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Journal of Retailing 83 (3, 2007) 297–308

Journal of Retailing

How retailer and competitor decisions drive the long-term effectiveness of manufacturer promotions for fast moving consumer goods

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Accepted 17 March 2006

Abstract

While both retailer and competitor decisions contribute to long-term promotional effectiveness, their separate impact has yet to be evaluated. For 75 brands in 25 categories, the author finds that the long-term retailer pass-through of promotions is 65 percent, yielding a long-run wholesale promotional elasticity of 1.78 before competitive response. However, competitors partially match the wholesale price reduction by 15 percent, which decreases promotional elasticity by 10 percent. The range of retailer and competitor response across the analyzed cases is very wide, and is affected by category and brand characteristics. As to the former, large categories yield stronger retailer response, while concentrated categories yield stronger competitor response. As to the latter, smaller brands face a fourfold disadvantage compared to leading brands: they obtain lower retail pass-through, lower retail support, and lower benefits from competing brand's promotions, while their promotions generate higher benefits to competitors. Interestingly, the mid-1990s move from off-invoice allowances towards scan-back deals only partially improves their promotional effectiveness compared to that of leading brands.

Keywords: Sales promotions; Long-term retailer pass-through and competitor response; Jeopardy; Impulse response restrictions

Introduction

The long-term success of manufacturer marketing actions often depends not only on consumer response, but also on retailer and competitor reaction. For instance, Proctor & Gamble's "value pricing" initiative was met with competitor price cuts and retailer skepticism and did not meet its objectives (Ailawadi et al. 2001). As a result, marketing managers are urged to consider all the long-run effects of their actions, including the dynamic response of consumers, retailers, and competitors (Besanko et al. 2005; Chen 1996; Dekimpe and Hanssens 1999). Unfortunately, little is currently known on the impact of retailer and competitor actions on the long-run effectiveness of marketing actions.

A particularly important marketing activity for fast moving consumer goods are sales promotions, which represent the majority of manufacturers' marketing budgets, amounting to 16 percent of their revenues (Canondale Associates 2001). However, manufacturers question the effectiveness of this practice as (1) the retailer may fail to pass-through and support price cuts over time (Armstrong 1991; Chevalier and Curhan 1976), (2) competitors may retaliate with their own promotions (e.g., Leeflang and Wittink 1996), and (3) consumers may "lie-in-wait" for promotions (Mela et al. 1998). Moreover, the move toward category management (Progressive Grocer 2001) implies that retailers may respond to wholesale price promotions with changes in prices (and feature and display activity[1]) for competing brands (Hall et al. 2002); a practice referred to as "cross-brand pass-through" (Besanko et al. 2005; Moorthy 2005). While recent research has estimated the immediate own and cross-brand pass-through of manufacturer promotions (Besanko et al. 2005), it did not account

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[1] Feature activity involves any product information the retailer provides a (potential) shopper outside of the store, for instance, a retailer leaflet featuring a 10 percent off price special on 2-l Coke bottles. Display activity involves the prominent display of a product inside the store; for instance, an end-of-aisle display with "bonus buys."

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doi:10.1016/j.jretai.2006.03.001

for dynamic effects and feedback loops among the retailer and the competing manufacturers, nor calculate their impact on the long-term promotional effectiveness.

In this paper, we conduct restricted impulse response functions, based on vector autoregression (VAR) models, for 75 brands in 25 product categories to answer three related research questions. First, to what extent are manufacturer promotions passed through by the retailer, and induce reaction by competing manufacturers? Second, how do these retailer and competitor reactions drive the long-term sales response to the initiating wholesale price promotion? Third, do these reactions and sales effects depend on category characteristics and the brand's competitive position? In particular, with respect to long-term promotional sales effects, are smaller brands in jeopardy compared to leading brands in the category?

Long-term promotional effects and the role of retailer and competitor response

Consider a manufacturer reducing the wholesale price for its brand (hereafter focal brand) to the retailer[2]; a manufacturer promotion that can last several weeks (Armstrong 1991). In response, the retailer may (1) adjust the consumer price[3] of the focal brand (own brand pass-through) and (2) adjust the consumer price for competing brands in the category (cross-brand pass-through). Moreover, competing brand manufacturers may react by offering their own promotions to the retailer. We discuss these reactions in turn.

Long-term retailer pass-through for the promoting brand

Acknowledging that the manufacturer promotion increases the retailer's margin on the focal brand, the retailer may change the focal brand's price in at least four documented ways:

1) The retailer may cut the price to the consumer by the same amount; that is, pass-through 100 percent of the manufacturer promotion to the consumer.
2) The retailer may cut the price to the consumer by a higher amount; that is, pass-through more than 100 percent of the manufacturer promotion.
3) The retailer may cut the price to the consumer by a lower amount; that is, pass-through less than 100 percent of the manufacturer promotion.
4) The retailer may not cut the price to the consumer at all; that is, "pocket" the promotion.

Based on previous literature, the choice between these actions likely depends on (1) the retailer's estimate of consumer price sensitivity, (2) the main retailer goal (profit vs. traffic/market share), and (3) the retailer's consideration for the manufacturer's requests and goals. First, the retailer has little incentive to pass-through when consumer sales are not very sensitive to price reductions. Moreover, profit-maximizing pass-through rates depend on the specification of the demand function: concave demand functions (including linear and homogeneous logit) yield pass-through rates of less than 100 percent, whereas multiplicative (constant elasticity) demand functions yield pass-through rates of over 100 percent (Tyagi 1999).

However, retailer goals may differ from mere short-run profit maximization. Indeed, increasing sales volume is often cited as a retailer objective, whether in the form of increasing store traffic or increasing market share vis-à-vis other retailers (Ailawadi 2001). This volume objective is more likely to trump the profit objective in large categories and for leading national brands (Bronnenberg and Mahajan 2001). A focus on traffic or market share may lead retailers to pass-through more than 100 percent of the deal, even though this is not optimizing short-run profits.

Finally, pass-through may be affected by the ability of brand manufacturers to ensure retailer compliance with the conditions for accepting the manufacturer promotion. This ability has traditionally been poor, but may be improving: the 1990s witnessed the move from off-invoice allowances to scan-back deals, which limit the retailer's freedom to "pocket" the deals. With an off-invoice allowance, the retailer gets rewarded with a price reduction for units he/she purchases in a given deal period, while with a scan-back deal, the retailer gets rewarded only for as much product as she can prove was sold to consumers in the given deal period (Drèze and Bell 2003).

Current empirical evidence demonstrates that (1) short-run pass-through rates are typically lower than 100 percent (Besanko et al. 2005) and (2) short-run pass-through rates are significantly higher for high-share brands and large categories, both of which are believed to draw more traffic and thus increase retail store revenues (Chevalier and Curhan 1976).

Long-term retailer cross-brand pass-through

The move toward category management (Progressive Grocer 2001) implies that retailers may respond to wholesale price promotions with price changes for other brands in the category (Zenor 1994). Analytical models provide the rationale for such cross-brand pass-through.

Negative cross-brand pass-through is motivated by retailer category profit maximization and Hotelling-like demand models (Moorthy 2001) or a combination of logit demand

[2] The analysis does not consider why the initiating manufacturer changes the wholesale price. Such exogenous treatment is common in both empirical as normative promotion studies (e.g., Besanko et al. 2005; Tyagi 1999). Just as these authors, we also merely analyze the impact of brand-specific cost changes for a single retailer (see Moorthy 2005, p. 111).

[3] The retailer may also support the promotion with feature and/or display, for which we allow in the empirical analysis. Similar arguments apply to why the retailer would choose to support the passed-through promotion with feature and/or display; that is, if these actions satisfy the retailer's objectives given their assumed impact on demand. In the interest of space, we therefore do not discuss feature and display support in this section.

and manufacturer Stackelberg interaction (Sudhir 2001). Intuitively, the promoted brand attracts brand switchers, which leaves competing brands with only hardcore loyal consumers. Therefore, the retailer creates volume with the promoted brand, while increasing margin on the non-promoted brands to "mix-back" to the desired category profit levels (Grier 2001). In the general formulation by Moorthy (2005), the retailer will increase prices on other brands when demand-substitution effects dominate. Such action would accelerate desired substitution toward the promoted brand. What would prevent retailers from engaging in such negative cross-brand pass-through? First, raising prices on (category) traffic-drawing brands may adversely affect overall retailer performance. Second, discontent by manufacturers (or consumers) of large brands may translate into a credible threat to the retailer. In contrast, little prevents the retailer from raising prices on the smaller brands in the category.

Positive cross-brand pass-through is motivated by strategic complementarity among brands in a category (Moorthy 2005). In this case, the marginal profit from each brand to the retailer is an increasing function of the other brands' prices. Retail competition adds "external" strategic complementarity: the marginal brand profit to one retailer increases if another retailer increases prices. An alternative explanation for positive cross-brand pass-through is simple retailer brand profit maximization[4] (Sudhir, 2001). Intuitively, a wholesale price promotion reduces overall retailers' costs, which they may then use to reduce prices on competing brands for a sales lift (Hall et al. 2002). The study by Besanko et al. (2005) reports a frequent occurrence of both positive and negative cross-brand pass-through in the short run. Which brands should particularly benefit from such positive cross-brand pass-through? As argued before, retailers are more likely to promote larger brands, which are believed to generate substantial category expansion.

Competing brand manufacturer reactions

In principle, the price response of competing brand manufacturers may be aggressive (reducing wholesale price), accommodating (increasing wholesale price), or passive (Chen 1996). Their choice among these options likely depends on (1) how their own sales were affected by the retailer's pass-through and (2) whether they perceive that their reaction will be beneficial.

First, the jury is still out as to the extent of brand switching versus category expansion effects of price promotions. On the one hand, a high degree of brand switching implies that competing brands suffer substantially (e.g., Gupta 1988). On the other hand, a high degree of category expansion implies that competing brand sales may hardly be affected, or even increase (Pauwels et al. 2002; Sun et al. 2003; Van Heerde et al. 2003). Logically, competing brand manufacturers would contemplate an aggressive response if their sales substantially decreased, which is more likely in concentrated categories (Chen 1996).

However, such aggressive response may not be beneficial if (1) the retailer is unlikely to pass-through (most of) the promotion or (2) the passed-through promotion will lead competitors to retaliate in turn, and the resulting "price skirmish" is undesirable. Both conditions appear more likely for a small brand manufacturer, who is contemplating how to respond to a larger brand manufacturer's promotion. An additional reason against aggressive response is low consumer price sensitivity, which often applies to manufacturers of high-end niche brands. In such case, accommodating response is often optimal, especially if the brand is driven out of price-sensitive segments (Hauser and Shugan 1983; Pauwels and Srinivasan 2004).

Finally, despite extensive study of competitor response, its impact on the *initiating brand sales* has received little empirical analysis. On the one hand, several authors envision substantial damage, and argue that the net effectiveness of a marketing action largely depends on competitive response (Bass and Pilon 1980; Chen 1996). On the other hand, competing brands may perceive minimal damage from each other's marketing actions (Chen and MacMillan 1992; Steenkamp et al. 2005), depending on the relative importance of brand switching versus category expansion from price promotions (Neslin 2002).

Are small-share brands in jeopardy regarding long-term promotional sales effectiveness?

Many of the above arguments imply that small-share brands end up with a smaller sales impact of their own promotions, and experience more harm from competing brand promotions.

First, both theoretical predictions (e.g., Lal et al. 1996) and empirical evidence (Chevalier and Curhan 1976; Walters 1989) support that promotions by smaller brands are less likely to be passed-through and supported. Retailers appear more willing to pass-through and support promotions of leading brands, as these are believed to generate substantial category expansion (Bronnenberg and Mahajan 2001) and may draw business away from competing retailers that do not offer consumers such promotion and/or guard against loosing business to those who do (Moorthy 2005).

Second, wholesale promotions by smaller brands are more likely to yield positive cross-brand pass-through for larger brands, while the reverse is not the case (Moorthy 2005). Interestingly, both phenomena would constitute a form of retailer-driven jeopardy for smaller brands, in addition to the consumer-driven jeopardy observed by Fader and Schmittlein (1993).

[4] Both store-level analysis as retailer interviews suggest that retailers often set prices without considering the impact on other brands (Hall et al. 2002). Indeed, Levy et al. (2004) report on business press claims that most retailers have not yet fully adopted sophisticated pricing models and evaluate brand profits separately in "what-if" sensitivity analyses.

Research methodology

To investigate our research questions, we apply an atheoretical (reduced-form) econometric model that captures the dynamic reactions of consumers (sales), retailers, and manufacturers (competitors). We opt not to consider a theoretical model for two reasons. First, marketing theory is often unclear as to the exact timing and direction of dynamic effects,[5] even when it is very informative about the direction and magnitude of immediate effects (Dekimpe and Hanssens 1999). Second, theoretical models typically require assumptions in the form of consumer demand or the managers' pricing behavior (Besanko et al. 2005). These assumptions may then drive estimated own-brand and cross-brand pass-through rates (Moorthy 2005); including a predisposition to find negative cross-brand pass-through (e.g., the nested logit model) or imply that if one brand generates positive cross-brand effects, the other generates negative effects (e.g., the linear demand model). Instead, we prefer to discover reaction patterns with a reduced form approach, and use past theoretical literature to interpret the empirical findings.

Evidently, this choice comes at a cost: as a reduced-form model merely identifies and summarizes historic data patterns (Franses 2005), it can not disentangle demand versus supply drivers of managerial decisions (e.g., Besanko et al. 2005), and its predictions may not hold up when such drivers substantially change. Therefore, we relate estimated response to supply and demand factors in a second stage; and perform a split-sample analysis to investigate the move from off-invoice allowances to scan-back deals.

The particular reduced-form model we estimate is a VAR model, which regresses the vector of all endogenous variables on the lagged vectors of these variables (hence the name vector autoregression) and the exogenous control variables. Because of this formulation, the VAR model captures the dynamic interactions among the endogenous variables of interest. VAR models have been used to analyze a wide variety of long-term marketing effects (Dekimpe and Hanssens 1999; Pauwels et al. 2002, 2004; Srinivasan et al. 2004).

Model specification

Specifically, our VAR model for each category includes the following as endogenous variables: log of sales, wholesale prices, retail prices, feature, and display for the top three brands (hereafter brands A, B, and C) in the category. The lag order of the VAR model is 1, which guards against curve fitting and is also selected in all cases by the Schwarz Bayesian information criterion (Lütkepohl 1993). As exogenous variables, we control for (i) a deterministic-trend variable (t) to capture the impact of omitted, gradually changing factors, (ii) seasonal dummy (0/1) variables that capture the shopping periods around major holidays (Pauwels and Srinivasan 2004), and (iii) new product introductions in the category. Importantly, wholesale promotions for any brand may affect retail actions for any considered brand in the category; which is necessary to detect cross-brand pass-through (Moorthy 2005). In addition, the model allows each endogenous variable (sales, retailer, and manufacturer actions) to be influenced by the past of all endogenous variables. Therefore, we account for a rich interplay of dynamic effects, including

(1) post-marketing actions may affect current sales because of consumer stockpiling and reference prices (a typical negative impact of past price on current sales);
(2) performance feedback and decision rules may imply that marketing actions get repeated, or alternate over time (e.g., if the retailer puts a brand on display, he/she typically puts it again/does not put the same brand on display the next week);
(3) competitive reaction induces current changes as a result of post-marketing actions.

The standard VAR model does not specify the contemporaneous effects, that is, which variables impact others in the same week, which are instead estimated through the residual covariance matrix using the generalized impulse approach (Pesaran and Shin 1998). Model fit is verified by the Schwarz's information criterion (balancing log likelihood with model parsimony), and by diagnostic tests for residual correlation (Durbin Watson test and LM tests), residual normality (Jarque-Bera test), and heteroskedasticity (White test).

Restricted impulse response functions

As it is infeasible to interpret the estimated VAR coefficients directly (Sims 1980), researchers use the estimated coefficients to calculate the unrestricted impulse response function. This "conceptual experiment" simulates the over-time impact of a change (over its baseline) to one variable on the full dynamic system and thus represents the net result of all modeled actions and reactions (e.g., Pesaran and Shin 1998). Recently, Pauwels (2004) developed conceptual experiments that only allow some variables to react, restricting the other variables to remain at their baseline level, as predicted by the VAR model. We adapt this methodology to our setting; starting from a brand's wholesale price promotion.

First, we calculate the long-term response of wholesale price itself to its own one-unit (i.e., $1) reduction. This quantity represents the "effective manufacturer promotion," as it indicates how long the typical manufacturer promotion for this brand lasts. As (immediate) pass-through is defined as the extent to which a change in wholesale price is passed through by the retailer in shelf price (Besanko et al. 2005), our long-term equivalent requires that we divide the estimated long-term retailer (and competitor) response by this "effective wholesale promotion" to calculate long-term retailer

[5] Economic theory faces a similar issue; an important reason why Sims (1980) proposed an atheoretical approach in the first place.

pass-through (and competitive reaction). In order to obtain the long-term retailer and competitor response, we estimate separate impulse response functions by restricting different variables to remain unaffected[6] by the manufacturer promotion, as detailed next.

The first conceptual experiment (E1) allows long-term changes to the wholesale price and retail price of the focal brand and to sales of all brands. This represents the base case scenario, isolating long-term retailer pass-through and its long-term sales response. The second conceptual experiment (E2) adds retailer promotion support by also allowing long-term changes to feature and display of the initiating brand. The third conceptual experiment (E3) adds long-term changes to the retail prices, feature, and display of competing brands, which represents the retail category management decisions. Finally, the fourth conceptual experiment (E4) also allows long-term changes to competitive wholesale prices. This scenario corresponds to the conventional unrestricted impulse response function, as all variables in the dynamic system are allowed to respond. Calculation of the standard errors for each conceptual experiment allows a formal comparison of the impulse response functions, as they are all based on the same estimated coefficients from the same VAR model.

Second-stage weighted least squares analysis

Our second-stage analysis relates the estimated long-term responses to brand and category characteristics. This second stage employs weighted least-squares regression, using as weights the inverse of the standard errors of the first-stage response estimates, which serve as the dependent variables. The independent variables are brand market share, category size, category concentration, brand ownership (national brand vs. store brand), brand expensiveness, brand wholesale price volatility, category expensiveness, category wholesale price volatility, product storability, and impulse buy (Narasimhan et al. 1996; Srinivasan et al. 2004).

Data description

Our time series are based on scanner data from a large mid-Western supermarket chain, Dominick's Finer Foods. With 96 stores in and around Chicago, this is one of the two largest in the area. These data are publicly available at the University of Chicago website (http://gsbwww.uchicago.edu/kilts/research/db/dominicks/). In order to allow comparison with recent research (Srinivasan et al. 2004), we study the same 25 fast moving consumer products: analgesics, bathroom tissue, beer, canned soup, canned tuna, cereal (cold, hot), cheese, cookies, crackers, dish detergent, fabric softeners, front-end candies, frozen dinners, fabric softener, juice (bottled, frozen, refrigerated), laundry detergent, paper towels, shampoos, snack crackers, soaps, soft drinks, toothbrushes, and toothpastes.

The relevant variables include unit sales at the SKU level, retail prices, and feature ("price special") and display ("bonus buy") activity.[7] Additionally, retail margin data allow us to calculate the average acquisition cost of each SKU to the retailer, which is a useful measure of wholesale price (Chintagunta 2002; Srinivasan et al. 2004). Sales are aggregated from the SKU to the brand level using the standard practice (e.g., Pauwels et al. 2002) in adopting constant weights, rather than varying (current-period) weights to compute the weighted prices.[8] All price data are appropriately deflated using the Consumer Price Index. The data period runs from September 1989 till May 1997. This extended time period also enables us to compare the early-1990s period in which manufacturer promotions mostly took the form of off-invoice allowances, and the late-1990s period during which scan-back deals became more prominent (Ailawadi 2001; Drèze and Bell 2003). The former period reflects Armstrong's (1991) situation in which manufacturers offer rather general performance requirements with little enforcement mechanisms. Based on previous research (Srinivasan et al. 2004), we use September 1994 as the cut-off point for the split-sample analysis. Given our interest in retailer chain-level response to changes in wholesale prices, we aggregate the data across stores.[9]

We focus on the three top-selling brands in each category, capturing on average 87 percent of the total category volume. For ease of exposition, we display results across 25 categories by brand market share: leading brands (hereafter brands A), have the highest market share in their category, on average 45 percent. Smaller brands B and C have considerably less market share, on average 24 and 15 percent, respectively. Table 1 provides more details on these brands, which do not differ much on price characteristics: both price level and wholesale price volatility are similar for the three groups (e.g., the higher price for some C brands denotes their niche status). As

[6] These conceptual experiments are simply used to assess long-term promotional effectiveness in past data and to distinguish which past actions contributed to this impact. In light of the Lucas (1976) critique, we do not claim to predict the effects of future policy changes, such as increased retailer pass-through or competitive reaction (see our split-sample analysis).

[7] Because percent of all commodity value featured and percent of all commodity value displayed are bounded between 0 and 1, we use the $(x/1-x)$ transformation to obtain positive continuous variables for inclusion in the model (Pauwels et al., 2002).

[8] In particular, we compute the average SKU share across the full sample, and then use these weights to average prices and support activity from the SKU to the brand level. We verified that results are unaffected by instead setting aside the first 6 months of data as an initialization period to compute the SKU market shares.

[9] Potential aggregation bias is limited because (1) Dominick's purchases at the chain level, that is, all stores are confronted with the same manufacturer products and prices, and (2) Dominick's adopts a chain-wide promotional strategy in which regular prices are lowered by a uniform percentage across all stores in the chain, even while these regular prices differ across price zones (Hoch et al. 1995). Empirically, we guard against aggregation bias by performing a pooling test.

Table 1
Brand classification (Q1, Q2, and Q3 quartiles across 25 categories)

	Brand A	Brand B	Brand C
Market share	[0.35, 0.44, 0.60]	[0.19, 0.26, 0.31]	[0.10, 0.15, 0.19]
National brand	100 percent	86 percent	77 percent
Expensiveness	[0.97, 1.01, 1.15]	[0.89, 1.00, 1.13]	[0.89, 1.02, 1.17]
Price volatility	[6.51, 8.16, 10.98]	[6.07, 8.02, 12.51]	[6.04, 8.00, 12.87]

Table 2
Retail pass-through of wholesale price promotion

	Brand A	Brand B	Brand C
Average pass-through across categories	0.91	0.48	0.55
Categories with 0–25 percent pass-through	0 percent	36 percent	32 percent
Categories with 26–50 percent pass-through	4 percent	24 percent	4 percent
Categories with 51–75 percent pass-through	24 percent	12 percent	32 percent
Categories with 76–100 percent pass-through	48 percent	20 percent	20 percent
Categories with 101+ percent pass-through	24 percent	8 percent	12 percent

for ownership, three of the B brands and six of the C brands are store brands (private labels). The additional measures for our second-stage analysis are shown in Appendix A.

Findings

Long-term retailer response to a wholesale price promotion

Table 2 presents the long-term retailer pass-through of a brand's wholesale price promotion. Across all cases, this pass-through is 65 percent, consistent[10] with optimal response of retailer who believes the consumer demand function is concave (Tyagi 1999). However, the range of our estimated pass-through rates is very wide: from 0 percent (insignificant) to 183 percent; consistent with the wide range in immediate pass-through reported by Walters (1989), Armstrong (1991), and Besanko et al. (2005). Twelve out of 75 brands (16 percent) enjoy pass-through rates of 100 percent or more: seven leading brands A, two brands B, and three brands C.

As for retail action on the competing brands, Table 3 shows significant cross-brand pass-through in 69 percent of all cases, compared to two-thirds for the immediate pass-through in Besanko et al. (2005). Long-term cross-brand pass-through is positive on average, with retail price reductions of 11 percent and feature and display increases of 9 and 3 percent, respectively. The direction of cross-brand pass-through is consistent with strategic complementarity among brands in a category (Moorthy 2005) or a retailer's desire to maximize category volume (Hall et al. 2002).

As expected, it is the leading brands that free-ride on competing brand promotions; small-share brands may experience positive or negative cross-brand pass-through.

Long-term competitor response

Table 4 indicates that competitors typically react to a manufacturer promotion by reducing their own wholesale price. In other words, they partially match the initiating wholesale price reduction, on average by 15 percent. Leading brands A react strongest with a reduction of 19 percent of the initiating promotion, while smaller brands B and C offer wholesale price reductions of 14 and 13 percent, respectively. Interestingly, the reaction of many C brands switches depending on the initiating brand: their wholesale price reduces with 41 percent of a promotion initiated by a leading brand A, but increases with 15 percent of a promotion by a brand B. Detailed analysis reveals that such accommodating response only occurs for high-end niche brands. Consistent with Hauser and Shugan (1983) and Pauwels and Srinivasan (2004), such brands may be better-off staying out of the price retaliation game, and instead build on their strengths of product quality and innovation.

Impact of retail and competitive response on long-term sales effects

Table 5 shows that competing brand sales typically decrease in the absence of competitive response, but increase when allowing for competitor price response. Still, 36 percent of analyzed brands experience sales harm, even when allowing for competitor response. The damage to competing brand sales increases in the face of retailer support, but decreases when we allow for category management decisions, consistent with our reported positive cross-brand pass-through.

[10] This result is of similar magnitude to the immediate pass-through of over 60 percent reported by Besanko et al. (2005) and of 80 percent reported by Walters (1989). However, it is lower than the 110 percent reported by Armstrong (1991) and higher than the 34 percent reported by Chevalier and Curhan (1976). Several factors may account for this difference, including the methodology (Besanko et al. 2005, p. 124) and our consideration of long-term effects, but also the analyzed retailer (Walters 1989) and the categories and brands considered.

Table 3
Long-term category management response to a competitive wholesale price promotion

	All brands	Brand A	Brand B	Brand C
Retail price (percent cases different from 0) [minimum, quartiles, maximum]	−0.11 (69)	−0.36[a] (76) [−0.68, −0.55, −0.40, −0.09, 0.00]	−0.04 (68) [−0.11, 0.00, 0.05, 0.12, 0.15]	0.07 (64) [−0.15, 0.00, 0.11, 0.15, 0.20]
Feature (percent cases different from 0)	0.09 (51)	0.21 (56)	0.08 (64)	−0.02 (32)
Display (percent cases different from 0)	0.03 (59)	0.05 (68)	0.06 (72)	−0.01 (36)

[a] If a competitor promotes, the retailer reduces the retail price of brand A by 36 percent of the wholesale price reduction.

Table 4
Mean and distribution of long-term competitor wholesale price response

Responding →	Brand A	Brand B	Brand C	Average
Initiating ↓				
Brand A [distribution][a]		−0.17 [0, 0.00, −0.16, −0.32, −0.47]	−0.41 [0, −0.39, −0.41, −0.54, −0.75]	−0.29
Brand B [distribution]	−0.13 [0, 0.00, −0.06, −0.28, −0.38]		0.15 [−0.02, 0.00, 0.20, 0.24, 0.27]	0.01
Brand C [distribution]	−0.25 [0, −0.05, −0.30, −0.40, −0.46]	−0.10 [0, 0.00, −0.05, −0.24, −0.29]		−0.18
Average	−0.19	−0.14	−0.13	−0.15

[a] [minimum, quartile 1, quartile 2, quartile 3, maximum].

Table 5
Long-term competitor sales effects of a wholesale price promotion across 25 categories

Initiating brand	All brands	Brand A	Brand B	Brand C
E1. Retail price response (percent significantly different from 0)	−0.02 (85)	−0.03 (96)	−0.21 (84)	0.20 (76)
E2. Retailer promotion support (percent significantly different from E1)	−0.24 (51)	−0.09 (32)	−0.58 (64)	−0.11 (56)
E3. Category management (percent significantly different from E2)	−0.08 (36)	−0.09 (8)	−0.16 (52)	0.01 (48)
E4. Competitor response (percent significantly different from E3)	0.27 (57)	0.09 (48)	0.35 (60)	0.37 (64)

Table 6
Long-term own sales effects of a wholesale price promotion across 25 categories

	All brands	Brand A	Brand B	Brand C
E1. Retail price response (percent different from 0)	1.78 (93)	3.02 (100)	0.72 (92)	1.59 (88)
E2. Retailer promotion support (percent different from E1)	1.89 (71)	3.16 (72)	0.75 (64)	1.77 (76)
E3. Category management (percent different from E2)	1.78 (48)	3.12 (12)	1.27 (68)	0.94 (64)
E4. Competitor response (percent different from E3)	1.60 (60)	2.84 (52)	0.98 (56)	0.97 (72)
Distribution	0, 0.65, 1.37, 2.34, 3.72	1.62, 2.16, 3.07, 3.48, 3.72	0, 0.59, 0.85, 1.37, 2.67	0, 0.48, 0.89, 1.55, 2.5

Table 7
Brand and category characteristics moderate long-term response[a]

	Brand share	Expensive brand	National brand	Category size	Expensive category	Category concentration
Retailer pass-through (*p*-value)	**0.23 (.04)**	**0.25 (.08)**	0.06 (.15)	**0.10 (.05)**	**0.01 (.07)**	−0.49 (.17)
Feature support (*p*-value)	**1.17 (.00)**	0.09 (.72)	0.27 (.24)	−0.27 (.37)	0.00 (.75)	−0.15 (.67)
Display support (*p*-value)	**0.16 (.03)**	**0.11 (.03)**	0.06 (.57)	**0.55 (.01)**	**0.01 (.03)**	0.38 (.13)
Category management (*p*-value)	**0.18 (.04)**	**0.47 (.00)**	0.04 (.78)	**0.17 (.04)**	0.01 (.40)	−0.23 (.32)
Competitor response (*p*-value)	**0.02 (.04)**	0.00 (.99)	**0.10 (.10)**	**0.03 (.02)**	−0.00 (.45)	**0.02 (.05)**
Competitor sales effect (*p*-value)	**−1.57 (.07)**	0.74 (.48)	**1.79 (.07)**	−0.31 (.81)	−0.04 (.45)	**0.69 (.07)**
Own sales effect (*p*-value)	**1.29 (.06)**	**0.66 (.07)**	0.31 (.66)	**0.25 (.08)**	−0.07 (.26)	**−1.85 (.06)**

[a] Each weighted least-squares regression yields a significant *F*-statistic, with R^2 ranging from .21 to .26. We only display moderators significant in at least one WLS regression; and put estimates significant at the 10 percent level in bold.

Table 6 presents the impact of retailer and competitor response on the own sales effect for the promoting brand. Across all brands, the long-term promotional sales elasticity is 1.78 for retailer price response only, and increases to 1.89 when allowing for retailer promotion support. However, the long-term elasticity decreases to 1.78 when allowing for retailer cross-brand pass-through, and to 1.60 when adding competitor reaction. As expected, only smaller brands B and C suffer from cross-brand pass-through; the vast majority of the market leaders remains unaffected. Furthermore, competitor reaction is indeed bad news for initiating brand sales, as the sales effectiveness of its promotion is reduced by 10 percent (as a percent difference from 1.78).

Brand and category moderators of long-term response

Table 7 summarizes the moderating role of brand and category characteristics. First, long-term retailer pass-through and display support are higher for leading brands and in large categories,[11] consistent with previous studies (Chevalier and Curhan 1976; Walters 1989; Besanko et al. 2005). Thus, pass-through is larger for high-revenue categories such as laundry detergents and frozen dinners, soft drinks, and refrigerated juices, but smaller in low-revenue categories such as fabric softeners and analgesics, crackers, and oatmeal. Moreover, we also find that retailer response is higher for expensive brands, which may be due to the belief that brands in higher price tiers yields greater promotional effects (Blattberg and Wisniewski 1989) or due to the higher unit margin on expensive brands, which allows more room for decreasing retail prices.

Second, leading brands benefit more from retail response to competing manufacturer promotions, as do expensive brands in large categories. Intuitively, retailers do not risk hurting brands and categories that are important to their performance (Walters 1989). Third, competitive wholesale price response is stronger by large competitors and national brands, and in concentrated and large categories. The first two factors represent the "battle of the brands," in which large national brands are especially aggressive. Likewise, the battle of the brands is more outspoken in more concentrated categories such as bathroom tissues and refrigerated juices than in less concentrated categories such as dish detergent and bottled juices. Finally, large categories are more important to the

[11] While retail pass-through appears also higher for national brands versus private labels (consistent with Besanko et al. 2005), this effect is not significant in our analysis.

Table 8
Split-sample comparison of response to and own sales effectiveness of promotion

	A brands		B brands		C brands	
	Before September 1994	After September 1994	Before September 1994	After September 1994	Before September 1994	After September 1994
Retailer pass-through	0.88	0.94	0.44	0.53	0.48	0.63
Retailer feature support	0.50	0.50	0.11	0.20	0.17	0.14
Retailer display support	0.16	0.24	0.09	0.21	0.08	0.16
Competitor response	−0.28	−0.31	0.04	−0.03	−0.17	−0.19
Own sales effects from only pass-through (E1)	2.98	3.08	0.66	0.79	1.44	1.76
Own sales effects with support (E2)	3.11	3.22	0.69	0.84	1.63	1.93
Own sales effects with category management (E3)	3.08	3.17	1.17	1.39	0.83	1.07
Own sales effects including competitor response (E4)	2.79	2.90	0.90	1.07	0.85	1.10

performance of multi-category brand manufacturers, such as P&G and Unilever. To analyze this further, based on the suggestion of an anonymous reviewer, we tested whether manufacturer size or identity drives long-term response estimates. However, neither the inclusion of "manufacturer size" nor that of dummies for P&G and Unilever yielded significant coefficients in the second-stage regressions.

Fourth, competitor sales are hurt more by promotions of leading brands, but less in concentrated categories. These findings are consistent with respectively the higher retailer response for leading brands and the higher competitor response in concentrated categories. Moreover, promotions by national brands are less harmful to competitor sales, indicating that the higher category expansion power of national brand promotions increases the pie for all competitors (e.g., Bronnenberg and Mahajan 2001).

Finally, own sales effectiveness is higher for leading and expensive brands in large categories. These results are consistent with the reported higher retailer response for these cases. In contrast, the own sales effectiveness is lower in concentrated categories, consistent with the higher competitor response.

Split-sample comparison of retailer response, competitor response, and sales effectiveness

Did promotional response change as manufacturers switched from off-invoice allowances towards scan-back deals? Table 8 shows the results of our split-sample analysis of the early-1990s period (September 1989–1994) and the late-1990s period (October 1994–May 1997). While leading brands A on average achieve slightly higher retail pass-through, display support, competitor response and net own sales effectiveness, these changes are only significant in a minority of categories. In contrast, most of the smaller brands B and C experience higher retail pass-through (80 percent) and display support (78 percent), as predicted by Drèze and Bell (2003). Moreover, most of the brands B achieve higher feature support (68 percent). Unfortunately, their promotions also generate more aggressive competitor response, in line with Lal et al.'s (1996) argument that low retailer pass-through mitigates inter-manufacturer price competition. However, this higher competitor response does not completely negate the increase in net long-term sales effectiveness: most brands B (60 percent) and C (72 percent) increase their net promotional elasticity, on average to more than 1. Still, this improvement only partially bridges the gap with leading brands, enjoying a 2.90 long-term promotional elasticity.

Conclusions and managerial implications

In sum, our analysis reveals empirical generalizations and specific differences among long-term retailer and competitor response and their impact on net long-term promotional effectiveness. First, long-term retailer pass-through of promotions is 65 percent on average, with feature and display support of 27 and 15 percent, respectively. Moreover, the retailer also adjusts competing brands' retail prices and feature and display activity (category management). Third, competitors react by reducing their wholesale price by 15 percent of the initiating wholesale promotion. Fourth, the separation of long-term responses taught us that competing brand sales typically decrease before, but increase after allowing for competitor wholesale price reaction. Finally, competitive reaction reduces the sales effectiveness for the initiating brand by 10 percent.

However, these effects depend on category size, concentration and expensiveness and on brand market share, ownership, and expensiveness. First, large and expensive categories yield high retailer response, while concentrated categories yield strong competitor response. Second, expensive brands obtain higher retail response and own sales effects, while national brand promotions generate higher competitor response and competitive sales benefits. Most

notably, we find evidence of asymmetric retailer response to promotions by leading versus smaller brands. Leading brands obtain higher own pass-through, feature and display support, and benefit from retail category management decisions. In contrast, smaller brands face a fourfold disadvantage: they obtain lower own retail price pass-through, lower retail support, and lower benefits from competing brand's promotions, while their promotions generate higher benefits to competing brands. As a result, smaller brands obtain lower sales benefits from their own promotions and are less effective in their competitive reaction to leading brand promotions. Interestingly, the mid-1990s move from off-invoice allowances toward scan-back deals only partially improves their promotional effectiveness compared to that of leading brands.

The managerial implications of our findings are threefold. First, we find substantial evidence of long-term retailer pass-through and support of manufacturer promotions for the three major brands. This result is consistent with previous studies of pricing at Domick's Finer Foods. First, the pricing experiments by Hoch et al. (1995) demonstrated that the retailer typically sets prices *below* the profit maximizing level. Second, Srinivasan et al. (2004) reported that retailer promotions typically increase category revenue, but decrease gross category margin. In other words, the retailer is not simply maximizing profit at all times but probably also aiming to increase traffic. Second, competitive reaction is mostly aggressive for price actions in fast moving consumer good markets. However, this competitive response only wipes out 10 percent of the long-term sales effectiveness for the initiating manufacturer. In other words, the effectiveness of price promotions for fast moving consumer goods does not appear to depend as strongly on competitive response as previously thought. Instead, our results suggest that competing brands perceive minimal damage from each other's promotional reactions, consistent with recent evidence on the substantial category expansion effects of price promotions (Pauwels et al. 2002; Steenkamp et al. 2005; Van Heerde et al. 2003). Third, the brand's competitive position within the category is a crucial moderator of long-term response to and effectiveness of price promotions. Leading brands are clearly at an advantage, thanks to higher retail pass-through, support, and beneficial category management decisions. They should recognize this preferential retailer treatment, and defend it against potential encroachment by manufacturers that challenge category leadership with retailer incentives. On the contrary, smaller brands face a tough upward battle for retailer pass-through and support. Moreover, their promotional effectiveness is relatively more affected by retailer support and category management decisions. As a result, it is crucial to engage retailer cooperation and create innovative sales promotions that benefit both parties and are hard to imitate by the leading brands. In particular, managers should focus on initiatives that enlarge the brand's consumer base, such as product sampling and integrated communications. The more consumers are familiar with the brand, the larger the retailer support for and the effectiveness of future price promotions (Bronnenberg and Mahajan 2001).

Our study has several limitations which suggest areas for future research. First, we analyzed data from one supermarket chain only, Dominick's, in one geographic region (the Chicago area). Therefore, our results are subject to the retailer's pass-through, support and category management strategies. This also means we were not able to distinguish between retailer-specific versus market-wide wholesale price promotions and their pass-through consequences (Moorthy 2005). Likewise, our data span the 1989–1997 period; so the results are not necessary generalizable to the current time. However, two main arguments justify an expectation of little substantial change: (1) empirically, the split-sample procedure shows no major changes with the much heralded move toward scan-back promotions, and (2) retailer power, including the ability not to comply with major manufacturer promotions requirements (as discussed by Armstrong 1991) and to exercise category management (e.g., in the form of cross-brand pass-through), shows no sign of waving in this century (e.g., Ailawadi 2001). Second, we had information on both retail prices and margins (enabling the calculation of wholesale prices), but not on other promotional expenses manufacturers may incur, such as slotting allowances, buy-back charges, and failure fees. Third, the findings are based on data from well-established product categories and their top brands, for which promotions do not generate permanent sales benefits. Based on a more extensive data set, future research may investigate whether our findings generalize to different retailers, manufacturer trade promotions, and growing categories and brands. In the light of our reported fourfold disadvantage of small brands, it seems particularly interesting to analyze when and how up-and-coming brands overcome these challenges on their way to the top.

In conclusion, we found evidence of substantial long-term retailer pass-through and support of manufacturer promotions, and competitive retaliation. However, larger categories obtain higher retailer pass-through and support, while concentrated categories show higher competitive response. Finally, leading brands obtain higher own pass-through, feature and display support, and benefit more from retail category management decisions. For managers of fast moving consumer goods, these variations in retailer and competitor response are critical forces that shape their long-term promotional sales effectiveness.

Acknowledgements

The author is indebted to Paul Wolson for stellar research support, to the Marketing Science Institute for financial support and to the University of Chicago for making the data available. The paper also benefited from comments by three anonymous reviewers and an associate editor of the *Journal of Retailing*, and by Marnik Dekimpe, Jean-Pierre Dubé,

Philip-Hans Franses, Vincent Nijs, and seminar participants at the Leuven Marketing Camp.

Appendix A. Measurement of moderator variables

Brand expensiveness, following Raju (1992), is calculated by dividing the brand's regular price by the market share weighted average of the regular prices of all the brands in the category.

Brand wholesale price volatility is calculated as the wholesale price's coefficient of variation (the ratio of the standard deviation to the mean), similar to Srinivasan et al. (2004).

Category revenue is the retailer revenue from the category in $M, averaged across all weeks.

Category expensiveness is calculated as the market share weighted average of the regular prices of the brands in the category (Raju 1992).

Category wholesale price volatility is calculated as the coefficient of variation (the ratio of the standard deviation to the mean) in the category price (market share weighted average of brand prices in the category), similar to the "variability in category sales" measure in Raju (1992), *category concentration*, following previous work in industrial organization and marketing (Caves 1998), is measured as the sum of the shares of the top three brands in the category.

Impulse buying and ability to stockpile are calculated based on the Narasimhan et al. (1996) storability and impulse-buy scales (we thank Scott Neslin for making available the factor scores of all categories). Specifically, a category with a positive factor score on "ability to stockpile" (see their Table 3, p. 23) is coded as "storable," while a category with a negative factor score is coded as "perishable." The same procedure is performed for the factor "impulse buying." Finally, we construct dummy variables indicating whether the product is considered perishable or storable (=1), and whether or not it is typically associated with an impulse versus a planned purchase (=1).

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