Price and Promotion Effects of Supermarket Mergers

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Abstract

Using a unique data set of transaction-level retail food sales, I find that food prices are negatively related to supermarket chains' shares of total US food sales. The negative relationship suggests that supermarket chains enjoy economies of scale or benefit from an improved post-merger bargaining position. In contrast, the regressions also show an increase in price after a merger which is independent from changes in observable control variables. Other analysis suggests mergers are associated with decreases in the frequency and depth of price-promotions. These latter effects suggest supermarkets enjoy greater pricing power post-merger, perhaps due to improved brand identity.

JEL Codes: L81, L11, D4

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I. INTRODUCTION

Mergers between some of the largest supermarkets in the US have resulted in sales concentrated among a few large firms and raised concerns about competitiveness. Because most retail food markets are local, anticompetitive effects of ownership concentration seem most likely to occur at that local level. At the same time, concentration of ownership through mergers may have effects beyond the local market if scale effects are important. Some argue supermarket mergers are driven by attempts to capture scale economies and to consolidate bargaining power over suppliers in order to better compete with new entrants into food retailing, including club-stores and "big-box" retailers (Balto, 1999; Kaufman, 1999; Kinsey,1998).

I use a unique data-set of retail food prices to analyze supermarket concentration of ownership at the national level. As chains merge, their share of national sales increases; a chain's share of the total retail food industry proxies for firm scale and bargaining position with suppliers. In reduced-form price regressions I find that chains with larger national-shares are associated with lower food prices. As in other merger studies, I include a merger dummy variable which, in contrast, suggests an independent increase in prices. An increase in cooperation between firms seems unlikely as regulators restrict changes in post-merger local-market structure. Instead I find evidence of unilateral strategic changes in pricing promotions; temporary price reductions (sales) decreased in depth and frequency following mergers explaining a portion of the post-merger increase in price. Supermarkets may have benefited from a stronger brand-identity post-merger which required less-frequent and smaller-price promotions.

II. SUPERMARKET MERGERS, CONCENTRATION OF OWNERSHIP, AND FOOD PRICES

Measuring the effects of mergers is an important empirical question in industrial organization because mergers offer the possibility for counteracting effects. Mergers may increase market power and result in higher prices for the good or service being offered. On the other hand, mergers may result in a more efficient, lower-cost entity and with sufficient competition from rivals, lead to lower prices. Despite the question's importance, relatively few studies have directly examined the effect of mergers on price, and most of those are of regulated industries (e.g., airlines, banking) (Pautler, 2001).

The empirical question in the supermarket industry seems especially intriguing. Mergers among some of the nation's largest food chains have left the industry with a few retailers with large shares of the national market and created concerns about competitiveness. However, competition between food retailers is largely local and local market shares have not been as dramatically affected as national shares (Kaufman, 2000).[1] While a merger may affect local competition as the strategic game changes, these changes cannot be approximated by changes in market concentration levels.[2]

Supermarket merger activity in the US peaked during the previous decade between 1997 and 1999. During these three years 3,492 stores with over $67 million in sales were acquired (Kaufman, 2000). This consolidation activity is reflected in nationwide four-firm concentration ratios (CR4) which increased from 15.9 in 1992 to 28.8 in 1998. However, local effects were more modest and the average CR4 in the largest 100 metropolitan areas increased only 3.7 percentage points between 1992 and 1998 (Kaufman, 2000). Small increases in local concentration reflect efforts of the Federal Trade Commission (FTC) to restrain the anti-competitive effects of mergers by focusing on local-market shares. In many instances, the FTC required acquiring firms to divest their own stores, or sell acquired stores when there was substantial market overlap between chains.[3]

Mergers among supermarkets may be a reaction by these traditional food retailers to increased competition from non-traditional entrants into food retailing – including club stores and supercenters (Tucker, 2003). When acquiring other chains, food retailers frequently cite the need to exploit efficiencies through economies of size in order to improve their competitive position relative to discount retailers (Balto, 1999). Wal-Mart is now the US' largest food retailer. Other supercenters and club stores continue to encroach on supermarkets' share of total food sales. Food sales at warehouse club stores and supercenters were estimated at 2.4 percent of all at-home food expenditures in 1990, while supermarkets garnered a 61.2 percent share. In 2002, the share of food sales at warehouse clubs and supercenters had

[1] The Federal Trade Commission examines expected post-merger HHIs in local markets to determine whether to challenge a proposed merger or to require store divestitures (Simpson and Hosken, 2000).
[2] Vita and Sacher suggest that this may explain the relative dearth of merger/ price research. FTC actions apparently reduce the likelihood of increased post-merger coordination.
[3] Balto notes the divestitures required by the FTC.

increased to 8 percent, and the share of sales at supermarkets had decreased to 57.8 percent in (ERS, 2002). Wal-Mart seems an increasingly important competitor as their efficient supply chain and their bargaining position with suppliers allows them to pass their lower costs to consumers as lower prices (*Business Week Online).*

A search for size economies, supply efficiencies, and an improved bargaining position with suppliers may be a motivation for supermarket consolidation. Some suggest reducing costs is a strategy supermarkets have employed to adapt to the new competition (Kaufman, 2000; Kinsey, 1998). Kaufman (1999) suggests several sources of efficiencies that consolidating food retailers may encounter, including reductions in operating, procurement, marketing, and distribution costs. Implicit in this argument is that costs decrease as chains' grow in scale. The veracity of cost declines remains in question, as to my knowledge no studies have examined the issue.

Studies that have explicitly examined the effect of supermarket mergers on food prices include Park and Weliwita (1999). The authors use data from 1967 through 1992 to examine the effect of merger activity on equilibrium quantities and prices, and find that merger activity decreased industry output by about 1.8%. Simpson and Hosken (2000) conduct an event study analysis of stock prices to examine six supermarket mergers in the late 1980s and early 1990s. They find little evidence that mergers increase stock prices. Chevalier (1995) finds that retail food prices increase following a leveraged buyout (LBO), if rival firms are highly leveraged. However, prices fall following an LBO if rivals are not highly leveraged and if there is a single large competitor with low leverage.

A related literature examines the relationship between food prices and competition in local markets.[4] Cotterill, (1986) uses a cross-section of Vermont supermarkets and finds a significant positive relationship between market concentration and food store (supermarket and grocery store) prices. Lamm (1981) also finds a positive relationship between price and market concentration. In contrast, a study by

[4]FTC merger analysis examines expected increases in concentration, because increases in concentration are thought to indicate increases in the ability of firms to coordinate activities. In merger reviews, the FTC also examines other theories of competitive effect including unilateral effects. "In unilateral theories, the merged entity has unilateral ability profitably to increase its prices" (Coleman, Meyer, and Scheffman, 2003).

Kaufman and Handy (1989) find a negative relationship between price and concentration. Similarly, Newmark (1990) did not find a relationship between price and market concentration. Binkley and Connor (1996) examine competition from new sources and conclude that competition from new store formats (warehouse stores, superstores) and others including fast food restaurants affect grocery prices. Marion (1998) also finds that markets with substantial warehouse stores experienced smaller price increases than did areas with no warehouse club stores.

III. THEORY

I follow Stewart and Davis (2005) to motivate an empirical model of spatial competition. I assume there are M markets with aggregate demand for food in each market represented by D_m. Aggregate demand varies with the number of consumers in each market and with social and demographic characteristics. Consumer's pay the retail price of food, but also incur a transportation, or search, cost for travelling to a retail outlet. I let N_m denote the number of stores in market m and let T_m denote a vector of variables capturing transportation costs in market m. I assume there is a fixed cost of establishing a store within a market, and denote that cost as C_m. N_m is decreasing in C_m, but increasing in T_m and D_m. In general,

$$N_m = N(C_m, D_m, T_m). \tag{1}$$

Demand at food store i, in market m is represented as a price relation. Prices are a function of marginal costs, $MC_{j,m}$, T_m and N_m,

$$P_{j,m} = P\big(MC_{j,m}, T_m, N_m\big). \tag{2}$$

In equation 2, price is increasing in marginal costs, and transportation costs, but decreasing in the number of stores.

I substitute equation 1 into equation 2 to get a reduced form equation for price,

$$P_{j,m} = P\big(MC_{j,m}, T_m, C_m, D_m\big). \tag{3}$$

In equation 3, there is a direct relationship between price, marginal costs, and fixed costs. Higher fixed costs imply fewer stores, less competition, and higher prices. The relationship between price and

transportation costs is ambiguous. Higher transportation costs imply higher search costs, which allow stores to increase prices. But, higher transportation costs imply more stores, and thus lower prices. Market demand is inversely related to price; increases in demand increase the number of stores, which lowers price.

IV. DATA AND VARIABLES

The empirical specification is motivated by previous merger studies. Taylor and Hosken (2004) note that there are three types of reduced form regressions most frequently used to analyze pre- and post-merger prices. The first regresses the merged firms' prices on the prices of a comparison group of firms that were not affected by the merger, a merger dummy variable, and time controls (e.g., Kim and Singal, 1993). A second regresses the merged firms' prices on a merger dummy variable with cost and demand controls. A third approach combines the first two and regresses the merged firm(s)' prices, relative to those of an unaffected comparison group, on relative cost and demand variables and a merger dummy variable (e.g., Vita and Sacher, 2001). I follow in this tradition and use reduced form equations to analyze mergers, measuring effects relative to a control group of non-merging firms.

Product Data

The source for product data is a detailed store-level supermarket data set from Information Resources Inc., (IRI). This data set is a record of weekly store-level sales of food items by Universal Product Code (UPC) and includes information for beverage and dairy products.[5] After eliminating drug stores and stores without complete data, weekly UPC item sales are recorded at 121 stores, in 23 metropolitan areas, for 156 weeks from the first week in 1997 through the last week in 1999.[6] Stores are identified by their chain affiliation and other variables include the price of the items sold and several

[5] The UPC items belong to one of 19 categories: aseptic juice, baby formula, canned juice, concentrate juice, isotonics, non-fruit drinks, powdered milk, tea, butter, creams and creamers, frozen juice, ice cream, milk, natural cheese, refrigerated juice, carbonated beverages, shelf-stable juice, water, yogurt.

[6] The 23 MSAs are Pittsfield, MA; Eau Claire, WI; Midland, TX; Visalia, CA; Grand Junction, CO; Cedar Rapids, IA; Los Angeles, CA; New York, NY; Chicago, IL; Memphis, TN; Houston, TX; Pittsburgh, PA; Seattle/Tacoma, WA; Detroit, MI; St. Louis, MO; Kansas City, MO; Boston, MA; San Francisco/Oakland, CA; Tampa/St. Petersburg, FL; Minneapolis/St. Paul, MN; Denver, CO; Philadelphia, PA, and Atlanta, GA.

product descriptors. The data also include information on the incidence and depth of price promotions for UPC items.

Initial analysis focuses on price effects, while subsequent analysis examines the depth and frequency of temporary price reductions (TPR). TPR depth and frequency calculation are detailed later.

It is important to control for cost and demand shocks that may be correlated with the timing of a merger to isolate the effect of mergers. The data do not include high-frequency, weekly, store-specific cost variables, so I instead define a control group of supermarkets, not affected by merger, that face similar cost conditions. I first create time series of price observations for each UPC item at each store, restricting the sample to include only items with observations at a store for at least 153 weeks.[7] Next, I calculate an average-weekly price for the category (e.g., butter, carbonated beverages, etc.) to which an item belongs using observations at chains that do not merge at any time during the sample period. The weekly price of each item is divided by its weekly-average category price. The price variable measures the price of an item, relative to the average-weekly price of its category, which was calculated from the comparison group of non-merging chains. For a typical item i from a given category, at store j, during week t,

$$RP_{i,j,t} = \frac{P_{i,j,t}}{\left(\frac{\sum_{i=1}^{n} P_{i,j,t}\left(\forall j \in NM\right)}{n} \right)} \tag{4}$$

where the denominator is the average price at non-merging (NM) stores for the category to which item i belongs.

Each item in the price calculation is identified as either a national brand or a private-label (store) brand. National-brand items are measured relative to the item's category average using only national brand items from non-merging stores. Private-label items are treated analogously.

[7] All UPC items are converted to a price per-ounce.

I average this relative price for each store each week, and multiply it by 100, essentially creating a store specific, weekly-price index.

$$\overline{RP}_{j,t} = \frac{\sum_{i=1}^{n} RP_{i,j,t}}{n} * 100 \tag{5}$$

I create three different price series for each store, private-labels, national brands, and all brands in aggregate.

An item's category average proxies for the item's cost and is unaffected by mergers since it is calculated from non-merging stores. Relative price differences across stores will be a function of differences in store-specific marginal costs, market transportation costs, market fixed costs, and market demand characteristics. The empirical model includes controls for each of these. If mergers affect prices, then I expect the relative price to change post-merger. An increase suggests prices increased relative to costs post-merger, whereas a decrease suggests prices decreased relative to costs post-merger.

Merger Variables

The data include store identifiers and the store's chain affiliation.[8] I use the chain-affiliation data to identify the stores in the data set that were part of a merger as either an acquiring or target chain. Table 1 notes the dates for mergers that occurred in the supermarket industry for the time period covered by the data (1997 through 1999) and that coincide with chains included in the data set.[9] I wish to test whether mergers create efficiencies, improve bargaining position, or lower costs leading to price reductions. I expect mergers must be of sufficient size to generate these effects and so restrict the analysis to large mergers. Supermarkets frequently acquire individual stores from other chains or other small chains, but this study analyzes mergers in which over 100 stores changed ownership.

[8] Chain names do not always indicate ownership. I used Progressive Grocer's Marketing Guidebook to match chain names with the appropriate ownership.

[9] Merger dates are taken from Mergerstat, Supermarket Annual Reports and Press Releases, and media reports.

I define a merger-dummy variable (Merge=1) to control for unobservable merger effects. A merger may improve efficiency apart from increases in scale, or mergers may affect brand loyalty among consumers as a new chain takes control of another chain's stores. Mergers may also affect pricing or promotional strategies played between competing chains in local markets. The merger-dummy variable takes a value of zero for all weeks at stores that never merge, a value of zero at stores that do merge in the weeks prior to a merger, and a value of 1 for all post-merger observations.

Merger effects are also measured by a chain's share of national supermarket sales (National Share). I expect this variable to capture the effect of scale economies and changes in a chain's bargaining position with suppliers. As chains grow larger, their bargaining position with suppliers likely improves which allows them to lower their acquisition costs (Skitol, 2002). Competition between supermarkets occurs at a local level and so a chain's share of the national market is unlikely to capture market power.

Progressive Grocer's *Marketing Guidebook* reports supermarket sales for chains and for each chain's subsidiaries. Prior to a merger between chains, each chain has its own national sales value. After the merger, the new entity's sales are the sum of the sales of both merging entities. Dividing sales by national supermarket sales completes the calculation of chains' national shares. Chains' national shares vary from two sources, growth and merger.

Local-Market Demand and Cost Variables

I create several high-frequency store-level variables. A data set of household purchase transactions complements the product-level data set described above. This data set is from a separate, but related, file from IRI.[10] It includes data for purchases made by households at the stores included in the store-data set. Its benefit for the current purpose is that it includes several demographic variables for the households that make purchases at the stores in the store-data set. For each store, I calculate the following weekly variables: average household income, the percent of households identifying their race as African

[10] IRI contracts with numerous supermarkets and matches store-level scanner data with IRI's data on household characteristics. Households are tracked by a "club-card" that they swipe each time they make a purchase at a supermarket. The data include three types of files, household purchase transactions, store-level price data, and household demographic data. I use data from the latter two files for prices, promotions, and household characteristics.

American, the average age of the household head, and the proportion of households without children.[11] These variables capture store-specific transportation or search costs. For example, households with higher incomes likely have higher search costs, and are likely to be less-price sensitive. Older customers, and households with children, are likely to have lower search costs, and to be more price-sensitive. While the percent of African-American households is not directly suggested by the theoretical model, I include it as a regressor in order to make comparison with previous studies that examine price discrimination based on race.

I include total market income (Total Income), measured at the MSA level, to control for aggregate market demand and market size. As total income increases, aggregate demand increases, which increases the number of stores. However, Ellingson (2006) shows that the supermarket industry may be characterized as a natural oligopoly, where the number of stores does not necessarily increase with the size of the market. Instead, supermarkets increase store size in larger markets. According to Ellingson, an increase in market size does not imply a decrease in price. Instead, an opposite effect may result. Larger markets may result in larger, but fewer stores, implying higher equilibrium supermarket-prices.

I control for market fixed-costs with a proxy for real-estate costs measured by residential rental rates. Rental rates (RENT) come from the Department of Housing and Urban Development (HUD). Each year HUD publishes a measure of "fair market rents" for MSAs. Fair market rents are the rent level below which 40 percent of "standard-quality" rental units are rented. Higher fixed costs should result in fewer stores and higher prices.[12]

Trade Dimensions collects sales data on supermarket chains by metropolitan statistical area (MSA) annually and publishes data summaries in *Market Scope*®. I use *Market Scope*® data to create a chain-specific proxy for store size by taking a chain's annual sales in an MSA divided by the chain's total

[11] Household income is reported as a categorical value in the data. I convert the categorical data to a continuous value by assigning each household the mid-point income from the appropriate range of incomes. The highest income range was $100,000+. For these households, I assigned a value of $200,000.
[12] Some studies (e.g., Stewart and Davis; Ellingson) use a measure of housing price to proxy for fixed cost. Rental rates should closely track housing prices.

number of stores in the MSA (Average Store Size). I expect that chains with large store sizes will have lower acquisition and operating costs, and therefore lower prices.

Using chain names, I am able to identify which stores are characterized as "discount" stores, or stores that offer fewer amenities and services than full-service supermarkets. I include a dummy variable for these types of stores (Discount). I expect a negative relationship between the discount dummy and price, since discount stores should have lower costs, and lower prices than full-service stores.

Each chain's share in an MSA is available from a proprietary data set from Trade Dimensions (Own chain share). Chain share captures the effect of search costs. A chain with a large local footprint implies fewer alternatives for consumers; search costs are higher and I expect higher prices. I include the food-market shares for two large non-traditional food retailers, Wal-Mart and SuperKmart. These retailers were capturing increasing proportions of food sales during the late 1990s and their shares control for the effect on competition.

Promotion Variables

The data provide each item's weekly TPR, as a proportion of shelf price. I measure promotion depth by averaging temporary price reductions at each store, each week, for the items included in the data (TPR Depth). To measure frequency, I sum the number of items on promotion ("on sale") in a week at a store. Where "sale" is defined as any item for which TPR is greater than zero. I divide this number by the total number of items at that store, giving the proportion of items on sale at that store in a given week (TPR Frequency).

V. DATA SUMMARY AND STATISTICS

The original data set included 8,746,763 weekly UPC- observations. I eliminated UPC items at a store if they were not recorded at that store for at least 153 weeks, which left 4,220,882 observations. I then calculated weekly averages for each store providing a panel of 156 weekly observations at 121 stores, or 18,876 observations.

I expect that retailers use different pricing strategies for national-brand products and private-label products, and I constructed separate data sets for them. I was able to calculate a complete data set for

national brands with 18,876 observations, but 5 stores were completely devoid of any valid private-label observations, and other stores were missing private-label observations for 3 other weeks, leaving only 18,093 private-label observations. National brands represent the majority of observations with 191.72 useable items per store, while there were only 23.38 useable private-label items per store.

Summary statistics are in table 2, which also shows the between and within standard deviation for each variable. The average national-share is 3.11 percent, but ranges from less than .01 percent to 10.88 percent. TPR depth averages only 3.8 percent, but ranges from 0 to 25.2 percent. About 19 percent of items are offered "on sale" on average each week. Table 2 shows that several variables have relatively little within store variation (e.g., HH head age, rent, Total income, Own share) as compared to between store variation which has implications for the estimation strategy.

Figure 1shows the all-products weekly-average relative price for 1997 – 1999. The data are divided into observations from stores that merged (Merge firms) and from stores that did not merge (Non Merge firms). In figure 1, merging stores' prices are trending upward. At first glance the trend may seem to be evidence of post-merger price increases, perhaps due to market power. But, the trend appears to pre-date most mergers and another possibility is that the trend is caused as these chains are updating their stores in a form of non-price competition with large discount retailers. The notion that stores are updating to compete is frequently noted. Binkley and Connor note this form of non-price competition, and Bonanno and Lopez (2009) note that supermarkets are increasing services offered which they show results in more market power and higher milk-prices. If chains are updating and adding services to appeal to consumers, then prices likely also increase from increased costs and market power. Failing to control for these changes may bias merger variables upward. Because I lack detailed store-level cost data, I create a linear trend variable to control for these unobservable (to the econometrician) changes. In Figure 1, merging stores' average prices are higher than non-merging stores. This may result from higher store costs, or from merging stores offering a different, higher priced, mix of products. I include a dummy variable in the regression that follow to account for overall higher prices at merging firms (Merge

Firm=1). The variable takes a value of one for each observation at stores from merging firms and zero for all observations from stores that never merge.

VI. EMPIRICAL MODEL

I assume a linear relationship between relative price and all independent variables. The basic model has the form

$$rp_{j,t} = x'_{j,t}\beta + v_{j,t} \tag{6}$$

$$where\ v_{j,t} = c_j + u_{j,t}.$$

$rp_{j,t}$ is relative price c_j is a unit effect, $x_{j,t}$ is a vector of exogenous variables, $\mu_{j,t}$ is a mean zero disturbance term, and β is a vector of parameters to estimate. The panel nature of the data suggests either a fixed- or random-effects estimator. However, the time-series are relatively short at three years which results in many independent variables having little within-store variation over time. Plümper and Troeger (2007) suggest that when independent variables in cross-section, time-series data have minimal time variation, pooled ordinary least squares (OLS) is more efficient than fixed-effect estimation. Their argument is essentially that although pooled OLS is not consistent, the information lost when using the less efficient fixed-effects estimator causes a bigger problem because coefficient estimates may be unreliable. The fixed-effect estimator uses only the variation within each cross-section unit to identify estimates, and when there is little within variation, intuitively estimates may be unreliable. Plümper and Troeger (2007) suggest a three-stage method to estimate coefficients when there is little within variation, which they call fixed-effect vector decomposition (FEVD). This estimator trades improvement in efficiency for loss of consistency. Because, as shown in table 2, several independent variables in these data have little within variation, FEVD is an appropriate estimation method.

The first-stage of the FEVD estimation regresses the dependant variable on the time-varying variables and includes fixed-effects. The estimated unit-effects represent the mean differences in the dependant variable between cross-section units, controlling for time-varying variables. But the mean differences do not isolate the true unit effects, c_i, because the estimated means include the effects of time-

invariant and rarely-changing variables. The second stage regresses the estimated unit effects on the time-invariant and rarely changing variables. This stage gives the method its name, because the unit effects (fixed effects) are decomposed into an explained portion and an unexplained portion. The unexplained portion is calculated as the residual to the second stage regression. In the third stage, the full model is estimated by pooled OLS including the residuals from the second stage. Time-varying variable coefficients are unbiased in the third stage, while time invariant-variable coefficients are unbiased as long as they are not correlated with the unit effects. The authors conduct Monte Carlo simulations and show that the FEVD estimator results in a lower root mean squared error than the fixed-effects estimator when the ratio of between to within standard deviation is greater than 1.7.[13] The authors suggest correcting standard errors using a robust sandwich estimator if heteroskedasticity is present in the third stage or panel-corrected standard errors (PCSE) in the first and third stage if serial correlation is present.

I test for serial correlation using the method suggested by Wooldridge (2002, 282-283) and test for heteroskedasticy using a likelihood ratio test comparing maximum likelihood results from iterated GLS with heteroskedasticity to iterated GLS with homoskedasticity. I find evidence that serial correlation and heteroskedasticity are present and so correct standard errors in all estimates.[14]

I conduct subsequent analysis using TPR depth and TPR frequency as dependant variables. TPR depth and frequency are measured as proportions. I adopt the method suggested by Papke and Wooldridge (1996) and estimate a fractional logit model for cross-section data. A fractional logit model has advantages over other alternatives. For example, the traditional log-odds ratio method disallows the dependent variable taking a value of zero or one, and other methods impose questionable distributional assumptions (Papke and Wooldridge, 1996).[15]

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[13] The relative performance of the two estimators also depends on the degree of correlation between the rarely changing variables and the unit effect.

[14] As suggested by Plumper and Troeger, I use panel PCSE in the first and third stage of the FEVD estimations. The authors kindly make available a Stata program to estimate FEVD which uses a Cochrane-Orcutt method to correct for serial correlation. This method drops the first observation of each cross-section.

[15] Papke and Wooldridge (2008) extend their earlier work to panel-data applications. However, as mentioned a shortcoming of the data in this analysis is the lack of within cross-section variation in many variables and so I do not use a panel data approach.

Addressing Omitted-Variable Bias

Figure 1 suggests that prices at merging firms behave differently than at non-merging firms, which also suggests that a merger dummy variable may be endogenous in a price regression. There may be an unobservable factor causing higher and increasing prices at some firms that also makes those firms more likely to merge. Of course, the fixed-effects model explicitly includes unit effects to capture unobservable factors. But as mentioned the data suggest against a traditional fixed-effects model leaving omitted variable bias a possibility. If a merger dummy variable is correlated with the unit effects, then the merger coefficient is biased as the FEVD model still suffers from omitted variable bias. Including a merge-firm dummy variable and a merge-firm trend variable addresses this bias. If merging firms are systematically different from non-merging firms, then the merge-firm dummy variable will isolate that effect from a post-merger change captured by the post-merger dummy variable. The merge-firm trend will similarly isolate the effect of time-varying unobservable factors from post-merger changes. Omitted variable bias is no longer a concern as the merger variables are no longer correlated with variables not included in the model.

VII. MERGER EFFECTS: PRICE

It is not clear the best price to examine because TPRs, or "sales," are frequently implemented in supermarkets. It is possible that mergers affect the depth or frequency of TPRs, and price effects may differ between shelf prices and net prices. I present results when each is used as the dependent variable in the tables below.

Table 3 presents results for three specifications for each of the product designations when relative net price is the dependent variable. Table 4 presents results when shelf price is the dependent variable. Columns 1, 4, 7 in each table are the least restricted specifications and include a merger dummy variable, a merge firm trend (Trend), and a merge-trend interaction (Merge x Trend). Columns 2, 5, and 8 eliminate the merge-trend interaction, and columns 3, 6, and 9 eliminate both trend variables; each of the columns is repeated in each table for each of the three product aggregations. In general, control variables have the

expected signs or are not significant. Some control-variable coefficients are notable and are discussed after key merger results.

A key finding is the negative and significant coefficient for national share in every specification in every price table. The coefficient is relatively large and suggests that when a chain's share increases by 1 percent, prices decrease by about 1-2 percent. The result provides support for the notion that larger firms are able to bargain for better terms from manufacturers and they pass these concessions to customers as lower prices.

The merger-dummy coefficient is positive, significant, and relatively large in all specifications. A post-merger price increase is not necessarily expected since mergers did not increase local-market concentration. Traditional theories of market conduct that suggest structure determines performance would not predict a change in pricing behavior. Here, the evidence suggests supermarkets may have unilaterally changed pricing strategies post-merger which resulted in higher prices. Mergers may result in an improvement in brand identification; in effect all customers become more price-insensitive post merger allowing merged firms to raise price. Mergers generated considerable "free" advertising from articles in newspapers, and some chains changed names post-merger (Los Angeles Business Journal, 1999).

In table 4, the Merge x Trend coefficient is small in each model ranging from a negative .007 percent per week change in the national-branded column to a positive .003 percent per week change in the private-label column. The (conditional) mean of the Merge x Trend variable for merging firms is 19.152. This suggests a shelf-price effect ranging from -.13 percent to .066 percent the average number of weeks after a merger. In table 3, the only statistically significant result is in column 4, representing private-label products. In this case, the effect the mean number of weeks after a merger is only .22 percent. The Merge x Trend coefficients are small and economically unimportant.

Also interesting is the negative and significant coefficient on the African-American Percent variable. Some previous studies have examined racial discrimination in food pricing (e.g., Graddy, 1997; Hayes, 2000). The results here suggest against racial discrimination and instead point to more price

sensitivity African-American customers. Rent is always positive and frequently significant, suggesting fixed costs reduce the number of stores in a market which results in higher prices. Own chain share is always positive and frequently significant, which suggests that when a chain's total sales in a market are large relative to its rivals its stores have the ability to charge higher prices. However, the average store size coefficient is negative and significant suggesting that chains with larger sized-stores have lower prices. Similarly, prices at discount stores are lower than at full-service stores, but discount stores seem to discount price more for private-label products as compared to branded products. As expected, prices at merging firms are higher than at non-merging firms.

VIII. MERGER EFFECTS: PROMOTION

Temporary price reductions ("sales") are frequently observed in retail grocery markets. The theoretical model above is a price-discrimination model and can be thought of as a motivation for price discrimination through price promotions (Berck et. al., 2007). Retailers price discriminate between groups by offering TPRs to attract informed or low-search customers, but charge a higher price to other customers with high-search costs or who are uninformed. The primary interest in this paper is how mergers affect pricing decisions and therefore TPRs. The hypothesis maintained is that *retailers* set price-promotion strategies (Berck et. al. (2007) find support for this proposition). The hypothesis tested is whether mergers affect promotion strategies. The assumed causal mechanism is that mergers affect retailers' brand identity and a stronger or weaker identity affects optimal strategies (Raju, Srinivasan, and Lal, (1999) show that brands with strong identities will promote less frequently than brands with weak identities). Because the theory used to motivate the price regression is a model of price discrimination, and because price promotions are thought to be used by firms to price discriminate, I use the same set of

variables in the promotion regressions as in the price regressions.[16] And, I examine private-labels and national brands separately.[17]

Table 5 shows the marginal effects from a fractional-logit regression when TPR depth is the dependent variable.[18] The predicted average depth is 3.8 percent for branded products and 3.1 percent for private-label products. Few of the control variables are statistically significant. But, notable results include a positive coefficient for average household income for nationally branded products; stores in markets with higher-income households have slightly higher promotion depths. But, the coefficient is very small and suggests that a $10,000 increase in income increases promotion depth by about 0.003. Chain Share has a negative effect for private-label products, a 10 percent increase in local share relates to a .004 decrease in promotion depth. The trend variable is negative, suggesting that promotion depth is declining, which likely explains some of the observed upward trend in net-prices. The Rent coefficient is negative and significant, suggesting that markets with higher fixed costs are associated with smaller average price promotions. African-American percent is negative in the private-label columns suggesting they are less influenced by TPRs. Even though markets with larger proportions of African-Americans receive smaller average TPRs, the price regressions suggest they pay lower prices, all else constant.

Turning to the merger variables, the national share coefficient is not statistically different from zero. It appears that mergers reduced the average promotion depth because the merger dummy coefficient is negative when no trend variables are included in columns 3, 6, and 9. It is also marginally significant when the trend variable is added in the all products and national brands in columns 2 and 8. But, the merge x trend interaction is negative and significant in columns 1, 4, and 7. At the conditional mean of merge-trend interaction, the effect is to decrease promotion depth by 0.0066, 0.004, and 0.0068 for the all,

[16] Several studies show that price promotions are more frequent during periods of peak demand. I experimented with including monthly dummy variable to control for demand shocks that correspond with holidays or other demand peaks. The results were qualitatively and quantitatively similar to those presented in the text.
[17] Berck, et. al. (2007) provide evidence that chains, and not manufactures, control promotions. They also show that private-label items are frequently promoted, as are national brands.
[18] Coefficient estimates are available from the author upon request.

private label, and national brand columns, similar to the merger dummy coefficient when the merge-trend interaction is not included.

Table 6 shows the results from a fractional-logit regression with TPR frequency as the dependent variable. Predicted frequencies are 18.3 percent, 16.7 percent, and 18.7 percent for all, private-label, and national brands. Coefficients for control variables are generally consistent with those in table 5. The merger coefficients suggest similar effects as they did in table 5 for TPR depth. The merger dummy coefficient is negative and significant in the columns without the merge-trend interaction. The coefficient suggests a rather large decrease in the frequency of promotion ranging from -3.51 percent to -4.8 percent. Again, the merger-trend interaction is negative and significant suggesting the merger effects may manifest over time. At the conditional mean, the trend-interaction coefficient implies a 2.62, 1.3, and 2.7 percent reduction in TPR frequency.

Taken together, the TPR depth and TPR frequency regressions suggest a change in promotion strategies after mergers. It is not clear why promotions should or should not change post-merger. One explanation is that promotions are used to differentiate supermarkets from rivals. As differentiation is attained through stronger brand identity, promotions are less necessary.

IX. CONCLUSION

I have used a scanner data set of supermarket prices to examine mergers between supermarket chains. Food retailing experienced a great deal of consolidation in the late 1990s. Increasingly under pressure from non-traditional food retailers, including mass merchandisers and club stores, some argue supermarkets have sought out sources for cost reduction. Merging operations has been touted as a way for firms to exploit efficiencies to reduce costs, bolster bargaining power, and lower prices in order to better compete with food retailing upstarts.

I find that food prices are negatively correlated with a supermarket chain's share of the national food retailing market. This finding supports the hypothesis that as supermarkets increase in national scale, they are able to negotiate more favorable terms from suppliers and pass cost reductions to consumers as lower prices. Some have contemplated the increasing influence of supermarkets in the food system as

they grow larger, due in large part to mergers between formerly competing chains (Li, Carman, and Sexton, 2005). The evidence here suggests a shifting of power from suppliers to retailing supermarkets.

The evidence also suggests that chains reduce promotions after merger, both in terms of depth and frequency. This is consistent with a chain capitalizing on a stronger brand image after a merger and changing their promotion strategy in response. Indeed, some chains changed the names of stores after a merger; acquired chains adopted the names of acquiring chains (Los Angeles Business Journal, 1999). Chains with stronger brand names are likely to find it less necessary to entice customers with temporary price reductions.

References

Balto, D. "Supermarket Merger Enforcement." *Antitrust Report*. 1999, pp 2-32.

Berk, P, Brown, J, Perloff, J, and Villas-Boas, S.B, "Sales: Tests of Theories on Causality and Timing, *International Journal of Industrial Organization*, forthcoming.

Binkley, J. K, and Connor, J.M, "Grocery Market Pricing and the New Competitive Environment," *Journal of Retailing*.1998; 74(2); 273-294.

Bonanno, A, and Lopez, R.A, "Competition Effects of Supermarket Services," *American Journal of Agricultural Economics*, 2009; 91 (3);

Business Week Online, "Wal-Mart is Eating Everybody's Lunch," April 15, 2002.

Chevalier, J.A, "Do LBO Supermarkets Charge More? An Empirical Analysis of the Effects of LBOs on Supermarket Pricing," *The Journal of Finance*. 1995;1 (4).

Coleman, M. T, Meyer, D.W, and Scheffman, D.T, "Economic Merger Analysis at the FTC: The Cruise Ships Mergers Investigation," *Review of Industrial Organization*, 2003; 23, 121-55.

Connor, J. M, "Evolving Research on Price Competition in the Grocery Retailing Industry: An Appraisal," *Agricultural and Resource Economics Review*, 1999; 28; 119-127.

Cotterill, R. W, "Market Power in the Retail Food Industry: Evidence From Vermont," *Review of Economics and Statistics.* 1986; 63 (3); 379-86.

Economic Research Service, "Food CPI, Prices, and Expenditures: Sales of Food at Home by Type of Outlet," online at: http://www.ers.usda.gov/briefing/CPIFoodAndExpenditures/Data/table16.htm

Ellingson, P. B, "Quality competition in retailing: A structural analysis," *International Journal of Industrial Organization*, 2006; 24(3); 521-40.

Graddy, K, "Do fast-food chains price discriminate on the race and income characteristics of an area?" *Journal of Business & Economic Statistics.*1997;15 (4); 391-401.

Hayes, L. R, "Are Prices Higher for the Poor in New York City?" *Journal of Consumer Policy*. 2000; 23(2); 127-52.

Hulihan, Lokey, Howard, and Zukin Investment Banking Services, *Mergerstat*, various years.

Kaufman, P.R, "Food Retailing Consolidation: Implications for Supply Chain Management Practices," *Journal of Food Distribution Research*, March 1999.

Kaufman, Philip R., "Consolidation in Food Retailing: Prospects for Consumers & Grocery Suppliers," *Agricultural Outlook*, USDA Economic Research Service, August 2000.

Kim, E H, and Singal, V, "Mergers and Market Power: Evidence from the Airline Industry." *The American Economic Review*, 1993; 83(3); 549-69.

Kinsey, J, D, "Concentration of Ownership in Food Retailing: A Review of the Evidence About Consumer Impact." 1998 Working Paper 98-04; The Retail Food Industry Center, University of Minnesota.

Lamm, R. McFall, "Prices and Concentration in the Food Retailing Industry," *The Journal of Industrial Economics*, Vol. 30 no. 1, 67-78, September 1981.

Li, L, Hoy, F. C, and Sexton, R. J, "Retail Price Variation and Its Determinants—What Do We Know about Grocery Retailer Pricing Strategies and Retail Competition?" 2005 Working Paper

Los Angeles Business Journal, "Lucky Stores Change Name," Brief Article, Nov 8, 1999

Park, T and Weliwita, A, "Competitive Behavior in the U.S. Food Retailing Industry," *Canadian Journal of Agricultural Economics,* 1999; 47 (1);

Papke, L. E, and Wooldridge, J.M, "Econometric Methods for Fractional Response Variables with an Application to 401(K) Plan Participation Rates," *Journal of Applied Econometrics*. 1996; 11(6); 619-32.

Pautler, P.A, "Evidence on Mergers and Acquisitions," Federal Trade Commission Survey Working Paper, September 2001.

Plumper, T. and Troeger, V.E, "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects, *Political Analysis*. 2007; 15;124-129.

Progressive Grocer, *Marketing Guidebook*, various years, The Nielsen Company, Westport, CT

Raju, J, Srinivasan, V, and Lal, R, "The Effects of Brand Loyalty on Competitive Price Promotional Strategies," *Management Science*, 1990; 36(3).

Simpson, John D. and Daniel Hosken, "Have Supermarket Mergers Raised Prices? An Event Study Analysis" Mimeo, May 2000.

Skitol, Robert A., "Consolidation and the Private Label Sector: Antitrust Enforcement Policy Developments," comments before the Private Label Manufactures Association, October, 2002. http://www.antitrustinstitute.org/recent2/207.pdf

Stewart, Hayden and D. E. Davis, "Price Dispersion and Accessibility: A Case Study of Fast Food," *Southern Economic Journal.* 2005;71(4);784-800.

Trade Dimensions, *Market Scope*®, various years, The Nielsen Company, Westport, CT

Tucker, Randy, "Kroger growth tougher: Acquisitions best way to compete," *The Cincinnati Enquirer*, September 21, 2003.

Van Den Broek, Astrid, "The chains rethink their price promotion strategies," *Marketing Magazine*, 1999

Vita, M. G, and Sacher, S, "The Competitive Effects of Not-For-Profit Hospital Mergers: A Case Study," *The Journal of Industrial Economics,* 2001; 44 (1); 63-84.

Wooldridge, J. M, Econometric Analysis of Cross Section and Panel Data. MIT Press, Cambridge, Massachusetts; 2002

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Table 1. Merging Supermarket Chains

Chain Name	National Share Before Merger	Merged with:	National Share Before Merger	Merger Date	National Share after Merger
Safeway	3.52	Vons	1.59	04/01/97	5.10
Safeway	5.15	Dominicks	0.74	11/20/98	5.89
Safeway	6.60	Randalls (Houston)	0.72	09/01/99	7.32
Ahold	4.68	Giant Food Inc.[a]	0.89	10/28/98	5.57
Ralphs	1.46	Fred Meyer[b]	1.60	11/7/97	3.37
Quality Food Center	0.31	Fred Meyer	1.60	11/7/97	3.37
Kroger	7.28	Fred Meyer	3.60	05/27/99	10.88
Albertson's	4.45	American Stores	3.95	06/23/99	8.40

a =There are no Giant Food Stores included in the data set
b = There are no Fred Meyer Stores included in the data set

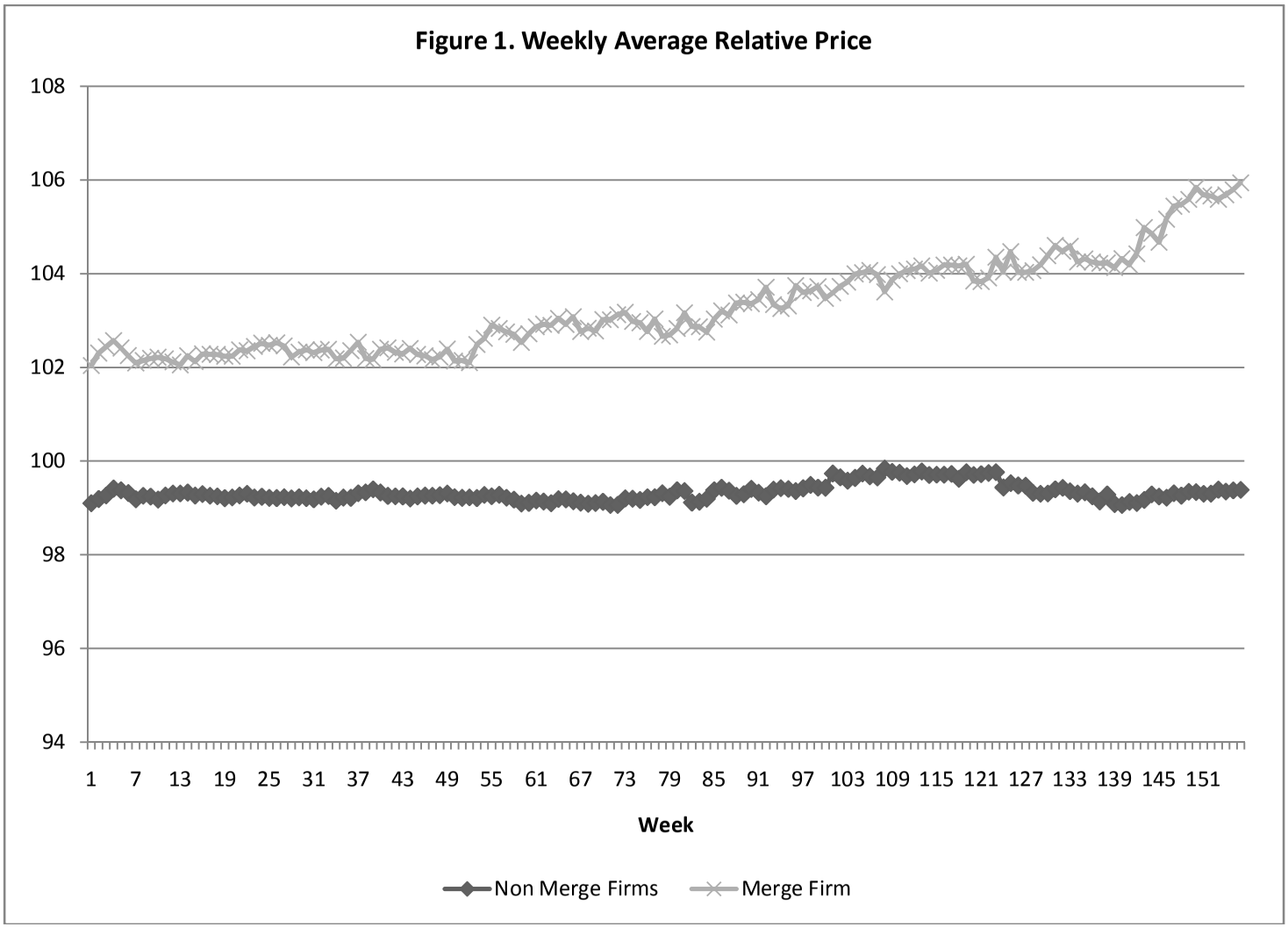
Figure 1. Weekly Average Relative Price
108
106
104
102
100
98
96
94
1 7 13 19 25 31 37 43 49 55 61 67 73 79 85 91 97 103 109 115 121 127 133 139 145 151
Week
Non Merge Firms
Merge Firm

Table 2. Summary Statistics

Variable	Variation type	Mean	Std. Dev.	Variable	Variation type	Mean	Std. Dev.
Relative Net Price	Overall	101.18	11.54	Rent (x 100 $)	Overall	6.06	1.56
	Between		11.18		Between		1.55
	Within		3.07		Within		0.25
Relative Shelf Price	Overall	101.10	11.33	Total Income (x 100 mil $)	Overall	1185.38	1599.02
	Between		11.18		Between		1602.47
	Within		2.11		Within		100.22
Depth of TPR	Overall	3.80	2.66	Own Local Share	Overall	24.34	17.97
	Between		1.71		Between		17.94
	Within		2.04		Within		1.91
Pct of TPR items	Overall	18.79	11.84	Average Store Size (x 1 mil. $)	Overall	18.90	7.49
	Between		7.28		Between		7.31
	Within		9.36		Within		1.79
Average Income	Overall	44.46	11.19	National Share	Overall	3.11	2.92
	Between		10.56		Between		2.69
	Within		3.82		Within		1.16
HH head age	Overall	45.68	3.69	Discount = 1	Overall	0.12	0.32
	Between		3.15		Between		0.32
	Within		1.95		Within		0.00
PCT w/o kids	Overall	57.99	11.45	Merge Firm = 1	Overall	0.45	0.50
	Between		9.82		Between		0.50
	Within		5.95		Within		0.00
Afr. Amer. Pct.	Overall	6.19	11.22	Merge	Overall	0.16	0.37
	Between		10.83		Between		0.26
	Within		3.11		Within		0.26
Kmart Share	Overall	0.49	1.12	Trend	Overall	35.03	49.27
	Between		1.11		Between		39.19
	Within		0.16		Within		30.08
Wal-Mart Share	Overall	2.41	4.32	Merge x Trend	Overall	8.71	26.37
	Between		3.80		Between		18.37
	Within		2.09		Within		18.99

Table3. Fixed Effects Vector Decomposition - Net price

	All products			Private Label			Nationally Branded		
HH head age	0.00544	0.00543	0.00678	-0.00262	-0.00266	-0.00175	0.00483	0.00482	0.00619
	(0.0124)	(0.0124)	(0.0128)	(0.0307)	(0.0307)	(0.0313)	(0.0129)	(0.0129)	(0.0132)
PCT w/o kids	0.000327	0.000314	0.000771	-0.00179	-0.00185	-0.00126	0.000249	0.000235	0.000720
	(0.00397)	(0.00396)	(0.00419)	(0.00973)	(0.00979)	(0.00984)	(0.00411)	(0.00411)	(0.00432)
Total Income	-0.000310	-0.000309	0.00183***	0.00112*	0.00114**	0.00367***	-0.000440	-0.000440	0.00164***
	(0.000369)	(0.000368)	(0.000332)	(0.000577)	(0.000580)	(0.000573)	(0.000385)	(0.000384)	(0.000349)
Kmart Share	-1.813***	-1.810***	-2.077***	-1.029***	-0.958***	-1.351***	-1.849***	-1.846***	-2.107***
	(0.173)	(0.172)	(0.175)	(0.326)	(0.324)	(0.326)	(0.177)	(0.175)	(0.178)
Walmart Share	0.0429***	0.0432***	0.0451***	-0.240***	-0.234***	-0.231***	0.0543***	0.0544***	0.0563***
	(0.0129)	(0.0130)	(0.0127)	(0.0248)	(0.0247)	(0.0251)	(0.0142)	(0.0142)	(0.0139)
Trend	0.0326***	0.0329***		0.0370***	0.0399***		0.0318***	0.0320***	
	(0.00184)	(0.00161)		(0.00302)	(0.00265)		(0.00190)	(0.00166)	
Merge x Trend	0.00119			0.0115***			0.00110		
	(0.00186)			(0.00318)			(0.00195)		
Average income	0.238***	0.238***	0.187***	0.0977***	0.0965***	0.0383***	0.247***	0.247***	0.197***
	(0.00173)	(0.00173)	(0.00185)	(0.00583)	(0.00586)	(0.00609)	(0.00179)	(0.00179)	(0.00189)
African Amer. Pct.	-0.116***	-0.117***	-0.128***	-0.154***	-0.158***	-0.168***	-0.0910***	-0.0912***	-0.102***
	(0.00251)	(0.00251)	(0.00256)	(0.00579)	(0.00585)	(0.00597)	(0.00265)	(0.00264)	(0.00269)
Rent	3.356***	3.358***	1.799***	1.049***	1.063***	-0.784***	3.484***	3.485***	1.967***
	(0.0207)	(0.0208)	(0.0219)	(0.0409)	(0.0413)	(0.0367)	(0.0214)	(0.0215)	(0.0228)
Own Share	0.0372***	0.0373***	0.0495***	0.173***	0.175***	0.190***	0.0412***	0.0413***	0.0532***
	(0.00175)	(0.00176)	(0.00175)	(0.00400)	(0.00399)	(0.00401)	(0.00181)	(0.00181)	(0.00181)
Average Store Size	-0.122***	-0.122***	-0.156***	-0.755***	-0.758***	-0.796***	-0.121***	-0.121***	-0.154***
	(0.00406)	(0.00409)	(0.00453)	(0.00816)	(0.00807)	(0.00779)	(0.00411)	(0.00415)	(0.00459)
Merge=1	3.483***	3.535***	5.148***	7.902***	8.431***	10.29***	3.238***	3.286***	4.864***
	(0.111)	(0.112)	(0.133)	(0.213)	(0.223)	(0.219)	(0.116)	(0.116)	(0.135)
National Share	-1.117***	-1.118***	-1.083***	-1.829***	-1.848***	-1.814***	-1.019***	-1.020***	-0.985***
	(0.0163)	(0.0164)	(0.0178)	(0.0355)	(0.0364)	(0.0397)	(0.0173)	(0.0174)	(0.0184)
Discount Store=1	-6.861***	-6.858***	-6.097***	-9.534***	-9.500***	-8.593***	-7.027***	-7.024***	-6.283***
	(0.0786)	(0.0790)	(0.0821)	(0.215)	(0.213)	(0.211)	(0.0855)	(0.0860)	(0.0892)
Merge Firm=1	2.629***	2.616***	5.591***	1.013***	0.874***	4.591***	2.422***	2.410***	5.301***
	(0.104)	(0.105)	(0.150)	(0.192)	(0.196)	(0.204)	(0.107)	(0.107)	(0.150)
eta	0.999***	0.999***	0.999***	0.996***	0.996***	0.995***	0.999***	0.999***	0.999***
	(0.00340)	(0.00340)	(0.00340)	(0.0148)	(0.0148)	(0.0149)	(0.00358)	(0.00358)	(0.00358)
Constant	74.66***	74.65***	83.64***	88.38***	88.35***	98.87***	74.26***	74.25***	83.00***
	(0.166)	(0.166)	(0.193)	(0.508)	(0.508)	(0.518)	(0.172)	(0.171)	(0.197)
Observations	18755	18755	18755	17974	17974	17974	18755	18755	18755
R-squared	0.941	0.941	0.939	0.743	0.743	0.740	0.939	0.939	0.936

*** p<0.01, ** p<0.05, * p<0.1; Panel corrected standard errors (Cochrane-Orcutt) in ().

Table 4. Fixed Effects Vector Decomposition - Shelf price

	All products			Private Label			Nationally Branded		
HH head age	0.00576	0.00575	0.00597	-0.00708	-0.00708	-0.00676	0.00623	0.00623	0.00643
	(0.00820)	(0.00824)	(0.00846)	(0.0226)	(0.0226)	(0.0230)	(0.00861)	(0.00864)	(0.00882)
PCT w/o kids	-0.000354	-0.000365	-0.000314	-0.00291	-0.00290	-0.00277	-0.000331	-0.000342	-0.000289
	(0.00286)	(0.00291)	(0.00309)	(0.00701)	(0.00700)	(0.00697)	(0.00300)	(0.00305)	(0.00322)
Total Income	-0.000698***	-0.000686***	6.08e-05	0.000816**	0.000814**	0.00194***	-0.000769***	-0.000757***	-4.27e-05
	(0.000244)	(0.000251)	(0.000231)	(0.000363)	(0.000361)	(0.000396)	(0.000256)	(0.000263)	(0.000246)
Kmart Share	-0.630***	-0.647***	-0.748***	0.755***	0.757***	0.539**	-0.713***	-0.732***	-0.834***
	(0.0911)	(0.0909)	(0.0942)	(0.211)	(0.210)	(0.209)	(0.0917)	(0.0914)	(0.0945)
Walmart Share	0.0266***	0.0253**	0.0238**	-0.0359**	-0.0359**	-0.0350**	0.0299***	0.0285**	0.0269**
	(0.0101)	(0.0101)	(0.00988)	(0.0141)	(0.0141)	(0.0144)	(0.0114)	(0.0114)	(0.0112)
Trend	0.0234***	0.0212***		0.0287***	0.0298***		0.0228***	0.0204***	
	(0.00113)	(0.000896)		(0.00121)	(0.00108)		(0.00116)	(0.000915)	
Merge x Trend	-0.00694***			0.00345**			-0.00748***		
	(0.00138)			(0.00173)			(0.00145)		
Average income	0.272***	0.272***	0.255***	0.113***	0.113***	0.0867***	0.281***	0.281***	0.264***
	(0.00129)	(0.00129)	(0.00136)	(0.00363)	(0.00362)	(0.00385)	(0.00131)	(0.00132)	(0.00138)
African Amer. Pct.	-0.148***	-0.147***	-0.151***	-0.226***	-0.227***	-0.230***	-0.120***	-0.119***	-0.122***
	(0.00192)	(0.00188)	(0.00193)	(0.00459)	(0.00458)	(0.00469)	(0.00200)	(0.00198)	(0.00202)
Rent	3.534***	3.514***	2.971***	1.601***	1.607***	0.785***	3.613***	3.592***	3.072***
	(0.0164)	(0.0165)	(0.0196)	(0.0212)	(0.0213)	(0.0167)	(0.0175)	(0.0176)	(0.0206)
Own Share	0.0167***	0.0158***	0.0201***	0.159***	0.159***	0.165***	0.0227***	0.0217***	0.0258***
	(0.00131)	(0.00140)	(0.00135)	(0.00185)	(0.00185)	(0.00184)	(0.00133)	(0.00141)	(0.00137)
Average Store Size	-0.0956***	-0.0941***	-0.106***	-0.787***	-0.788***	-0.804***	-0.0934***	-0.0917***	-0.103***
	(0.00164)	(0.00175)	(0.00174)	(0.00751)	(0.00750)	(0.00701)	(0.00176)	(0.00186)	(0.00187)
Merge=1	2.436***	2.121***	2.536***	8.479***	8.599***	9.259***	2.161***	1.824***	2.222***
	(0.0764)	(0.0930)	(0.108)	(0.0948)	(0.0937)	(0.112)	(0.0814)	(0.0987)	(0.110)
National Share	-1.077***	-1.064***	-1.066***	-1.969***	-1.973***	-1.974***	-0.977***	-0.964***	-0.965***
	(0.00972)	(0.0104)	(0.0105)	(0.0197)	(0.0193)	(0.0230)	(0.0106)	(0.0112)	(0.0111)
Discount Store=1	-7.404***	-7.417***	-7.145***	-10.26***	-10.25***	-9.846***	-7.523***	-7.537***	-7.277***
	(0.0583)	(0.0566)	(0.0583)	(0.162)	(0.162)	(0.159)	(0.0635)	(0.0618)	(0.0634)
Merge Firm=1	3.103***	3.207***	5.138***	0.364***	0.326***	3.078***	2.974***	3.086***	4.936***
	(0.0573)	(0.0551)	(0.0802)	(0.101)	(0.0962)	(0.101)	(0.0589)	(0.0563)	(0.0772)
eta	0.991***	0.991***	0.991***	0.982***	0.982***	0.982***	0.991***	0.991***	0.990***
	(0.00220)	(0.00218)	(0.00233)	(0.0149)	(0.0149)	(0.0154)	(0.00234)	(0.00232)	(0.00245)
Constant	72.44***	72.52***	75.69***	86.15***	86.12***	90.83***	72.11***	72.20***	75.23***
	(0.139)	(0.140)	(0.163)	(0.217)	(0.217)	(0.219)	(0.148)	(0.149)	(0.171)
Observations	18755	18755	18755	17974	17974	17974	18755	18755	18755
R-squared	0.969	0.969	0.967	0.823	0.823	0.820	0.967	0.967	0.965

*** p<0.01, ** p<0.05, * p<0.1; Panel correct standard errors (Cochrane-Orcutt) in ()

Table 5: TPR Depth Marginal Effects

	All products			Private Label			Nationally Branded		
Average income	0.000300***	0.000291***	0.000286***	2.68e-05	8.28e-06	4.38e-06	0.000308***	0.000301***	0.000296***
	(0.000117)	(0.000120)	(0.000119)	(0.000163)	(0.000172)	(0.000170)	(0.000119)	(0.000122)	(0.000121)
HH head age	0.000536	0.000579	0.000586	0.000738	0.000799	0.000798	0.000535	0.000575	0.000582
	(0.000348)	(0.000366)	(0.000373)	(0.000495)	(0.000513)	(0.000517)	(0.000366)	(0.000385)	(0.000391)
PCT w/o kids	-0.000160	-0.000160	-0.000184	-9.35e-05	-9.62e-05	-0.000113	-0.000170	-0.000170	-0.000195
	(0.000128)	(0.000131)	(0.000129)	(0.000147)	(0.000154)	(0.000153)	(0.000137)	(0.000141)	(0.000139)
Afr. Amer. PCT	-1.99e-05	-1.64e-06	-1.49e-05	-0.000473***	-0.000470***	-0.000480***	7.21e-05	9.21e-05	7.81e-05
	(0.000113)	(0.000115)	(0.000118)	(0.000135)	(0.000143)	(0.000143)	(0.000121)	(0.000122)	(0.000125)
Rent	-0.00510***	-0.00525***	-0.00523***	-0.00266***	-0.00258*	-0.00259***	-0.00550***	-0.00567***	-0.00564***
	(0.00172)	(0.00174)	(0.00168)	(0.00134)	(0.00135)	(0.00132)	(0.00185)	(0.00186)	(0.00180)
Total Income	2.32e-06***	2.49e-06***	2.57e-06***	1.14e-06	1.12e-06	1.22e-06	2.51e-06***	2.69e-06***	2.77e-06***
	(1.17e-06)	(1.19e-06)	(1.15e-06)	(1.21e-06)	(1.20e-06)	(1.17e-06)	(1.25e-06)	(1.27e-06)	(1.24e-06)
Chain Share	-0.000206*	-0.000202*	-0.000198*	-0.000384***	-0.000376***	-0.000368***	-0.000180	-0.000175	-0.000171
	(0.000111)	(0.000114)	(0.000111)	(0.000107)	(0.000108)	(0.000107)	(0.000119)	(0.000122)	(0.000118)
Kmart Share	-0.00140	-0.00110	-0.00106	0.00106	0.00128	0.00132	-0.00172	-0.00142	-0.00138
	(0.00106)	(0.00105)	(0.00107)	(0.000993)	(0.000975)	(0.000994)	(0.00112)	(0.00110)	(0.00112)
Wal-Mart Share	0.000230	0.000284	0.000251	0.000231	0.000266	0.000238	0.000207	0.000258	0.000224
	(0.000319)	(0.000316)	(0.000313)	(0.000415)	(0.000426)	(0.000426)	(0.000329)	(0.000323)	(0.000320)
Merge	0.00398	-0.00937*	-0.0134***	0.00784	-0.00153	-0.00485	0.00359	-0.0100*	-0.0142***
	(0.00620)	(0.00510)	(0.00370)	(0.00564)	(0.00476)	(0.00383)	(0.00643)	(0.00536)	(0.00391)
Trend	-8.83e-05*	-0.000117***		-6.61e-05	-9.16e-05***		-9.32e-05*	-0.000121***	
	(4.99e-05)	(5.44e-05)		(4.31e-05)	(4.63e-05)		(5.17e-05)	(5.60e-05)	
Merge x Trend	-0.000346***			-0.000211***			-0.000354***		
	(8.89e-05)			(8.48e-05)			(9.26e-05)		
Average Store Size	0.000299	0.000285	0.000258	-0.000165	-0.000192	-0.000222	0.000307	0.000293	0.000265
	(0.000246)	(0.000235)	(0.000234)	(0.000313)	(0.000313)	(0.000318)	(0.000253)	(0.000242)	(0.000241)
National Share	0.000671	0.000689	0.000150	-1.62e-05	6.65e-05	-0.000420	0.000782	0.000790	0.000237
	(0.000770)	(0.000792)	(0.000856)	(0.000808)	(0.000833)	(0.000840)	(0.000824)	(0.000850)	(0.000913)
Discount Store=1	-0.00186	-0.00191	-0.00177	-0.000789	-0.00112	-0.00104	-0.00230	-0.00233	-0.00220
	(0.00468)	(0.00468)	(0.00465)	(0.00495)	(0.00492)	(0.00492)	(0.00498)	(0.00497)	(0.00494)
Merge Firm=1	0.0125***	0.0140***	0.00919***	0.00952***	0.0106***	0.00709	0.0123***	0.0138***	0.00877*
	(0.00451)	(0.00469)	(0.00440)	(0.00450)	(0.00460)	(0.00449)	(0.00472)	(0.00489)	(0.00466)
Predicted Mean	0.037	0.037	0.037	0.038	0.038	0.038	0.031	0.031	0.031
Observations	18876	18876	18876	18093	18093	18093	18876	18876	18876

*** p<0.05, ** p<0.05, * p<0.10 Standard errors in parentheses robust to arbitrary correlation (clustering) within stores

Table 6: TPR Frequency Marginal Effects

	All products			Private Label			Nationally Branded		
Average income	0.00118***	0.00115***	0.00112***	0.000445	0.000391	0.000370	0.00117***	0.00115***	0.00112***
	(0.000509)	(0.000527)	(0.000521)	(0.000655)	(0.000675)	(0.000668)	(0.000521)	(0.000537)	(0.000531)
HH head age	0.00119	0.00131	0.00134	0.00180	0.00200	0.00197	0.00116	0.00128	0.00130
	(0.00144)	(0.00153)	(0.00156)	(0.00190)	(0.00197)	(0.00199)	(0.00151)	(0.00160)	(0.00163)
PCT w/o kids	-0.000223	-0.000209	-0.000349	0.000244	0.000223	0.000144	-0.000276	-0.000258	-0.000404
	(0.000507)	(0.000522)	(0.000511)	(0.000581)	(0.000594)	(0.000586)	(0.000538)	(0.000556)	(0.000544)
Afr. Amer. Pct	-0.000159	-9.17e-05	-0.000167	-0.00191***	-0.00191***	-0.00196***	0.000200	0.000277	0.000197
	(0.000477)	(0.000489)	(0.000502)	(0.000570)	(0.000606)	(0.000609)	(0.000519)	(0.000526)	(0.000539)
Rent	-0.0224***	-0.0232***	-0.0230***	-0.0140***	-0.0136***	-0.0136***	-0.0237***	-0.0246***	-0.0244***
	(0.00711)	(0.00737)	(0.00695)	(0.00487)	(0.00496)	(0.00487)	(0.00759)	(0.00785)	(0.00741)
Total Income	7.20e-06	8.05e-06	8.51e-06*	5.51e-06	5.30e-06	5.80e-06	7.62e-06	8.54e-06	9.02e-06*
	(4.76e-06)	(4.96e-06)	(4.74e-06)	(4.45e-06)	(4.45e-06)	(4.36e-06)	(5.04e-06)	(5.26e-06)	(5.03e-06)
Chain Share	-0.000961***	-0.000947*	-0.000917***	-0.00175***	-0.00172***	-0.00168***	-0.000831*	-0.000819	-0.000789
	(0.000475)	(0.000486)	(0.000463)	(0.000427)	(0.000430)	(0.000424)	(0.000503)	(0.000513)	(0.000490)
Kmart Share	-0.00841*	-0.00696	-0.00675	0.00341	0.00430	0.00446	-0.0105***	-0.00898*	-0.00875*
	(0.00450)	(0.00448)	(0.00454)	(0.00503)	(0.00502)	(0.00516)	(0.00470)	(0.00464)	(0.00469)
Wal-Mart Share	0.00172	0.00189	0.00170	0.000749	0.000836	0.000707	0.00172	0.00189	0.00169
	(0.00137)	(0.00136)	(0.00134)	(0.00179)	(0.00183)	(0.00183)	(0.00141)	(0.00140)	(0.00137)
Merge	0.00662	-0.0472***	-0.0709***	-0.00581	-0.0351*	-0.0500***	0.00792	-0.0480***	-0.0731***
	(0.0246)	(0.0211)	(0.0154)	(0.0253)	(0.0190)	(0.0150)	(0.0251)	(0.0220)	(0.0161)
Trend	-0.000557***	-0.000688***		-0.000346	-0.000447*		-0.000589***	-0.000722***	
	(0.000211)	(0.000232)		(0.000215)	(0.000228)		(0.000215)	(0.000237)	
Merge x Trend	-0.00137***			-0.000705***			-0.00142***		
	(0.000334)			(0.000340)			(0.000351)		
Average Store Size	0.00176*	0.00172*	0.00156	-0.000978	-0.00105	-0.00119	0.00179*	0.00175*	0.00158
	(0.00105)	(0.00100)	(0.000995)	(0.00109)	(0.00112)	(0.00114)	(0.00107)	(0.00103)	(0.00102)
National Share	0.00365	0.00359	0.000306	-0.00246	-0.00217	-0.00441	0.00446	0.00435	0.000920
	(0.00317)	(0.00326)	(0.00358)	(0.00369)	(0.00370)	(0.00369)	(0.00331)	(0.00342)	(0.00375)
Discount Store=1	0.00884	0.00855	0.00952	0.00173	0.000641	0.00111	0.00749	0.00718	0.00817
	(0.0238)	(0.0236)	(0.0236)	(0.0222)	(0.0222)	(0.0223)	(0.0254)	(0.0251)	(0.0250)
Merge Firm=1	0.0636***	0.0711***	0.0431***	0.0624***	0.0669***	0.0490***	0.0612***	0.0687***	0.0394*
	(0.0194)	(0.0202)	(0.0194)	(0.0206)	(0.0211)	(0.0198)	(0.0200)	(0.0207)	(0.0203)
Predicted Mean	0.183	0.184	0.184	0.167	0.166	0.166	0.187	0.188	0.188
Observations	18876	18876	18876	18093	18093	18093	18876	18876	18876