the firm and not rely on a nonunique, price-oriented message.

As a final cautionary note, this research does not give credence to unconditional statements, such as "advertising and sales force activities are good" and "promotions are bad." First, the effectiveness of each of these communication activities in producing differentiation depends on the uniqueness of the message. Second, the research herein does not account fully for intertemporal profit maximization. However, by considering the long-term differentiation implications due to communication activities, we can safely conclude that for above average price consumer goods firms, on average, advertising and sales force activities are perhaps more valuable and promotion activities less valuable than previously thought. Specifically, in addition to an outward shift in demand typically attributed to advertising and sales force activities, these actions also can shield the firm from future price competition via increased differentiation. In contrast, unless promotion activities lead to an outward shift in demand, as opposed to movement down (along) the demand curve, there is no counterbalancing effect to the possibility that promotions increase future price competition due to decreased differentiation.

Appendix A

Assertion: An outward shift in linear demand always results in a decrease in the point price elasticity, even with increased price sensitivity.

Proof: Let the old demand function be of the form

$$q_o = a - bp.$$

Then any linear outward shift can be written as

$$q_n = m(a - bp) + s,$$

where $m > 1$ (i.e., price sensitivity increases) and $s > 0$ (i.e., an outward shift in demand).

It is easy to see that the point elasticity for the old demand function is

$$\eta_o = \frac{\dfrac{(a - bp_2) - (a - bp_1)}{a - bp_1}}{\dfrac{p_2 - p_1}{p_1}} = \frac{-bp_1}{a - bp_1}$$

Likewise, the point elasticity for the new demand function is

$$\eta_n = \frac{\dfrac{m(a - bp_2) + s - m(a - bp_1) - s}{m(a - bp_1) + s}}{\dfrac{p_2 - p_1}{p_1}} = \frac{-bp_1}{a + s/m - bp_1}$$

Because $s/m > 0$ for any outward shift in demand, one can see that in absolute value $\eta_o > \eta_n$.

REFERENCES

Assael, Henry (1992), *Consumer Behavior and Marketing Action*, 4th ed. Boston: PWS-KENT.

Bain, Joe S. (1956), *Barriers to New Competition*. Cambridge, MA: Harvard University Press.

Blattberg, Robert C. and Scott A. Neslin (1990), *Sales Promotion: Concepts, Methods, and Strategies*. Englewood Cliffs, NJ: Prentice-Hall Inc.

Boulding, William (1990), "Unobservable Effects and Business Performance: Do Fixed Effects Matter?" *Marketing Science*, 9 (Winter), 88–91.
——— and Eunkyu Lee (1992), "Differentiation Via the Marketing Mix," *Marketing Letters*, 3 (4), 343–56.
——— and Richard Staelin (1990), "Environment, Market Share, and Market Power," *Management Science*, 36 (October), 1160–77.
——— and ——— (1993), "A Look on the Cost Side: Market Share and the Competitive Environment," *Marketing Science*, 12 (Spring), 144–66.
Comanor, William S. and Thomas A. Wilson (1974), *Advertising and Market Power*. Cambridge, MA: Harvard University Press.
——— and ——— (1979), "The Effect of Advertising on Competition: A Survey," *Journal of Economic Literature*, 27 (June), 453–76.
Davis, Scott, J. Jeffrey Inman, and Leigh McAlister (1992), "Promotion Has a Negative Effect on Brand Evaluations—Or Does It? Additional Disconfirming Evidence," *Journal of Marketing Research*, 29 (February), 143–48.
Dodson, Joe A., Alice M. Tybout, and Brian Sternthal (1978), "Impact of Deals and Deal Retraction on Brand Switching," *Journal of Marketing Research*, 15 (February), 72–81.
Dorfman, Robert and Peter O. Steiner (1954), "Optimal Advertising and Optimal Quality," *American Economic Review*, 44, 826–36.
Eskin, Gerald J. and Penny H. Baron (1977), "Effects of Price and Advertising in Test-Market Experiments," *Journal of Marketing Research*, 14 (November), 499–508.
Farris, Paul W. and Mark S. Albion (1980), "The Impact of Advertising on the Price of Consumer Products," *Journal of Marketing*, 44 (Summer), 17–35.
——— and David J. Reibstein (1979), "How Prices, Ad Expenditures, and Profits are Linked," *Harvard Business Review*, 57 (November/December), 173–84.
Gatignon, Hubert (1984), "Competition as a Moderator of the Effect of Advertising on Sales," *Journal of Marketing Research*, 21 (November), 387–98.
Guadagni, Peter M. and John D.C. Little (1983), "A Logit Model of Brand Choice Calibrated on Scanner Data," *Marketing Science*, 2 (3), 203–38.
Hagerty, Michael R., James M. Carman, and Gary J. Russell (1988), "Estimating Elasticities with PIMS Data: Methodological Issues and Substantive Insights," *Journal of Marketing Research*, 25 (February), 1–9.
Hauser, John R. and Steven M. Shugan (1983), "Defensive Marketing Strategies," *Marketing Science*, 2 (Fall), 319–60.
——— and Birger Wernerfelt (1989), "The Competitive Implications of Relevant-Set/Response Analysis," *Journal of Marketing Research*, 46 (November), 391–405.
Hausman, Jerry A. (1978), "Specification Tests in Econometrics," *Econometrica*, 46 (November), 1251–72.
Huber, Joel, Morris B. Holbrook, and Barbara Kahn (1986), "Effects of Competitive Context and of Additional Information on Price Sensitivity," *Journal of Marketing Research*, 23 (August), 250–60.
Jacobson, Robert (1990), "Unobservable Effects and Business Performance," *Marketing Science*, 9 (Winter), 74–85.
Kahn, Barbara E. and Therese A. Louie (1990), "Effects of Retraction of Price Promotions on Brand Choice Behavior for Variety-Seeking and Last-Purchase Loyal Consumers," *Journal of Marketing Research*, 27 (August), 279–89.
Kanetkar, Vinay, Charles B. Weinberg, and Doyle L. Weiss (1992), "Price Sensitivity and Television Advertising Exposures: Some Empirical Findings," *Marketing Science*, 11 (4), 359–71.
Keller, Kevin Lane (1993), "Conceptualizing, Measuring, and Managing Customer-Based Brand Equity," *Journal of Marketing*, 57 (January), 1–22.
Krishnamurthi, Lakshman and S.P. Raj (1985), "The Effect of Advertising on Consumer Price Sensitivity," *Journal of Marketing Research*, 22 (May), 119–29.
Lambin, Jean-Jacque (1976), *Advertising, Competition, and Market Conduct in Oligopoly Over Time*. Amsterdam: North-Holland Publishing Co.
Lattin, James M. (1989), "Measuring Preference from Scanner Data: Filtering Out the Effects of Price and Promotion," working paper, Stanford University.
Lerner, A.P. (1934), "The Concept of Monopoly and the Measurement of Monopoly Power," *Review of Economic Studies*, 1 (June), 157–75.
McAlister, Leigh and Michael J. Zenor (1992), "The Impact of Retailer Differences on Promotional Response: The Link Between Unusual Levels of Support and Unusual Levels of Response," working paper.
McTaggart, James M. and Michael C. Mankins (1992), *Commentary: Total Quality and Value Creation*. Stamford, CT: Marakon Associates.
Moore, Michael J. and William Boulding (1987), "Economic and Econometric Analysis of Disguised Data," working paper, Duke University.
Nelson, Philip (1974), "Advertising as Information," *Journal of Political Economy*, 82 (July-August), 729–54.
Neslin, Scott A. and Robert W. Shoemaker (1983), "Using a Natural Experiment to Estimate Price Elasticity: The 1974 Sugar Shortage and the Ready-to-Eat Cereal Market," *Journal of Marketing*, 47 (Winter), 44–57.
——— and ——— (1989), "An Alternative Explanation for Lower Repeat Rates After Promotional Purchases," *Journal of Marketing Research*, 26 (May), 205–13.
Nicholson, Walter (1972), *Microeconomic Theory: Basic Principles and Extensions*. Hinsdale, IL: The Dryden Press.
Ornstein, Stanley I. (1975), "Empirical Uses of the Price-Cost Margin," *Journal of Industrial Economics*, 24 (2), 105–17.
Porter, Michael E. (1976), "Interbrand Choice, Media Mix and Market Performance," *American Economic Review*, 66 (2), 398–406.
Prasad, Kanti V. and Winston L. Ring (1976), "Measuring Sales Effect of Some Marketing Mix Variables and Their Interactions," *Journal of Marketing Research*, 13 (November), 391–96.
Sawyer, Alan G., Parker M. Worthing, and Paul E. Sendak (1979), "The Role of Laboratory Experiments to Test Marketing Strategies," *Journal of Marketing*, 43 (Summer), 60–67.
Schmalensee, Richard (1989), "Inter-Industry Studies of Structure and Performance," in *Handbook of Industrial Organization*, Richard Schmalensee and Robert Willig, eds. Amsterdam: North Holland.
Simon, Hermann and Eckhard Kucher (1992), "A New Price-Advertising Interaction Model: Theory, Empirical Evidence and Managerial Implications," working paper.
Srinivasan, V. and Tom Kibarian (1989), "Purchase Event Feedback: Fact or Fiction," working paper, Stanford University.
Staelin, Richard and Russell S. Winer (1976), "An Unobservable Variable Model for Determining the Effect of Advertising on Consumer Purchases," in *Marketing 1776–1976 and Beyond: 1976 Educators' Proceedings*, Kenneth L. Bernhardt, ed. Chicago: AMA.
Tellis, Gerard J. (1988), "The Price Elasticity of Selective Demand: A Meta-Analysis of Econometric Models of Sales," *Journal of Marketing Research*, 25 (November), 331–41.
Tellis, Gerard J. (1990), "Do Deals Increase, Decrease, or Have No Effect on Brand Repurchases?" working paper, University of Southern California.
Tirole, Jean (1988), *The Theory of Industrial Organization*. Cambridge, MA: The MIT Press.
Wittink, Dick R. (1977), "Exploring Territorial Differences in the Relationship Between Marketing Variables," *Journal of Marketing Research*, 14 (May), 145–55.