New Insights into Supermarket Promotions via Scanner Data Analysis: The Case of Milk

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Supermarket companies expend significant resources and employ many promotional activities so as to convince consumers to shop their stores. This analysis investigates the promotional activities of a single retail food company to determine the price and promotion responsiveness of fluid milk products that differ by milkfat content. It utilizes weekly, store-level scanner data. Seasonality and advertising are significant determinants of retail sales of fluid milk. Own-price elasticities are negative, and cross-price elasticities are positive for all milk types and are significant and elastic in the case of 2% milk. Advertising effects are positive and statistically significant. The response to advertising is much more pronounced for reduced-fat milk types than it is for whole milk.

Introduction

The adoption of scanner equipment by retail food companies during the past decade has revolutionized market analysis. In particular, retail scanner data have become a more common source of information for demand analysis. One principal advantage of scanner data is that they are rich in terms of product-specific information, allowing for demand analysis of product groups on a disaggregate level. In addition, the use of scanner data focuses the analysis on a shorter time period than do other sources of data. Indeed, scanner data hold great promise for developing insights into store-level performance. As stated by Nayga (1992), "Scanner data have tremendous potential for use in the analysis of consumer demand for specific products. Translating these data into information for management, advertising, and pricing decisions, however, remains a major concern." (p. 210)

In this light, the focus of this study is an evaluation of the promotional activities for a much investigated food product (milk) through the use of scanner data. Sales elasticities are developed for an individual retail food chain. Management within the firm will find such elasticities useful for evaluating pricing strategies. A basic knowledge of the price responsiveness of products used in promotional activities is important because it allows food retailers to set prices that maximize the benefits of the promotion. Additionally, this knowledge could be used by retailers to more accurately forecast sales of items featured in a price promotion, allowing for optimal ordering and inventory control by individual retail stores. Furthermore, this study examines the effects of seasonality and promotion on fluid milk sales. This is important as retailers are often unable to separate these effects from that of a change in price as they evaluate their day-to-day operations.

Loss Leaders

Retailers expend significant resources so as to convince consumers to shop their stores. Sales promotion activities comprise a wide variety of short-term, tactical tools designed to generate an immediate market response. Such tactics include: radio announcements, television spots, frequent shopper cards, and weekly feature advertisements (fliers distributed through the mail or as newspaper inserts). Of particular interest is the weekly advertisement, which typically features 100 to 150 items. Many of these products are priced at very low, sometimes negative, margins in an effort to generate traffic by diverting customers away from competing stores. These items are often referred to as loss leaders. Although an item priced this way might be sold at a loss, the supposition is that customers will purchase additional merchandise in other categories, leading to increased store sales and profitability.

Walters and MacKenzie (1988) conducted an empirical analysis of loss leaders and found that most loss leader promotions had no effect on store profit, but those that did affect profit did so by increasing store traffic. These results are somewhat at odds with the findings of Kumar and Leone (1988). Looking at diaper sales in 10 stores, their results indicated that the display, featuring, and price promotion strategies used by stores can result in increased sales of the brand within the

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store. Part of the increase is due to brand substitution within the store, primarily as a result of the price promotion, and some of the increase is attributable to consumers' substitution of stores in order to buy the product being promoted.

The practice of loss leader pricing also creates an overall low price image for the store and fewer disturbances (that is, price wars among competition) than do general price cuts. Dreze (1995) investigated the timing of promotions and items included in those promotions for competing grocery chains. He showed that some products are used as loss leaders to protect the retailer's market share, but for other products, it is in the best interest of the retailer to avoid direct competition and to encourage cross-shopping in order to maintain a promotional pricing strategy.

The median supermarket carries 30,000 items, making consumers unfamiliar with the majority of prices; therefore, leader prices are typically associated with high-frequency, high-traffic items. These include daily menu items (for example, meat) or items that are subject to repeat purchase (for example, laundry detergent). Milk is a classic example of a loss leader for various reasons: It is an important item in many consumer grocery budgets; it is perishable so it must be replaced often; and its perishability implies that the retailer will not sacrifice many sales in the next period when the price returns to its standard markup.

Demand for Milk

Analyses of milk are abundant in the extant literature. For the most part, these traditional demand analyses have been conducted with only a limited degree of disaggregation. In an analysis of household survey data, Heien and Wessels (1988) showed that the demand for dairy products is generally inelastic. Similarly, Capps and Schmitz (1991) showed that fluid milk demand is insensitive to price; however, they found that seasonality and advertising were significant determinants of the demand for milk. In contrast to these studies, others have disaggregated the products for analysis generally on the basis of fat content.

Jensen (1995) studied the effects of nutrition information and household socioeconomic characteristics on market participation and the amounts of whole and low-fat milk purchased in the South. Results suggested that the promotion of milk, on the basis of nutritional benefits, through health professionals and product packaging is a useful tool that may be used by the dairy industry to attract market participation. Gould (1996) estimated a three-equation demand system for fluid milk that varied by fat content. This study looked at milk purchased for at-home consumption during a 12-month period. It included the effects of household demographics (income, ethnicity, food stamps, composition, region, seasonality, adult equivalents, and household size) on the own- and cross-price elasticities for whole, 2% and other reduced-fat milks. The study showed household demand to be inelastic for all types of milk. Kaiser and Reberte (1996) looked at the impacts of advertising on per capita sales response for whole, low-fat, and skim milk in New York. The results indicated that the long-term advertising elasticities were inelastic for all milk products.

An individual retailer typically observes item sales and not individual demand; therefore, elasticities presented in this analysis may not adhere to a priori expectations based on previous work. Further, although other studies have disaggregated the products for analysis, they have also focused on other levels of the market. In comparison, this analysis draws implications for the managerial practices of an individual retail food company.

Data

This analysis utilizes weekly scanner data, capturing the fluid milk sales of a prominent grocery retail chain in New York state. Senior management from this retail chain provided data for three stores that were selected as representative of the chain as a whole. The three selected stores operate within the same metropolitan statistical area (MSA). The data include prices and quantities sold (measured in gallons) for more than 30 universal product codes (UPCs) corresponding to fluid milk products. Individual UPCs represent products that vary by fat content, brand, and package size.

A visual inspection of the data reveals that the majority of milk sales are accounted for by gallon-size packages of store-brand milk (Figure 1). Promotional periods are characterized by spikes in the sales of store-brand gallons and corresponding valleys in the sales of all other milk packages. When looking at total milk sales, we see that individual milk types exhibit different sales levels, both overall and in response to price promotions (Figure 2). In particular, sales of 2% milk are characterized by higher overall sales and pronounced promotional responses.

Figure 1. Three-store Total Retail Sales of Fluid Milk by Package Type.

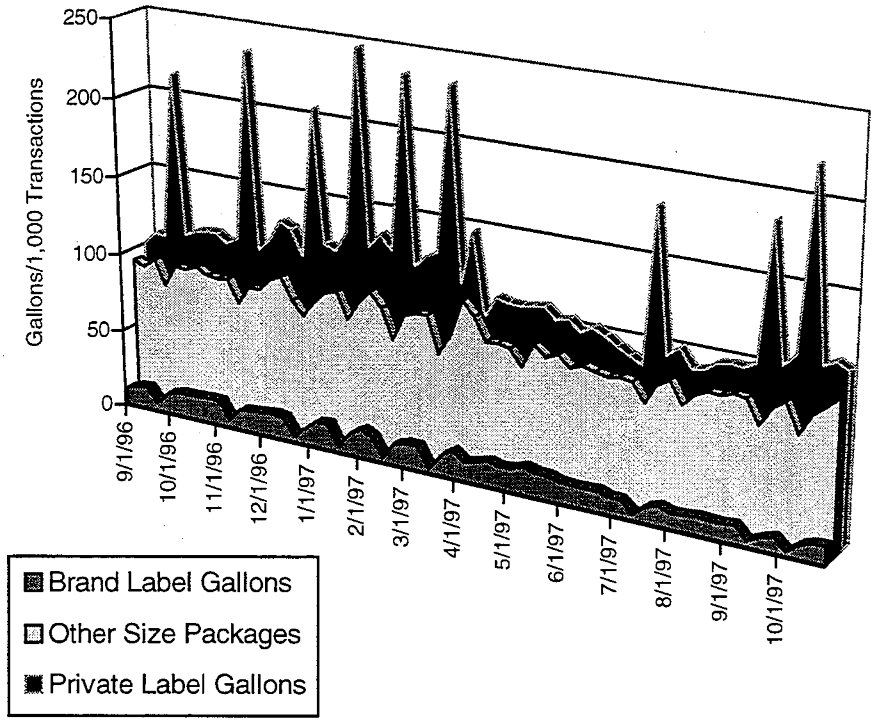
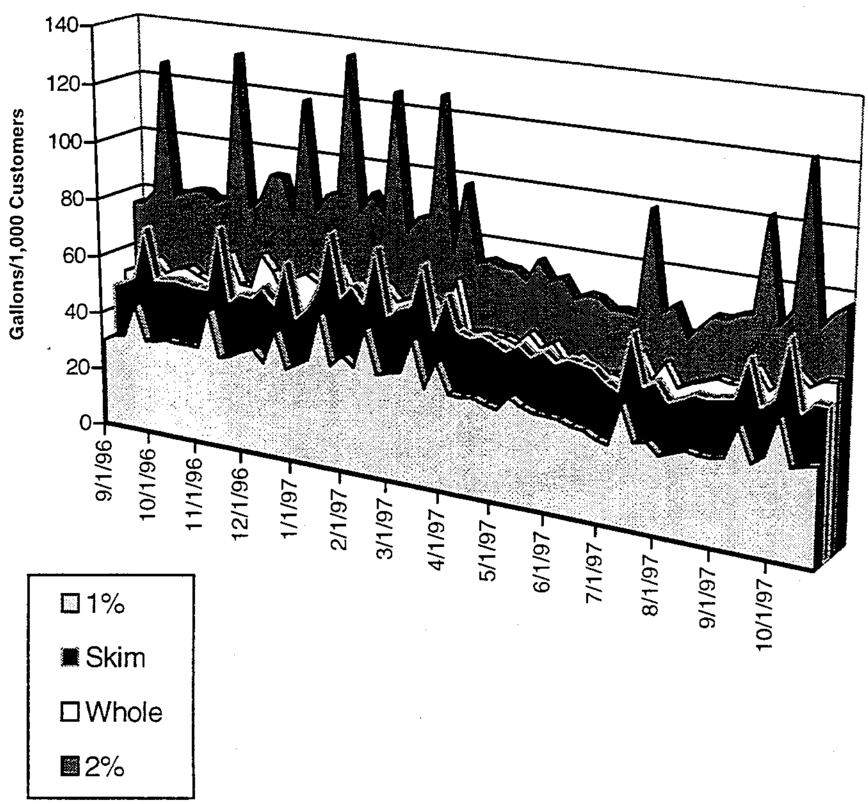


Figure 2. Three-store Total Retail Sales of Fluid Milk by Milk Type.



To circumvent difficulties from multicollinearity, the data were ultimately aggregated according to fat content—whole, 2%, 1%, and skim. Weighted average prices were developed for each of these product groups. In addition, the data are augmented by a weekly count of customer transactions for each of the three stores in the analysis and by dummy variables that account for seasonality and advertising. The data are aggregated across all three stores. Descriptive statistics for these variables are exhibited in Table 1.

The data cover 61 weeks from September 1, 1996, through October 26, 1997. During this period, the retailer featured store-brand milk in nine separate price promotions. The advertising of milk promotions is accomplished through the use of the retailer's weekly newspaper insert. The size and position of these advertisements are constant and feature only gallon-size packages of store-brand milk. Furthermore, the retailer generally sets one promotional price for all gallon packages of store-brand milk, regardless of fat content.

Table 1. Descriptive Statistics of Weekly Scanner Data (n=61 weeks).

	Mean	Standard Deviation	Minimum	Maximum
Customer Count (Transactions)	58,898	2,618.7	50,879	65,083
Quantities				
Fluid Milk		*Gallons/1,000 Transactions*		
Whole	53.745	5.681	43.930	67.406
2%	82.022	18.385	58.819	135.050
1%	34.426	5.836	26.167	52.246
Skim	53.276	8.411	41.332	78.083
Average Weighted Prices				
Fluid Milk		*$/Gallon*		
Whole	2.522	0.226	2.019	2.873
2%	2.477	0.252	1.828	2.802
1%	2.468	0.243	1.844	2.782
Skim	2.491	0.234	1.882	2.818
Binary Variables				
Milk Featured in Advertising	0.148	0.358	0	1

Although this analysis is based on weekly store-level data, we present a profile of the surrounding households in order to provide insight into the associated sales patterns. Households located within the surrounding zip codes are predominantly white, urban families (Table 2). Forty-two percent of these households earn between $15,000 and $39,999 with another 32 percent earning between $40,000 and $74,999. We also see, from Table 2, that the majority of residents are between the ages of 25 and 54.

Methodology

The retail demand for various fluid milk products and the potential effects of promotional activities can be characterized by

$$\text{(1)} \quad q_i = f_i(p_1, p_2, \ldots, p_n, a_1, a_2, \ldots, a_m),$$

where q represent the dependent quantity variables, p represents the retailer's price offer, and a represents the retailer's non-price offer (Holdren, 1960). Non-price variables could include such factors as advertising, promotional activities, store cleanliness, customer service, and the number of facings (shelf space) that the product is allowed. A conceptual framework of this type has been used successfully in other analyses of retail scanner data (Capps, 1989; Capps and Nayga, 1991; Capps and Lambregts, 1991). To operationalize the model established in equation (1), we create dependent variables that consist of gallons of whole, 2%, 1%, and skim

Table 2. Demographic Profile of Surrounding Households.[a]

	Number	Percent[b]
Households	19,645	
Family	13,342	68
Non-family	6,303	32
Income		
Less than $15,000	3,379	17
$15,000 to $39,999	8,229	42
$40,000 to $74,999	6,319	32
$75,000 or more	1,718	9
Persons	48,849	
Urban	46,232	95
Rural	2,617	5
Race		
White	46,388	95
Black	1,513	3
Native American	80	<1
Asian	760	2
Other	108	<1
Ethnicity		
Hispanic	619	1
Age		
1 to 17	10,682	22
18 to 24	4,711	10
25 to 54	20,900	43
55 and above	12,556	26

[a] Includes households living within the same zip codes as the stores pertaining to this study.
[b] May not total 100 percent due to rounding.
SOURCE: U.S. Census Bureau (1990).

milk per 1,000 customer transactions. Weighted average prices are generated for these and competing milk products. Again, due to multicollinearity among the prices for individual brands and product types, four weighted average prices were created for all competing fluid milk products. For example, the price of milk products that compete with whole milk is a weighted average price for all 2%, 1%, and skim products. Variables describing the non-price component of the model include simple binary variables that indicate promotional activity and seasonality. In regards to advertising in the weekly circular, advertisements for milk were invariant with respect to size, placement, and product. The resulting demand equations incorporate the following variables:

q_i gallons of milk type i;

p_i weighted average price of milk type i; and

$p_{not,\,i}$ weighted average price of fluid milk other than type i,

where i indicates the type of milk in question (whole, 2%, 1%, and skim). The binary variables that describe advertising and seasonality are defined as follows:

advertising equals one for weeks that milk is featured in the store circular and zero otherwise, and

seasonality a group of binary variables that indicates the individual months of the year.

Thus, the system of four demand equations (suppressing the time subscript) is specified as

$$\text{(2)} \qquad \begin{aligned} \ln q_i &= \beta_0 + \beta_1 \ln p_i + \beta_2 \ln p_{not,i} \\ &+ \beta_3 \text{advertising} + \delta\, \text{seasonality} + \varepsilon_i \end{aligned}$$

for i = whole, 2%, 1%, and skim. Also, δ is a coefficient vector for 11 monthly dummy variables that correspond to January through November, with December being omitted to avoid singularity in the matrix of regressors.

It is reasonable to expect that random exogenous factors could impact the demand of milk products. These factors could include competition from other stores, general economic activity, or other omitted factors, such as weather, holidays, and other promotional activities within the store (Eastwood, Gray, and Brooker, 1994). In this light, the estimation of equation (2) is accomplished by means of a seemingly unrelated regression (SUR) or joint generalized least-squares (JGLS) technique. The SUR is appealing in that it accounts for contemporaneous correlation in the disturbances while allowing for a different coefficient vector for each demand equation. Also, use of the SUR technique will potentially limit the adverse effects from multicollinearity although the extent of this benefit remains an empirical question. Finally, because the right-hand-side variables differ across equations, the SUR may provide gains in estimation efficiency over the ordinary least-squares procedure (Judge et al., 1988).

Empirical Results

Parameter estimates and associated standard errors resulting from the SUR are presented in Table 3. R^2 for the system of equations is 0.998. For the individual equations, the coefficient of multiple determination takes values between 0.787 and 0.939. Other diagnostic statistics include the Durbin-Watson statistic, which fails to verify the presence of autocorrelation in any of the four equations. Table 3 also presents F statistics for the joint test of significance on δ for each milk-type equation. In each equation the coefficients for the seasonal dummy variables are jointly significant.

Due to the log linear specification of the demand equations, elasticities are conveniently obtained from parameter estimates. In each equation, the own-price elasticity is negative, and the cross-price elasticity is positive. Both own-price and cross-price elasticities are significant at the 0.05 level in the 2% equation. In all equations, the coefficient on advertising is positive and significant at the 0.05 level, taking on values that range from 0.167 (whole milk) to 0.438 (2% milk). In general, the coefficients on the seasonal dummy variables tend to be negative in the summer months, relative to the base month of December. Many of these coefficients were significant at the 0.05 level throughout the model. As previously stated, the coefficients for seasonal variation are jointly significant in each milk-type equation.

While price elasticities are easily obtained with the log linear specification, a clear interpretation of the dummy variable coefficients has not been made. A description of the estimated dummy variable coefficients in equation (2) is phrased in terms of changes in the natural logarithm of quantity. A more intuitive interpretation would translate this information into a numerical result, using the common base of 10; therefore, we calculate the percentage change in quantity sold due to an occurrence of the dummy variable in question. For illustration, this result is derived below for the case of the weekly advertisement.

Starting with the system outlined in equation (2), expressed in its nonlinear form, we have

$$\text{(3)} \qquad q_i = A p_i^{\beta_1} p_{not,i}^{\beta_2} e^{\beta_3 \text{advertising}} e^{\delta \text{seasonality}}.$$

Thus, during a promotional week (advertising = 1), we have

$$\text{(4)} \qquad q_i^{Ad} = A p_i^{\beta_1} p_{not,i}^{\beta_2} e^{\beta_3} e^{\delta \text{seasonality}}.$$

Likewise, during the weeks that milk is not being promoted (*advertising* = 0), we have

$$\text{(5)} \qquad q_i^{NoAd} = A p_i^{\beta_1} p_{not,i}^{\beta_2} e^{\delta \text{seasonallity}}.$$

Equations 4 and 5 are then combined into an expression of the percentage change in quantity due to the appearance of milk in the weekly feature advertisement. The result is shown in equation (6).

Table 3. Parameter Estimates from Seemingly Unrelated Regression.

Variable	Equation			
	Whole	2%	1%	Skim
Intercept	3.803*[a] (0.256)[b]	3.836* (0.260)	3.230* (0.246)	3.547* (0.257)
Own Price	-0.453 (0.437)	-2.714* (0.868)	-0.329 (0.996)	-0.507 (0.777)
Price of Other Fluid Milk	0.722 (0.464)	3.256* (0.891)	0.588 (0.977)	0.880 (0.802)
Advertising Dummy Variable	0.167* (0.068)	0.438* (0.072)	0.379* (0.067)	0.395* (0.066)
Seasonal Dummy Variables				
January	0.041 (0.047)	0.134* (0.048)	0.109* (0.045)	0.144* (0.046)
February	0.021 (0.047)	0.093 (0.048)	0.137* (0.045)	0.155* (0.046)
March	0.011 (0.043)	0.090* (0.044)	0.144* (0.041)	0.144* (0.042)
April	-0.138* (0.041)	-0.076 (0.042)	0.013 (0.040)	0.034 (0.040)
May	-0.129* (0.041)	-0.089* (0.042)	0.017 (0.040)	-0.0004 (0.041)
June	-0.216* (0.045)	-0.157* (0.046)	-0.065 (0.043)	-0.027 (0.044)
July	-0.181* (0.052)	-0.128* (0.053)	-0.111* (0.050)	-0.068 (0.051)
August	-0.175* (0.056)	-0.134* (0.057)	-0.119* (0.053)	-0.080 (0.055)
September	-0.105* (0.039)	-0.051 (0.040)	-0.037 (0.037)	-0.011 (0.039)
October	-0.062 (0.035)	-0.028 (0.035)	0.001 (0.033)	0.012 (0.036)
November	-0.050 (0.037)	-0.009 (0.038)	-0.010 (0.036)	0.029 (0.037)
Diagnostic Statistics				
F Statistic for Seasonal Dummies[c]	9.823	11.965	11.553	8.914
Durbin-Watson Statistic	2.421	2.117	1.915	1.824
R^2	0.787	0.939	0.908	0.890
System R^2	0.998			

[a] An asterisk (*) indicates significance at the 0.05 level.

[b] Standard errors are reported in parentheses.

[c] Joint test of significance for the seasonal dummy variables, $F_{11, 184}$.

(6) $$\left(\frac{q_i^{Ad} - q_i^{NoAd}}{q_i^{NoAd}}\right) X\ 100 = \left(e^{\beta_3} - 1\right) X\ 100.$$

This result may be applied, in turn, to all dummy variable coefficients in each equation. The numbers presented in Table 4 were calculated in this manner. The most notable of these results is that the percentage change in quantity sold due to advertising is more pronounced for low-fat milk types (46 percent to 55 percent) than it is for whole milk (a change of 18 percent). In regards to seasonality, sales are greater in winter months than they are in summer months.

Discussion

The results show that differences exist in the price and promotion responsiveness of milk products that differ in milk-fat content. In general, fluctuations in sales of fluid milk products are readily explained by seasonality and advertising. In particular, the changes in product movement that this retailer observes in response to a milk feature in the weekly advertisement are much more pronounced for reduced-fat milk types. This is evidenced by the relative values of the advertising effects shown in Table 4.

Not only does 2% milk exhibit the greatest response to advertising (a 55 percent change); it also exhibits the greatest response to a change in price. The coefficient suggests that the demand for 2% milk is extremely price-elastic; however, it should be pointed out that the elasticities presented here are *sales* elasticities—the percentage change in retail sales due to a 1-percent change in the price of milk. Thus, these relationships are not adequately explained solely by traditional factors of demand. Rather, one must also consider other factors, such as store patronage and shopping patterns.

In fact, industry experts would point out that it is unlikely that milk consumption has increased for the whole market as a result of the retail promotions. Instead, the retailer's sales increases most likely occur at the expense of either (a) milk sales at other retail outlets or (b) milk sales in the following week. For this particular retailer, milk sales do not appear to decline in the weeks following a promotion. This suggests that this retailer has stolen sales from elsewhere in the market.

From an economic standpoint, it would be interesting to know why the promotion of milk has such a greater impact on reduced-fat milk types than it does on whole milk. To examine this fully, one must consider the effect of the promo-

Table 4. Increase in Milk Sales Due to Featured Advertising and Seasonality.

	Percent Change in Quantity Sold			
Responsible Factor	Whole	2%	1%	Skim
Product Featured in Weekly Advertisement	18	55	46	48
Seasonality (Compared to December)				
January	4	14	12	15
February	2	10	15	17
March	1	9	15	15
April	-13	-7	1	3
May	-12	-9	2	-0.04
June	-19	-15	-6	-3
July	-17	-12	-11	-7
August	-16	-13	-11	-8
September	-10	-5	-4	-1
October	-6	-3	0.1	1
November	-5	-1	-1	3

tion on store patronage as well as consumption behavior. In other words, did the promotion increase consumption of fluid milk products among established store shoppers, or bring new shoppers into the store in search of milk? Or are both effects occurring simultaneously? The answer ultimately lies in the use of household panel data (obtainable through frequent shopper programs or industry consultants such as AC Nielsen) specific to an individual retail chain. In this way, detailed sales could be associated with specific shoppers and stores.

However, this analysis has more practical implications for a retail company seeking to improve the effectiveness of its promotional activities. These activities may involve the use of loss leader pricing, where the retail selling price is reduced to below normal levels in an effort to attract customers to the store. As stated previously, a successful loss leader will have a highly elastic sales response, potentially drawing more customers into the store.

The retail company in this analysis periodically uses milk as a loss leader, generally promoting all store-brand gallons of milk at a single low price; however, our results show that setting prices according to fat content could enhance fluid milk promotions. In particular, 2% milk products are apparently more effective loss leaders and, therefore, should be priced separately from other milk. Furthermore, because of their inelastic sales response, one might suggest that the retailer should not reduce the price of other types of milk at all; however, this is not a foregone conclusion for various reasons, which include: (a) the retailer's desire to promote a low price image for the store, (b) the retailer's desire to be equitable to consumers who prefer whole milk, and (c) the fact that the promotion of other types of milk still has a prominent impact on overall store sales and profitability.

In regards to (c) above, items with an elastic sales response are generally equated with items that generate store traffic, thereby having a positive impact on overall store sales. Thus, price promotions of other types of milk are assumed to be ineffective at generating increased store sales; however, this is not a testable hypothesis as the data for overall store sales are unavailable.

In conclusion, this analysis has utilized an often neglected source of sales information—namely, the scanner data of a specific retailer. The benefits of using such data include the ability to examine products at a disaggregated level and to examine specific management practices. It has been shown that differences exist in the sales and advertising responses of various milk products, suggesting that the retailer could optimize promotional performance by pricing different types of milk independent of each other. Further analysis would benefit from additional data on overall store sales, or on individual consumers through the use of frequent shopper data. With this additional information, one could examine a promotion's ability to affect store sales and could provide insights into the source of increased item movement.

References

Capps, O., Jr. 1989. "Utilizing Scanner Data to Estimate Retail Demand Functions for Meat Products." *American Journal of Agricultural Economics.* 71(August): 750–760.

Capps, O., Jr., and J.A. Lambregts. 1991. "Assessing Effects of Prices and Advertising on Purchases of Finfish and Shellfish in a Local Market in Texas." *Southern Journal of Agricultural Economics.* 23(July): 181–194.

Capps, O., Jr., and R.M. Nayga. 1991. "Demand for Fresh Beef Products in Supermarkets: A Trial with Scanner Data." *Agribusiness.* 7: 241–251.

Capps, O., Jr., and J.D. Schmitz. 1990. "Effect of Generic Advertising on the Demand for Fluid Milk: The Case of the Texas Market Order." *Southern Journal of Agricultural Economics.* 23(December): 131–140.

Dreze, X. 1995. "Loss Leaders, Store Traffic and Cherry Picking." Unpublished Dissertation. University of Chicago Graduate School of Business, Chicago, IL, August.

Eastwood, D.B., M.D. Gray, and J.R. Brooker. 1994. "Supermarket Patronage: An Analysis of Customer Counts Among Outlets Within a Geographic Area." University of Tennessee, Knoxville, TN. Paper presented at the Southern Agricultural Economics Association Annual Meeting, Nashville, TN, February 7.

Gould, B.W. 1996. "Factors Affecting U.S. Demand for Reduced-Fat Fluid Milk." *Journal of Agricultural and Resource Economics*: 21: 68–81.

Heien, D.M., and C.R. Wessells. 1988. "The Demand for Dairy Products: Structure, Prediction, and Decomposition." *American Journal of Agricultural Economics.* 70(May): 219–228.

Holdren, B.R. 1960. The Structure of a Retail Market and the Market Behavior of Retail Units. Englewood Cliffs, NJ: Prentice-Hall.

Jensen, K. 1995. "Fluid Milk Purchase Patterns in the South: Effects of Use of Nutrition Information and Household Characteristics." *Journal of Agricultural and Applied Economics.* 27(December): 644–657.

Judge, G.G., R.C. Hill, W.E. Griffiths, H. Lütkepohl, and T. Lee. 1988. *Introduction to the Theory and Practice of Econometrics.* New York, NY: Wiley.

Kaiser, H.M., and C. Reberte. 1996. "Impact of Generic Advertising for Fluid Milk on Demand for Whole, Lowfat, and Skim Milks." *Journal of Dairy Science.* 79: 2284–2291.

Kumar, V., and R.P. Leone. 1988. "Measuring the Effect of Retail Store Promotions on Brand and Store Substitution." *Journal of Marketing Research.* 25(May): 178–185.

Nayga, R.M., Jr. "Scanner Data in Supermarkets: Untapped Data Source for Agricultural Economists." *Review of* Marketing and Agricultural Economics. 60(August): 205–212.

U.S. Census Bureau. 1990. "1990 U.S. Census Summary Tape File 3B." http://venus.census.gov/cdrom/lookup.

Walters, R.G., and S.B. MacKenzie. 1988. "A Structural Equations Analysis of the Impact of Price Promotions on Store Performance." *Journal of Marketing Research.* 25(February): 51–63.