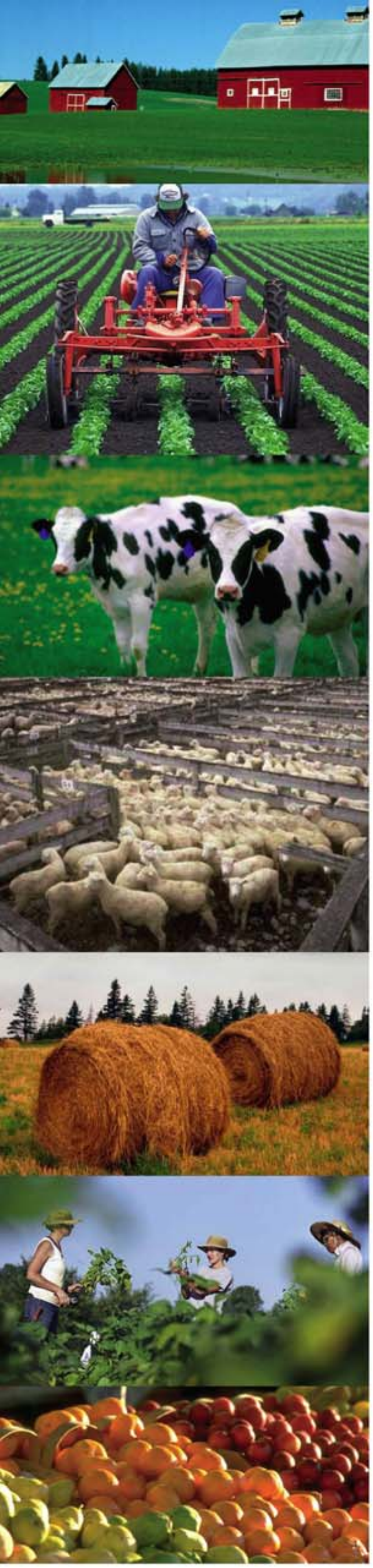

FSRG Monographs

Evaluating a Supermarket Merger Event:

The Case of Copps and Kohl's in Madison WI

Kun Huang and Kyle Stiegert

Food System Research Group

FSRG Monograph Series, #21 March 2009

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Funding for the project and data collection efforts were graciously provided by the Food System Research Group. The authors thank Igal Hendel for detailed comments and discussion, and Dana Bauser for assistance in compiling the data.

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Executive Summary

This monograph is a compilation of research on the merger of Copps and Kohl's supermarkets that took place in the spring of 2003 in Madison, Wisconsin. A distinct feature of our data, collected initially from March 2003, one month before the acquisition, through September 2003, is that it allowed us to assemble price and promotion information for *all* major competitors in Madison's supermarket sector. With both pre- and post- merger information, the research provides empirical evidence of how *acquiring* and *non-acquiring* firms responded in the short run to a significant structural change in two primary strategic variables: price and advertising. Additionally, data were collected on price and promotion activities for the same weeks in 2005. The additional data were used to evaluate the possibility of long-run structural pricing adjustments in the Madison market. To account for possible confounding effects from a wide range of potential demand and supply shocks, the price impacts of the merger were carefully controlled using same period and product prices in the Green Bay, Wisconsin market area. Four acquisition phases were identified and used throughout the study. They were:

Phase I: Pre-acquisition period
Phase II: Kohl's store closures
Phase III: Copps grand openings
Phase IV: Post-grand openings

Numerous interesting findings are forthcoming from the analysis.

Basic Pricing Patterns: The Madison market is quite diverse in its pricing across each chain. Based on our price data of 47 food items and controlling for holiday effects and acquisition phases, there remained a 25% price wedge between the highest- and lowest- priced chains. Despite sizable geographic-based income variation across the city and natural geographic barriers caused by a large lake system, we found no evidence of zone pricing commonly observed in larger cities. Indeed, our random effects coefficient on within-chain pricing was near zero, indicating no pricing variability within chains across the entire Madison market.

Short-run price impacts: One major focus of the study was to evaluate the pricing impacts from the merger. We first analyzed within-chain pricing over the various phases of the acquisition event. In the three 2003 post-acquisition phases, *overall* market prices increased from 1% to 1.7% both in the acquiring and non-acquiring chains. We found no evidence that the spatial location of chains had a role in these price increases. Of course, there are many potential reasons for price changes, including seasonality, wholesale price changes, demand shocks, etc. To account for these effects, we isolated on price changes in Madison by introducing a control group with similar market features but without a merger shock. We tested for short-run merger-induced impacts in Madison across chains and acquisition phases with the supermarket sector in the Green Bay metropolitan area serving as a control group. We found virtually all of the short-run price increases that occurred in Madison also occurred in Green Bay. Thus, if there are any negative price impacts imposed by the merger, it did not occur in the 47 products in the weeks immediately following the merger.

Long-run price impacts: Mergers can dramatically shock a market and lead to short-run behavior that is not consistent with how firms will eventually behave in the longer run. To evaluate the long-run price impacts, we collected 2005 price data on each of the 47 products over the same weeks that comprised the first three phases of the 2003 acquisition event. The analysis focused on the acquiring Copps chain and the non-acquiring Sentry chain, which are present in both the Madison and Green Bay markets. Copps was shown to significantly raise prices in the Madison market relative to Green Bay in two of the three phases, while Sentry did not change its prices. Thus, it appears Copps may have been motivated to acquire Kohl's for strategic pricing reasons that did not materialize in the short-run. The result cast doubt on the quality of merger studies that may not include analysis on longer-run impacts.

Promotional impacts: The data collection effort also involved tabulating a great deal of promotion information. This allowed for two additional ways in which we analyzed the merger. First, we looked at the timing of promotions in response to rival promotions. Our results suggest that chains were significantly more sensitive to rivals' "feature" promotions during the Kohl's closure period (Phase II). Because "feature"-styled promotions are designed to increase store traffic, this result appears consistent with a battle for market share. Our analysis of "in-store" displays confirms this finding: there was no increased sensitivity to "in-store" promotion activity. Our second analysis of promotion behavior is the focus of Chapter 3. Specifically, we analyzed the strategies associated with "loss-leader" pricing, a practice widely adopted in the supermarket industry. We found that, after controlling for seasonality and cost shocks, the average price level dropped for those most-advertised products ("loss leaders") and the average price level increased for those least-advertised products ("non-loss leaders") after the acquisition event. We argue that this post-merger asymmetric price movement was primarily due to strategic concerns, rather than cost efficiencies associated with the merger.

Contents

1 Introduction **1**
1.1 Description of the Supermarket Acquisition Event 6
1.1.1 Market Structure and Retail Prices 6
1.1.2 The Supermarket Acquisition in Madison, WI 9

2 The Supermarket Merger's Effect on Prices and Promotion **12**
2.1 Descriptive Statistics 12
2.2 The Short-run Price Effect of the Merger 14
2.3 The Long-run Price Effects of the Merger 22
2.4 The Merger's Effect on Promotional Decisions 25

3 Loss-leader Pricing and the Merger Outcome **30**
3.1 Introduction 30
3.2 A Model of Multiproduct Pricing 35
3.2.1 Model Setup 35
3.2.2 Analysis and Comparative Statics 37
3.3 Market and Data Description 43
3.3.1 Data and Descriptive Statistics 46
3.3.2 Testable Implications 50
3.4 Empirical Evidence 52
3.4.1 Pre- and Post-acquisition Average Price Change 54
3.4.2 Changes in "Featured" Prices and "Displayed" Prices 59

4 Summary and Concluding Remarks **64**

Bibliography **71**

List of Tables

2.1 Summary of Sampling Periods 13
2.2 Food Items in the Sample 15
2.3 Short-Run Price Effect: Overall Price Levels 18
2.4 Short-Run Price Effect: With Control 21
2.5 Long-Run Price Change at Chain S 23
2.6 Long-Run Price Change at Chain C 24
2.7 Marginal Change in Probability of Promotions 28

3.1 Characteristics of Supermarket Chains in Madison, WI 44
3.2 Summary Statistics: Average Prices and Promotion Frequency 47
3.3 Data Structure and Variable Definitions 49
3.4 Pre- and Post-acquisition Average Price Change in Chain S and C 56
3.5 Pre- and Post-acquisition Average Price Change in Chain W and U . . . 59
3.6 Pre- and Post-acquisition Change in Advertised Prices 61

List of Figures

1.1 Madison Supermarket Stores: Before and After Acquisition 10

Chapter 1

Introduction

Public policy towards merger and acquisition activities has been principally concerned with their potential negative impact on competition. Economists have long agreed[1] that mergers, which reduce the number of firms in the industry, could lead to potentially higher consumer prices if the merger-induced cost reductions are not too large.[2] Yet, in the past two decades, the literature sees surprisingly little direct evidence that measures the price effects of an actual merger. This is largely due to the unavailability of data. For the small number of studies in this area (Borenstein (1990), Kim and Singal (1993), Prager and Hannan (1998), Barton and Sherman (1984), and most recently McCabe (2002)), analysis was restricted to very few industries whose data were made available either by regulation (e.g., airline and banking industries) or by antitrust cases filed by

[1]Merger theories, like those presented in Perry and Porter (1985), Deneckere and Davidson (1985), McAffee, Simons, and Williams (1992) and Salant, Switzer, and Reynolds (1983), although they might differ in their arguments concerning merger incentives, all agree on the price-effect of a merger under a variety of market structures and competitive environments.

[2]See, for example, Stigler (1950) and Farrell and Shapiro (1990).

the Federal Trade Commission (FTC) or the Department of Justice (DOJ). Although the analysis generally seems to confirm predictions from existing merger theories, the literature to date does little to show how mergers and acquisitions would affect strategic variables other than price, for instance, promotional decisions.[3]

This monograph is a compilation of research on the merger of Copps and Kohl's supermarkets that took place in the spring of 2003. Upon public announcement of the merger on February 25, 2003 (Newman (2003)), the Food System Research Group (FSRG) organized a data collection effort of pricing and promotion activities in four distinct periods covering pre-merger, store closings, grand openings and post-grand openings. A distinct feature of our data, collected from March 2003, one month before the acquisition, through September 2003, is that it allowed us to assemble price and promotion information for *all* major competitors in Madison's supermarket sector. With both pre- and post- merger information, the research provides empirical evidence of how acquiring *and* non-acquiring firms responded in the short run to a significant structural change in two primary strategic variables: price and advertising. Additionally, the FSRG collected price and promotion data for the same weeks in 2005. The additional data were used to evaluate the possibility of long-run structural pricing adjustments in the Madison market. To account for a wide range of potential demand and supply shocks in the analysis, the pricing impacts of the merger were carefully controlled using same period and product prices in the Green Bay market area.

[3] See Bagwell (2007) for an extensive review of the literature on the strategic implications of promotion under imperfect competition.

Most theoretical models evaluating merger shocks are derived from static models assuming linear demand in a market consisting of symmetric firms selling homogeneous goods. However, when one firm absorbs the other the identities of each become blurred: compared with the $n-$firm pre-merger market, there are only $n-1$ firms left, with a "larger" new firm on the post-merger market.[4] Once the heterogeneity of firms is taken into consideration, less is known, both theoretically and empirically, as to whether the merging and non-merging firms will behave as existing models predict.

Our first reported exercise engages a linear mixed effect model corrected for serial correlation that explains prices with fixed effects for chain, phase, and holidays. Random effects of within-chain pricing were statistically insignificant. The Madison market has wide pricing differences across chains. The lowest price chain maintains prices over 25% lower compared to the highest price chain. In the short-run and without controlling for potential confounding factors, statistically significant price increases were observed in phases II, III, and IV. The price increases were highest in phase III (1.7%) and compared to the other phases, which were both about 1%. Despite wide differences in pricing across store formats, short-run price impacts (i.e., March to September of 2003) across the phases were minimal and not significant. Moreover, this short-run price impacts disappeared once prices from Green Bay market were used as controls for unobservables.

This project was further extended to study the *long-run* effects of this merger event. We returned to the supermarket industry of Madison WI and collected price and

[4]Perry and Porter (1985) more explicitly used this framework in their model finding that mergers result in an increase in prices to consumers. Many early studies of the price effects from mergers are summarized in Weiss (1989).

promotion data for the same set of products comprising the 2003 collection for the same March-September time window. The landmark 1992 U.S. Merger Guideline makes clear that challenges be justified on the merits of *non-transitory*, anticompetitive effects of the merger. Using the 2003 and 2005 data, we are able to present the first clearly structured *long-run* analysis of an actual merger and provide information of central interest to antitrust agencies.

The longer-run price impacts were analyzed specific to two chains in both the Green Bay and Madison markets: Copps and Sentry. Copps, the acquiring chain, was shown to significantly raise prices in the Madison market relative to Green Bay in two of the three periods. In contrast, Sentry, one of the non-acquiring chains, did not change its prices. Thus, it appears Copps may have been motivated to acquire Kohl's for strategic pricing reasons. It is also worth noting that Kohl's operated with union labor contracts. After the acquisition, Copps was able to dissolve the union contract by re-hiring Kohl's employees below the required 50% threshold (Turner 2003). Depending on the pre-merger wage levels and potential gains from dissolution of the union contract, both Copps and Kohl's appears to have had much to gain from the merger in a dimension (union busting) that does not draw much attention from antitrust authorities.

Structural issues of the supermarket industry have attracted much attention over the past decades.[5] Modeling supermarket pricing is challenging largely due to two features of this industry. First, supermarket chains use many different marketing strategies

[5]See chapter 2 in Sharkey and Stiegert (2006) for a comprehensive review.

(e.g., advertising, promotion, in-store location promotion) other than price, and these strategies play increasingly important roles in competing for consumers. As a result, a classic model focusing only on pricing but omitting other endogenous variables could generate biased predictions. Secondly, supermarket chains sell thousands of products to consumers, and it is likely that chains utilize different pricing strategies on different food categories based on food attributes, consumer search costs, firm image, etc.

Keeping the aforementioned supermarket industry traits in mind, the study's design was to measure the merger impacts for a wide range of supermarket products through both a price variable and a non-price strategic variable, promotion. These effects were evaluated based on possible differences on both the acquiring and non-acquiring chains. Several key results came from an assessment of promotional activities on the market. Promotional decisions ("features" advertising) became more sensitive to rivals' promotions after the acquisition, indicating more fierce post-merger non-price competition on the market. Also, we found significant evidence of an overall post-merger strategy to increase the price of low-profile products while decreasing the price of products with strong consumer price-awareness. On the issue of overall price impacts, we found that, relative to a control market (Green Bay), short-run price impacts were insignificant. However, in the long-run, it does appear that the acquiring firm did significantly raise price relative to the control group in the Green Bay market. Despite the close proximity of several Sentry stores to post-merger Copps stores, Sentry did not change its overall pricing relative to the control group in Green Bay. This result, new to the literature of merger studies, provides useful insights for future theoretical modeling.

The third chapter focuses on studying one specific pricing strategy, “loss-leader” pricing, which is widely adopted in the supermarket industry, and empirically examines how this pricing strategy would affect post-merger price outcomes. This is motivated by an interesting finding in our initial analysis of the data. We find, after controlling for seasonality and cost shocks, that the average price level dropped for those most-advertised products (“loss leaders”) and the average price level increased for those least-advertised products (“non-loss leaders”) after the acquisition event. We argue that this post-merger asymmetric price movement was primarily due to strategic concerns, rather than cost efficiencies associated with the merger.

The remainder of the monograph is organized as follows. The remainder of Chapter 1 provides a detailed description of the event of acquisition and the data we collected. In chapter 2, we study the acquisition’s short- and long-run impact on market prices, and how the market key players reacted to this event after the merger. Chapter 3 tests the “loss-leader” strategy by using price variations created by this merger event. Chapter 4 provides a summary of the findings along with suggestions for future research.

1.1 Description of the Supermarket Acquisition Event

1.1.1 Market Structure and Retail Prices

Due to perceived price competition and high sales volume, the supermarket industry has long been thought of as a sector that operates with low profit margins. However, much past research has also uncovered links between market structure and price levels (Sharkey and Stiegert (2006)) suggesting that retail food markets are not uniformly competitive across the United States. Like most urban regions, the supermarket sector in the Madison WI area can be best described as a spatial oligopoly. The major players are several grocery chains owned by different national supermarket corporations. Unlike conventional small grocers that mainly serve their neighborhood markets and charge higher prices for their convenience, grocery chains usually operate at multiple locations in the market and pricing is done at a chain-wide level according to their own business philosophies and strategies used to compete with other food suppliers. The Madison market was, previous to the merger, dominated by five grocery chains: Kohl's Food Stores Inc. (hereafter chain K), Sentry Foods (chain S), Copps Corporation (chain C), Cub Foods (chain U) and Woodman's (chain W). Each of these chains run a number of stores spread throughout the city. Starting from most places of the city at least one grocery store can be reached within a five-minute drive.

There are two commonly observed grocery pricing formats: "Hi-Low pricing" (H-L) and "everyday low pricing" (EDLP). The former charges higher prices on an everyday basis with frequent temporary price cuts, and the latter charges lower and constant everyday prices. Based on our data and on reputation, Woodman's is a classic EDLP chain. Our data reveals that Woodman's indeed offers low prices, exhibits less price variability and carries out significantly fewer promotional activities than the other chains.

Non-price retail competition among chains is mainly through promotions, usually taking the form of "features" and/or "displays." All chains except Woodman's use weekly newspaper fliers advertising featured foods or price cuts. In-store displays of discounts are offered periodically to attract consumers. Both forms of promotion serve to reduce search cost (out-of-store or in-store) on the consumer side. While "features" are mainly designed to incur consumer migration across chains, "displays" provide a valuable guide to consumers' shopping upon their arrival at a certain store.[6] Kohl's, Sentry and Copps are membership stores: almost all the promotions are offered exclusively to members. Non-members of these chains will normally have to pay the "usual prices." Membership, however, can be obtained free of charge and immediately by filling out application forms in the store. This marketing strategy is generally believed to help build consumer loyalty. It also extracts rent from one-time shoppers not wanting to go through the application process and those who are not willing to disclose personal information to the store. Non-membership chains, i.e., Cub Foods and Woodman's, have no such "two-price" schemes: every consumer is charged the same prices.

Other than choosing different marketing strategies, grocery firms differ in many

[6]For relevant discussion of these two promotional forms in the marketing literature, see Peter Boatwright and Rossi (2004) and references therein.

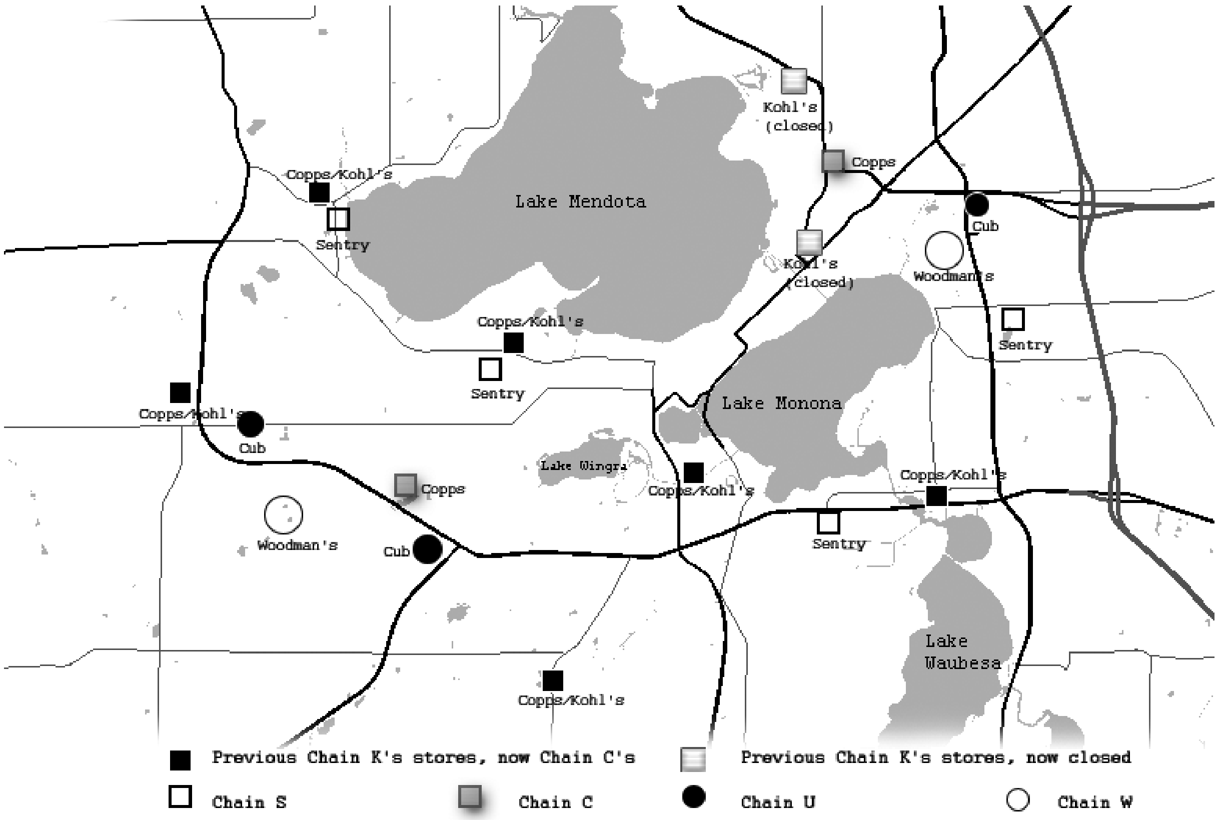
dimensions in services: some chains have faster check-out lanes than others, superior store ambience, provide free shuttles or simply have workers who smile more. On the one hand, the difference in the quality of shopping environment may result in different cost structures among chains and therefore could affect food prices. On the other hand, this may help segment the market, differentiating consumers who care more about service and therefore have a higher willingness to pay. As a result, shoppers are frequently faced with different prices from different chains. This occurs even for most branded food items with the exact same quality.

1.1.2 The Supermarket Acquisition in Madison, WI

During the first six months of 2003, the Madison WI food retailing business experienced a rapid structural change. On February 25, 2003, Great Atlantic & Pacific Tea Co. (A&P), the corporate parent of Kohl's, announced an agreement to sell seven of Chain Kohl's (Chain K) supermarkets in Madison WI to Chain Copps (Chain C), a subsidiary of Milwaukee-based Roundy's, Inc.(see Newman (2003) for an example newsprint summary). A&P is one of North America's largest supermarket conglomerates, operating more than 690 stores in 15 states. Its decision to sell Chain K's stores resulted as part of its nationwide effort to reduce debt and lower operating costs.[7] Because the sale agreement was subject to customary conditions and regulatory reviews, Chain K's Madison local stores continued to operate until the last week of April 2003, when completion of

[7] In early 2004, A&P also sold nine supermarket stores in northern New England. In August 2003, A&P closed its 23 supermarket stores in the Milwaukee WI area.

Figure 1.1: Madison Supermarket Stores: Before and After Acquisition



the sale was announced.

The former Chain K's stores were closed for one month after the deal was approved. Before this acquisition, Chain C operated two local stores while Chain K operated eight. The purchase of Chain K's business was of several acquisitions that Roundy's executives took to expand supermarket part of the corporation and therefore was not an endogenous decision as a result of market forces specific to the Madison market. [8] On June 1, six of the seven stores purchased from Chain K's stores reopened under the banner of Chain C:

[8]By June, 2003, Roundy's completed its acquisition of 31 Minneapolis-St. Paul area local stores that were under the banner of "Rainbow." This constituted its fifth purchase within the year of 2003.

the seventh was closed permanently. The eighth outlet of Chain K's stores was not part of the deal and also closed to avoid self-competition. By the first week of June, when Chain C was ready to kick off a grand-opening celebration of its now established eight food centers, Chain C was the second largest grocer in the Madison market.

Figure 1.1 depicts both the geographic distribution of Madison's major supermarkets and the ownership change after the acquisition. Our study is based on a data set containing shelf prices as well as promotion information drawn from all five supermarket chains from March to September 2003, a period spanning the pre- and post-acquisition processes of Chain K's food stores. It is evident from Figure 1.1 that non-acquiring chain S is in very close proximity to acquiring chain C. This spatial pattern makes it particularly interesting to study how chains adjusted pricing in the *short run* when faced with the acquisition event, which resulted in less competition among chains and also left a fairly large market share to the remaining chains for competition.

A straightforward, yet important, extension of this study is to ask if this merger event would have any longer run impacts. When evaluating the potential anticompetitive effect of a merger, the U.S. merger guidelines would lead investigators to consider the likelihood of new entry after the merger. If significant entry possibilities are present, then such a merger is generally not challenged. One problem with this approach is that, at least to our knowledge, no research has evaluated past decisions that were based on the entry "forecast." For this reason, we conducted a second-round price data collection from March to September, 2005. We covered the same set of products as in the first-round study. In addition, Chain S closed two of its Madison stores and no new entrants were observed in the two years following the merger. One key objective of the study is to assess any longer run post-merger impacts on the pricing as well as promotion behaviors in the Madison food market industry.

Chapter 2

The Supermarket Merger's Effect on Prices and Promotion

In this chapter, we move quickly into the data analysis for both the 2003 and 2005 periods. The next section contains a thorough presentation of the data and the collection process, an analysis of the short-run and long-run price effects from the merger, and an evaluation of the promotional decisions in each phase of the merger process.

2.1 Descriptive Statistics

Our data was collected starting from the last week of March 2003, shortly after we learned the news of the upcoming acquisition. We carefully planned out a list of branded grocery items, which included canned foods, soft drinks, etc., all leading brands in their own food categories. Several produce items were also collected. At the time the data

Table 2.1: Summary of Sampling Periods

Phase Description	From	To	# Weeks	Active Chains	Active Stores
1. Pre Acquisition Period	03/24	04/27	5	5	19
2. Kohl's Closure Period	04/28	05/31	5	4	11
3. Copps Grand Opening Period	06/01	07/27	8	4	17
4. Post Grand Opening Period	07/28	09/14	7	4	17

was collected, Kohl's operated eight local stores, Sentry four, Copps two, Cub Foods three, and Woodman's two: a total of 19 stores owned by the five major grocery chains in Madison area. By the second week of September when we stopped collecting price information, the total number of stores in our sample became 17 due to the event of acquisition, and they are now owned by four grocery chains, with Kohl's complete exit from the market. Our data set therefore spans four periods, as listed in Table 2.1.

We collected retail prices as well as information on promotion activities for more than 50 branded items at all operating stores from March 24th to September 14th, a period of 25 weeks. The data were collected with the assistance of the Food System Research Group of UW-Madison. Retail prices on tags for those items on our list, as well as their brands and sizes, were collected during visits to each of these 19 stores on a weekly basis. At the same time, we recorded all information on in-store displays of discounts and kept all weekly fliers each chain sent out to its customers. On those fliers each chain advertised a subset of its foods, and prices advertised were valid usually from the first day of a week through the weekend at all of its local food stores.

If an item (and/or its price tag) was not available at the time of visits, we recorded its price as "missing." After several weeks we soon discovered that the packages for several food items were not consistent. For example, for a given store, prices for a certain brand of oranges sometimes were given for small size, but other times for large or medium size. Even for a food item with the same size the store might not be selling the same brand consistently. For example, there could be as many as six different brands of Large Grade A Egg on sale over time in our data.[1] We recorded these kinds of heterogeneity in brands and sizes in our data. For several food products this problem appeared frequently so we had to drop those items from our sample. For other items we just omit these "heterogeneous" (around 50) observations in our analysis. As a result we ended up with a longitudinal sample for 47 items with 18,332 "homogeneous" observations (missing values not counted) over a period of 25 weeks.

Table 2.2 lists the 47 branded food items in our sample and provides brand, size, number of observations, mean price and price standard deviation for each item.

2.2 The Short-run Price Effect of the Merger

We start by checking if there are significant changes of overall price levels of different chains across the four phases of our interest. Consider a linear mixed-effects model (LME)

[1]Sometimes this might be due to the fact that a certain brand was not available and our data collector recorded the price of a close substitute.

Table 2.2: Food Items in the Sample

Category	Brand	Size	Obs	Mean Price	S.D. Price
Margarine	Fleischman's	4 sticks	388	1.41	0.26
Butter Substitute	Country Crock	1 lb tub	397	1.21	0.06
Cheese	Kraft	24 slices	387	3.51	0.47
Peanut Butter	Skippy	18 oz jar	395	1.88	0.31
Chocolate	Jello	6 pack	397	2.63	0.25
Chocolate	Nestle Toll House	12 oz	394	2.09	0.12
Frozen Pie	Sara Lee	9 inch pie	381	4.67	0.54
Frozen Corn	Green Giant	1 lb bag	363	1.39	0.15
Apple	Golden Delicious(type)	1 lb	391	1.12	0.17
Bananas	Turbana	1 lb	395	0.46	0.06
Lettuce	Iceburg(type)	1 lb	392	1.10	0.25
Potatoes	Russet(type)	5 lb	387	1.81	0.42
Bacon	Oscar Mayer	1 lb	391	4.18	0.66
Hot Dog	Oscar Mayer	1 lb	391	2.38	0.53
Wheat Bread	Brownberry	26 oz loaf	394	2.70	0.25
Tuna	Starkist	6 oz can	374	0.56	0.10
Pineapple	Dole rings	20 oz can	395	1.08	0.15
Peaches	Del Monte	29 oz can	394	1.57	0.16
Corn	Green Giant	11 oz can	397	0.78	0.16
Soup	Campbell's	10 oz can	397	0.68	0.10
Soup	Progresso	19 oz can	397	1.99	0.20
Coffee	Folgers	39 oz can	397	5.72	0.71
Cereal	Cheerios	20 oz box	389	3.93	0.58
Cereal	Kellogs Corn Flakes	24 oz box	396	3.36	0.43
Cereal	Honey Bunches of Oats	16 oz box	394	2.78	0.41
Cookie	Oreo	20 oz pckg	392	3.04	0.54
Cracker	Nabisco	16 oz box	392	2.21	0.28
Cracker	Cheese-its	16 oz box	391	2.91	0.52
Corn Oil	Mazola	48 oz bottle	379	3.03	0.23
Vegetable Oil	Wesson	2 quart bottle	394	3.40	0.22
Flour	Pilsbury	5 lb	397	1.62	0.26
Sugar	C&H	4 lb	395	1.76	0.23
Oats	Quaker	18 oz can	396	1.99	0.20
Rice	Minute	14 oz box	379	1.61	0.15
Pasta	Creamette	1 lb box	396	1.12	0.15
Dog Food	Purina	8.8 lb bag	394	6.00	0.43
Salad Dressing	Kraft	16 oz bottle	386	2.59	0.39
Salad Dressing	Wishbone	16 oz bottle	396	2.39	0.40
Ketchup	Heinz	24 oz bottle	395	1.49	0.20
Ice Cream	Breyer's	1/2 gallon	389	4.58	0.90
Ice Cream	Ben & Jerry's	1 pint	388	3.16	0.24
Soda	Mountain Dew	2 liter bottle	394	1.27	0.22
Soda	Coca-Cola	12 cans	396	3.25	0.59
Orange Juice	Florida's Natural	1/2 gallon	395	2.77	0.36
Juice	Ocean Spray	48 oz bottle	370	2.84	0.09
Beer	Budweiser	12 cans	386	8.07	0.25
Beer	Sam Adams	6 cans	359	6.36	0.39

with an AR(1) error term in the following form:

$$p_{csit} = \alpha + \sum_{i=2}^{5} \beta_i C_i + \sum_{i=2}^{5} \sum_{j=2}^{4} \theta_{ij} C_i P_j + \sum_{i=2}^{47} \gamma_i I_i + \sum_{i=1}^{4} \lambda_i H_i + \eta_{cs} + \epsilon_{csit} \tag{2.2.1}$$

$$\epsilon_{csi,t} = \rho \epsilon_{csi,t-1} + \zeta_{csi,t} \tag{2.2.2}$$

$$\eta_{cs} \sim N(0, \sigma_\eta^2), \quad \zeta_{csi,t} \sim N(0, \sigma_\zeta^2) \tag{2.2.3}$$

where p_{csit} is price in logs for item i at store s of chain c at week t. We include a set of chain ($C_i's$), phase ($P_j's$) and item ($I_i's$) dummies in the regression (e.g., $C_i = 1$ for observations from chain i, $P_j = 1$ for observations from phase j). Therefore $\beta_i's$ and $\gamma_i's$ capture chain and item fixed effects respectively. We allow these phase dummies to interact with chain dummies so that $\theta_{ij}'s$ capture chain i's price change during phase j. We also create a dummy for each of the four holidays spanned by our sampling period: Easter (H_1), Memorial Day (H_2), Independence Day (H_3) and Labor Day (H_4). We set $H_i = 1$ if an observation was from a holiday week *or* the week proceeding a holiday.

In our specification, store effect nested under a certain chain is modeled through a random-effect term η_{cs}. This is motivated by the fact that prices in stores belonging to the same chain usually exhibit little variation. A random-effect specification can capture possible (if any) effect due to different locations of stores within a certain chain, while significantly reducing the number of parameters we have to estimate. We also model the within-group error term ϵ_{csit} as an AR(1) process. This specification, by allowing store and item specific serial correlation structure in the error, complements the time fixed-effect specification represented by holiday dummies in our model.[2] To complete our model setup, we assume a Gaussian distribution for η_{cs}, ζ_{csit} and that they are independent to each other. The estimation is carried out by maximum likelihood method and the results are reported in Table 2.3.

For comparison purposes, we report estimation results for three restricted versions of our full model in the first three columns of Table 2.3: OLS (Ordinary Least Square), GLS (Generalized Least Square) and LME (Linear Mixed Effects) without AR(1) error term. Results for the full model are reported in the last column. Although we get close estimates for different specifications, the Akaike Information Criterion (AIC) reveals that including an AR(1) error leads to a significantly better fit with our model. There is virtually no difference in results between specification 2 and 4, because the random effect is negligible. Nevertheless the full model gives us a sense of the magnitude of the random effect, and we use GLS as a check for the robustness of our estimation. All further discussion of Table 2.3 is constrained to model [4] and to the four likelihood ratio tests across the bottom section.

Several findings follow. Beginning with the chain effects (i.e., the βs), price differentials are striking. Prices in the highest priced chain (Kohl's) are 25% more expensive than the lowest priced chain (Woodman's). Overall price levels in different chains are significantly different. However, chains seem to price uniformly across their local stores. The estimate of the store-within-chain random effect is very close to zero, suggesting

[2] A calculation of the *empirical autocorrelation function* also suggests strong evidence of a lag-1 correlation in the error term. For details of how to calculate this measure, see Box, Jenkins, and Reinsel (1994).

Table 2.3: Short-Run Price Effect: Overall Price Levels

Specification:	[1] OLS	[2] GLS	[3] LME	[4] LME+AR(1) error
AIC	-21593.84	-24215.39	-21593.15	-24213.34
Fixed Effects:				
Intercept ($\hat{\alpha}$)	0.199	0.203	0.199	0.203
	(0.008)	(0.011)	(0.008)	(0.011)
Sentry-Kohl's ($\hat{\beta}_2$)	-0.036	-0.038	-0.036	-0.038
	(0.005)	(0.006)	(0.006)	(0.006)
Copps-Kohl's ($\hat{\beta}_3$)	-0.114	-0.115	-0.114	-0.115
	(0.004)	(0.006)	(0.005)	(0.006)
Cub-Kohl's ($\hat{\beta}_4$)	-0.151	-0.154	-0.151	-0.154
	(0.005)	(0.006)	(0.006)	(0.006)
Woodman's-Kohl's ($\hat{\beta}_5$)	-0.256	-0.258	-0.256	-0.258
	(0.005)	(0.007)	(0.006)	(0.007)
Phase II-Phase I ($\hat{\theta}_2$)	0.010	0.010	0.009	0.010
	(0.005)	(0.005)	(0.005)	(0.005)
Phase III-Phase I ($\hat{\theta}_3$)	0.019	0.017	0.020	0.017
	(0.004)	(0.004)	(0.004)	(0.004)
Phase IV-Phase I ($\hat{\theta}_4$)	0.010	0.011	0.010	0.011
	(0.004)	(0.005)	(0.004)	(0.005)
Easter ($\hat{\lambda}_1$)	-0.005	-0.006	-0.005	-0.006
	(0.004)	(0.004)	(0.004)	(0.004)
Memorial Day ($\hat{\lambda}_2$)	-0.012	-0.011	-0.012	-0.011
	(0.005)	(0.005)	(0.005)	(0.005)
Independence Day ($\hat{\lambda}_3$)	-0.021	-0.019	-0.021	-0.019
	(0.004)	(0.004)	(0.004)	(0.004)
Labor Day ($\hat{\lambda}_4$)	-0.013	-0.011	-0.013	-0.011
	(0.004)	(0.004)	(0.004)	(0.004)
Random Effects:				
Store within Chain ($\hat{\sigma}_\eta$)	–	–	0.0029	0.0006
Other Parameters:				
Autocorrelation Coefficient ($\hat{\rho}$)	–	0.3827	–	0.3827
Standardized Error ($\hat{\sigma}_\zeta$)	–	0.1342	0.1338	0.1342
Likelihood Ratio Tests:	[1]	[2]	[3]	[4]
Hypothesis	$H_0 : \rho = 0$	$H_0 : \sigma^2_\eta = 0$	$H_0 : \theta_{ij} = \theta_j$	$H_0 : \theta_j = 0$
Test Statistic	2618.344	0.056	5.989	14.889
d.f. of χ^2	1	1	9	3
p-value	$< .0001$	0.8126	0.7410	0.0019

Note: $\theta_j (j = 2, 3, 4)$ was estimated by constraining $\theta_{ij} = \theta_j (\forall i, j)$.

little difference in within-chain price levels.

To evaluate the acquisition effect on market price levels, we could generate estimates of parameters in the following sensitivity matrix:

$$\Theta = \begin{pmatrix} \theta_{22} & \theta_{32} & \theta_{42} & \theta_{52} \\ \theta_{23} & \theta_{33} & \theta_{43} & \theta_{53} \\ \theta_{24} & \theta_{34} & \theta_{44} & \theta_{54} \end{pmatrix} \tag{2.2.4}$$

where θ_{ij} measures chain i's price sensitivity to the event of acquisition at phase j. However, as the third likelihood ratio test ($H_0 : \theta_{ij} = \theta_j$ $(\forall i, j)$) indicates, chains were not different in adjusting price levels within phases. Therefore we used the restriction suggested from the likelihood test to provide estimates of overall market price differences across phases ($\theta_j' s$). Our results show that eliminating one chain from the market may have raised price levels by about 1-2%. Compared with the pre-acquisition period, prices rose by 1% during the closure period of Kohl's, and 2% during the Copps grand opening period. Although the absolute magnitude is quite small, its effect on consumer welfare might be considerably larger because most food items in our sample would be purchased multiple times each year by the same consumer.

On the other hand, price levels drop by up to 2% during holidays. This suggests seasonal and cyclical pricing of grocery chains.

We provide a set of formal test results for assumptions made above in the last portion of Table 2.3 and discuss their implications. First, the estimated correlation parameter ($\hat{\rho}$) is significantly positive. That is to say, unobserved and store specific determinants of price levels will generate a positive correlation in the estimation residuals. The second test ($H_0 : \sigma_\eta^2 = 0$) confirms that there was not much price variation across stores within a chain. Prices were set on a chain-wide basis and stores at different locations did not discriminate consumers with different demographic characteristics.

The next two tests were designed to test restrictions on parameters in the sensitivity matrix Θ. The test for $H_0 : \theta_{ij} = \theta_j \; \forall \, i, j$ statistically determines if different chains responded to the event of acquisition in different ways (e.g., was Sentry's pricing more sensitive to the acquisition than Woodman's?). Failure to reject the null justifies our assumption of homogeneous price adjustment across chains in each phase. More importantly, it also implies: 1) Chain's pricing formats do not seem to affect their responses to the change of market structure. "EDLP" chains (e.g., Woodman's) increased their prices to the same degree as "Hi-Low" chains (e.g., Sentry), and 2) Chain decisions to increase prices seem to be independent of demand fluctuation (if any) caused by the event of acquisition. During our sampling period, a number of Kohl's stores were eliminated temporarily and restored later under the banner of Copps. We expected that this natural experiment would have affected chains in different degrees. Specifically, stores geographically closer to those eliminated stores would likely experience larger demand shocks. For example, Sentry was probably more likely to be affected by the acquisition to a larger degree because it was closer to the eliminated chain Kohl's. Our test result, however, shows that spatial location of chains played very limited role in determining

Table 2.4: Short-Run Price Effect: With Control

	Copps	Sentry	Cub	Woodman's
Phase II-Phase I	-0.012	-0.010	0.003	0.003
	(0.014)	(0.012)	(0.012)	(0.013)
Phase III-Phase I	-0.023	-0.013	0.011	0.007
	(0.013)	(0.011)	(0.010)	(0.012)
Phase IV-Phase I	-0.018	0.008	-0.004	0.026
	(0.013)	(0.011)	(0.011)	(0.012)
Item fixed effect	Yes	Yes	Yes	Yes

price levels. Finally, the fourth test ($H_0 : \theta_j = 0 \; \forall \, j$) shows that price levels significantly increased after the Kohl's exit.

One caveat follows. Because, in the above analysis, we do not include demand or cost side information, we do not know if the price increase was caused by the acquisition or from some other coincidental common market demand or cost shocks. For this reason, we used an auxiliary data set from Green Bay, WI to control for seasonality and cost shocks. That data set contains price information for the same set of products as our Madison study during the same period of time (March-September 2003). The similarity of demographics and location for both markets suggests that the Green Bay data could be used as an excellent control for seasonality or other regional demand-side or supply-side shocks .

Table 2.4 presents short-run price changes in individual chains when we use Green Bay data as a control. It shows that the modest short-run price increase disappeared when unobservable shocks are controlled. While it is arguable whether Green Bay data is a good control for the Madison data, our analysis seems to point to the fact that short-run price gains from the merger are statistically and economically insignificant.

2.3 The Long-run Price Effects of the Merger

In this section, we report the results of our analysis of merger-induced long-run price effects. During 2005, the FSRG collected prices and promotion materials for the same weeks that were collected in the 2003 merger period. The subsequent analysis of pricing behavior was conducted on the two chains (the acquiring chain C (Copps), and one of the non-acquiring chains S (Sentry)) that presided in both the Madison and Green Bay markets. Thus, we explicitly control for chain effects in the model design. The setup is straightforward. We compare price data in each chain in 2005 with the pre-merger data (i.e., phase I, 2003) in 2003. Thus, the 2005 data is divided into the same three post-merger phases.

The results of this analysis is reported for the Sentry chain in table (2.5) and for the Copps chain in table (2.6). The first column of results show the price differences in Madison without the Green Bay market as a control group. The second column of results show the price differences with Green Bay serving as a control group. We sought first to understand the merger impacts in terms of any indirect effects on Sentry, the chain not engaged in the merger. As the first column shows, the pricing of Sentry products changes as we move from phase to phase. However, the changes are small and may reflect normal

Table 2.5: Long-Run Price Change at Chain S

	Sentry's Price Change w/o Control	Sentry's Price Change w/ Control
Phase II 2005-Phase I 2003	0.015 (0.013)	0.022 (0.015)
Phase III 2005-Phase I 2003	0.010 (0.013)	-0.001 (0.016)
Phase IV 2005-Phase I 2003	0.020 (0.010)	0.001 (0.013)
Item fixed effect	Yes	Yes

seasonal forces or other factors leading to changes in wholesale prices. The results in the second column control for unobservable price drivers by evaluating the Madison market for price changes that are different from price changes in Green Bay. The results show that Madison Sentry stores did not alter its pricing in any of the phases in 2005 in ways that were different from its Green Bay pricing patterns. The results suggest forcefully that the long-run impacts of the merger seem to be rather innocuous for this chain.

The results for the Copps stores indicates a very different outcome compared to Sentry. Without the Green Bay controls, the pricing in Copps stores show a statistically significant increase in all phases. Furthermore, the magnitude of these price increases was much larger than recorded for the Sentry chain, which raises concerns about the use of market power in long-run post-merger strategies for Copps. We then introduce the Green Bay control group to see if the price increases could be traced strictly to

Table 2.6: Long-Run Price Change at Chain C

	Copps' Price Change w/o Control	Copps' Price Change w/ Control
Phase II 2005-Phase I 2003	0.048	0.048
	(0.015)	(0.006)
Phase III 2005-Phase I 2003	0.031	0.016
	(0.015)	(0.036)
Phase IV 2005-Phase I 2003	0.059	0.035
	(0.013)	(0.015)
Item fixed effect	Yes	Yes

the Madison Copps stores. While some of the price increases could be attributed to chain-wide impacts, possibly due to wholesale price increases and national and state-wide demand shocks, we found that a potentially permanent price increase has emerged for Copps in the Madison Market. In phases II and IV, we note that prices are 4.8% and 3.5% higher in the Madison Copps stores compared to the pre-merger phase in 2003 after controlling for prices using Green Bay prices. In phase III, the prices in Madison Copps were not different than the prices in Green Bay. Interestingly, the standard error in this period is quite large and seems to signify some form of pricing or promotion change in only one of the markets. Overall, the result show that that the Kohl's-Copps merger caused Copps to increase its prices. Recall that the Copps market presence increased from only two stores to eight stores in the Madison metropolitan area. One would certainly expect some scale economies emerged from the merger. If such is the case, then cost reductions were not passed on to consumers and Copps was able to use its market power to raise prices.

2.4 The Merger's Effect on Promotional Decisions

The event of acquisition eliminates one firm from the market and alters the post-merger market concentration. While the merger literature has extensive discussion on the price effect of a merger, less is known about a merger's effect on a firm's non-pricing competition behavior. In this subsection we focus on studying how the event of acquisition would affect a chain's promotional decisions.

Promotions, a major source of non-price competition, mostly take the form of "features" or "displays" in Madison's food market. According to the November 2003 issue of *Inside Roundy's*, a monthly publication from Copps' parent company, 5,250,000 ad circulars are distributed each week for its affiliated stores throughout the midwest. Chains send out weekly fliers to consumers, circulating information about "featured" food items and weekly special prices. The use of "featured" items in ad circulars represent a form of promotion designed principally to maintain customer loyalty and compete against other chains for store traffic.

Information was collected on whether an item was advertised in the weekly fliers or displayed in stores of a particular chain during a particular week. All chains except Woodman's send out weekly fliers. Our information on promotional activities during the sampling period enables us to address two important issues: first, did the event of acquisition lead to any change in a chain's promotional intensity? Clearly, the merger shock left fewer incumbent firms, two store closures and a need to reallocate market share. Did firms use more promotions to attract more customers? Or did firms reduce promotions as a result of increased market power? Secondly, did non-price competition become more fierce after the acquisition? Specifically, did firms become more responsive to rivals' promotions after the acquisition? Will the rising of a new dominant firm in the market change chains' sensitivity to rivals' promotional behaviors?[3]

Our analysis is carried out by estimating the following Probit model on promotional activities:

$$\begin{aligned} y^*_{csit} &= \alpha + (\alpha_{11} + \sum_{j=2}^{4} \alpha_{1j} P_j) * RP_{csit} + (\alpha_{21} + \sum_{j=2}^{4} \alpha_{2j} P_j) * LMP_{csit} \\ &\quad + \sum_{i=2}^{5} \beta_i C_i + \sum_{i=2}^{5} \sum_{j=2}^{4} \theta_{ij} C_i P_j + \sum_{i=2}^{47} \gamma_i I_i + \sum_{i=1}^{4} \lambda_i H_i + \epsilon_{csit} \end{aligned}$$

$$y_{csit} = \begin{cases} 1, & y^*_{csit} > 0 \\ 0, & y^*_{csit} < 0 \end{cases} \tag{2.4.1}$$

where y represents the decision of promotion and ϵ has a standard normal distribution. Therefore, we model a chain's promotion decision as a function of rival promotion (RP), lowest market price (LMP) among other chains, and a number of fixed effects due to chain, product and holiday. The variable "rival promotion" (RP) is set to 1 whenever

[3] An earlier study by Baumol, Quandt, and Shapiro (1964) provided evidence of surprisingly independent pricing of advertised items among Philadelphia retail food chains.

a promotion was observed in a rival chain. Each item's lowest market price (LMP) is equal to the lowest available price among other chains during a certain week. These two variables offer proxy measures of the degree of market competition (both non-pricing and pricing) faced by each chain.

Our major interest would be to estimate parameters in the following matrix:

$$\Lambda = \begin{pmatrix} \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{22} & \alpha_{23} & \alpha_{24} \end{pmatrix} \tag{2.4.2}$$

which measures chains' promotional sensitivity to their rivals' price and non-price competition behavior. From these estimates, we provide tests of restrictions in a manner similar to parameter restrictions in Λ and Θ, which were similarly defined in equation (2.2.4). These results will measure changes of individual chain's promotional intensity in different phases. Table 2.7 reports the estimation results. Numbers there represent marginal change in probability of promotions instead of actual coefficient estimates. Because Woodman's did not utilize weekly fliers and we did not observe any promotions for some food items in our sample, our results were obtained based on data excluding Woodman's.

The first column of Table 2.7 provides estimates for probability of "feature" advertisements. Our results suggest that chains were significantly more sensitive to rivals' "feature" promotions during the Kohl's closure period, which appears consistent with a market share battle. Rivals' promotions were found as more likely to trigger chains'

Table 2.7: Marginal Change in Probability of Promotions

Specification:	[1] Prob(Feature=1)	[2] Prob(Display=1)
Rival Promotion	-0.040	-0.012
	(0.009)	(0.008)
Rival Promotion: Phase II	0.133	0.020
	(0.078)	(0.029)
Rival Promotion: Phase III	0.019	-0.004
	(0.033)	(0.013)
Rival Promotion: Phase IV	0.076	0.019
	(0.037)	(0.024)
Lowest Market Price	-0.191	-0.104
	(0.023)	(0.015)
Lowest Market Price: Phase II	-0.011	-0.005
	(0.008)	(0.004)
Lowest Market Price: Phase III	-0.007	-0.003
	(0.007)	(0.004)
Lowest Market Price: Phase IV	-0.012	-0.004
	(0.009)	(0.004)
Fixed Effects	chain, product, holiday	chain, product, holiday
χ^2 **Tests:**	Test Statistic (p-value)	Test Statistic (p-value)
[1] $H_0 : \alpha_{1j} = 0,\ j = 2, 3, 4$	8.57 (0.0356)	2.27 (0.5185)
[2] $H_0 : \alpha_{2j} = 0,\ j = 2, 3, 4$	2.46 (0.4833)	1.80 (0.6159)
[3] $H_0 : \theta_{ij} = 0,\ \forall\, i, j$	8.77 (0.4583)	22.13 (0.0014)

promotions after the acquisition ($H_0 : \alpha_{1j} = 0,\ j = 2, 3, 4$ is rejected). However, the effect of market price levels on promotion decisions seems to be the same across phases (failure to reject $H_0 : \alpha_{2j} = 0,\ j = 2, 3, 4$), although promotions were more likely to occur when market price level was low (negative coefficient on LMP). Our test results ($H_0 : \theta_{ij} = 0,\ \forall\, i, j$) also show that chains did not change their overall promotional probabilities before and after the acquisition, but they cared more about rivals' promotions after the change of market structure.

To facilitate comparison, we also conducted a Probit analysis for "in-store displays" and report the results in the second column. "In-store displays" differ in promotional functions from "features": they are mainly used as a guide for consumers' shopping upon their arrival of a particular store. Therefore they do not typically associated with marginal cross-chain consumer migration effects. As a result we expect that the probability of in-store display would not be affected by rivals' feature advertising, neither would it be affected by market price levels. Our test results confirm this conjecture: all coefficients on variables related to rival promotions are statistically insignificant.

Chapter 3

Loss-leader Pricing and the Merger Outcome

3.1 Introduction

Pricing theories in industrial organization have largely been constructed on the assumption that firms sell only one product. Ignoring the ubiquitous multiproduct nature of firms, however, could undermine our understanding of important motives of strategic pricing. In a multiproduct setting, interesting pricing patterns could arise. Particularly, with the possibility of cross subsidizing, firms that maximize total profit may price some products below cost, yet they can compensate for the loss incurred on those products by charging high prices on other goods. This phenomenon, frequently termed as "loss-leader" pricing, has attracted growing attention in the literature. The research presented in this chapter examines this pricing strategy from an empirical perspective, using data containing price variations created by an acquisition event in the supermarket industry, where "loss leader" pricing has long been informally recognized yet with little (or mixed) empirical evidence. The goal of the research in this chapter is two-fold: first, it aims to document some of the first evidence about the price effect of an actual merger in a multiproduct industry; second, it examines how multiproduct retailers' strategic pricing behavior may affect the post-merger price outcome.

Theoretical works in the literature have identified a variety of circumstances under which "loss leader" pricing might arise (e.g., Bliss (1988), Tirole (1988), Hess and Gerstner (1987), Bagwell and Ramey (1994), Simester (1995), Ellison (2005) and Beard and Stern (2008)). Among them, the most relevant and widely cited formalization of the "loss leader" idea is the one presented in Lal and Matutes (1994). In that model, consumers do not know prices charged until they visit stores by incurring a sunk transportation cost. Multiproduct retailers in turn charge the consumer's reservation price for each good, leading to negative surplus in the presence of positive transportation costs. To solve this conundrum, firms utilize advertising to commit a low price (sometimes even below cost) on advertised products to guarantee positive surplus for consumers (even if they purchase the product bundle), while charging a monopoly price on unadvertised products.

Although the story of loss leaders is intuitive, research that tests the theory empirically remains quite limited. Furthermore, these studies provide evidence both for and against the theory. One line of empirical work on loss-leader pricing focuses on testing the direct effectiveness of loss-leader products: they are designed to compete for consumers and increase store traffic so that consumers will buy other products that have higher profit margins. Walters (1988) and Walters and MacKenzie (1988) are two standard references in the marketing literature. These two studies find that "most loss-leaders had no ultimate effect on store profit because they failed to stimulate either loss-leader sales or store traffic."[1] Ellison and Ellison (2007), on the other hand, find that low prices set on a base product (a low-quality memory module) can help increase sales of "add-on" products (medium- and high-quality modules). Another line of empirical research explores a testable implication not highlighted in Lal and Matutes (1994): aggregate and idiosyncratic demand seasonality will result in lower prices during higher demand states under the non-negative price constraint. Chevalier, Kashyap, and Rossi (2003) apply this idea to a data set containing information on retail and wholesale prices, product quantities and costs from a large supermarket chain in the Chicago area. They find that countercyclical pricing behavior best conforms to the loss-leader explanation. MacDonald (2000) finds that prices of many food items tend to fall at seasonal demand peaks. Hosken and Reiffen (2004) show that popular items are more likely to be put on sale. Interestingly, Nevo and Hatzitaskos (2006), using the same data set in Chevalier, Kashyap, and Rossi (2003), argue that the observation of price reduction on a high-demand state is primarily

[1]Note that Lal and Matutes (1994) and Beard and Stern (2008) argue that this finding does not conflict with their versions of loss-leader theory. Lee and Png (2004) provides indirect evidence to the loss-leader story by showing that bookstores' bestseller discounts increase with a variety of measures of the profits on non-advertised items.

due to demand substitution among brands (e.g., an increase of cheaper products' shares in the price index) and a change in price elasticity. They conclude that their findings are "less consistent with 'loss-leader' models of retail competition."

This chapter embarks on a different route and contributes to the empirical studies of loss-leader pricing by looking at price variations of the most-advertised (loss leaders) and least-advertised products before and after an acquisition event in the supermarket industry in Madison WI from March to September 2003. The main reasoning, as shown in our simple model, is that an acquisition reduces the number of competitors in the market and will increase post-acquisition demand for incumbent firms. As a result, retailers will have incentive to increase prices on those unadvertised products. Anticipating this, consumers will be more reluctant to shop. This reluctance creates incentives for firms that adopt "loss leader" pricing to further lower post-acquisition prices on advertised products and thus to retain and compete for customers. Once consumers arrive in the store, losses incurred on advertised products could be compensated for by higher prices charged on unadvertised products. We apply this simple idea to the rare data set, which contains weekly advertising and price information on most- and least-advertised products before and after a supermarket acquisition event. To control for possible contemporaneous factors (e.g., seasonal and cost variations) that could confound the price effect of the acquisition event, We drew auxiliary data from Green Bay WI for the same set of products during the same sampling periods. We adopted a difference-in-difference approach to compare pre- and post-acquisition price changes. The results show that the post-acquisition average price level of loss-leader products dropped by $4.6\% - 10\%$, while the average price level of unadvertised products went up by $4.8\% - 9.5\%$ in two major incumbent chains. We interpret the results to be consistent with "loss-leader" pricing.

One novel aspect that distinguishes the research in this chapter from previous empirical merger analyses is that we examine the price effect of an actual merger in a typical multiproduct setting (i.e., the supermarket industry) where cross-subsidizing is possible. Products are distinct in their functions (as a loss-leader product or not) when put on sale. This study reveals a strikingly different price movement between different product groups (loss leaders vs. non-loss leaders) after a merger. It shows that, when firms can commit to low prices of advertised products to attract consumer shopping for unadvertised products, the after-merger advertised price could be lower. This result, at first glance, stands in contrast with the conventional wisdom of merger analysis. This chapter provides a view of loss-leader pricing that reconciles findings with the notion that post-merger price decreases on some products are simply a result of multiproduct firms' strategic pricing behavior. Furthermore, because the unique data contain price information for all major chains in the market, we are able to study the post-merger pricing behavior for both merging and non-merging chains. This kind of empirical study on mergers, as pointed out in Whinston (2006, chapter 3), can help us assess the likelihood of anti-competitive effects a future merger might have in a particular industry. It also provides an important evaluation to the increasingly popular merger simulation approach used in antitrust analyses (see, for example, Berry and Pakes (1993), Nevo (2000) and

Peters (2006)).

3.2 A Model of Multiproduct Pricing

3.2.1 Model Setup

Consider a spatial model similar to the one first introduced by Salop (1979). There are n ($n \geq 3$) competing firms evenly spaced around a circle of unit length so that each firm is at a distance of $1/n$ from its neighbor. Each firm i ($i = 1, 2, \ldots, n$) produces two products, 1 and 2, at identical and constant marginal costs, which are assumed to be zero without loss of generality. Therefore, a positive price should be interpreted as a markup and a negative price should be interpreted as a markdown below cost. Products are priced at p_{i1} and p_{i2} respectively. All firms are assumed to advertise one and the same product, say, product 1, but not both. This assumption is to capture the idea that in reality supermarkets can never advertise all of their products and some products are frequently advertised by all competitors. In this model, the advertising decision is exogenous.

There is a continuum of consumers located uniformly along the circle. Each consumer j has a demand for at most one unit of each product. It is assumed that consumers can be classified into two types: the informed and the uninformed, where the fraction of informed consumers in the population is $\theta \in (0, 1)$. Informed consumers have full information about prices on both of the products while uninformed consumers can only learn p_{i1} through advertisement and subsequently form expectations of p_{i2}. If a consumer decides to buy from a firm i located at a distance of $|i-j|$, he or she will incur a transportation cost of $|i-j|z$ $(z > 0)$. All consumers have a reservation price R on each product. For ease of exposition, R is assumed to be high enough[2] for all consumers to participate in the market such that if a consumer decides to visit a store, he or she will purchase both of the products. It is also assumed that firms cannot price discriminate consumers on the basis of their types.

Shopping rules are simple. The informed consumers learn both of the prices and will purchase both of the products from firm i (rather than firm k) if

$$p_{i1} + p_{i2} + |i-j|z > p_{k1} + p_{k2} + |k-j|z. \tag{3.2.1}$$

The uninformed consumers are assumed to be rational, in the sense that they can correctly form expectations about unadvertised prices set by a profit-maximizing firm. Let $p^e_{\cdot 2}$ denote the expected price of product 2. It is easy to see that an uninformed consumer will visit firm i if

$$p_{i1} + p^e_{i2} + |i-j|z > p_{k1} + p^e_{k2} + |k-j|z. \tag{3.2.2}$$

I consider a stage game in this framework. In Stage 1, each firm chooses the price of product 1, given the prices simultaneously set by their rivals. The prices of product 1 are sent to all consumers via advertisements. In Stage 2, profit-maximizing firms set

[2] More accurately, we need $R > \frac{z}{\theta n}$.

the prices of product 2, and uninformed consumers form expectations of $p_{\cdot 2}$, taking into account the fact that firms set prices optimally. It is required that, in equilibrium, $p^e_{\cdot 2} = p_{\cdot 2}$ in that no "surprise" is allowed. In Stage 3, informed consumers will choose which store to visit given the price bundles observed from neighboring firms, and uninformed consumers select stores on the basis of both the advertised price, $p_{\cdot 1}$, and their forecasts about the prices of product 2, $p^e_{\cdot 2}$. In Stage 4, consumers visit stores. Uninformed consumers learn the prices of the visited firm and are free to visit a rival firm by incurring a transportation cost z/n. Of course, in equilibrium, consumers never switch stores because firms do not "surprise" consumers by charging different prices. The solution concept to this game is subgame perfection. We look for a pure-strategy symmetric equilibrium in which

$$p_{i1} = p_{k1}, \quad p_{i2} = p_{k2}. \tag{3.2.3}$$

3.2.2 Analysis and Comparative Statics

First consider consumers' decision in Stage 3. Consumers at location $x \in [0, 1/n]$ choose between two neighboring firms, labelled i and k respectively. For the informed type, an indifferent consumer who plans to buy both of the products will be located at x^*_I defined by

$$p_{i1} + p_{i2} + x^*_I z = p_{k1} + p_{k2} + \left[\frac{1}{n} - x^*_I\right] z, \tag{3.2.4}$$

or,

$$x_I^* = \frac{p_{k1} + p_{k2} - p_{i1} - p_{i2} + \frac{z}{n}}{2z}. \qquad (3.2.5)$$

For the uninformed type, a consumer at x_U will be indifferent to buying from either store if x_U satisfies

$$p_{i1} + p_{i2}^e + x_U z = p_{k1} + p_{k2}^e + \left[\frac{1}{n} - x_U\right] z, \qquad (3.2.6)$$

or alternatively,

$$x_U = \frac{p_{k1} + p_{k2}^e - p_{i1} - p_{i2}^e + \frac{z}{n}}{2z}, \qquad (3.2.7)$$

where $p_{\cdot 2}^e$ is the expectation of price for product 2 and is possibly a function of $p_{\cdot 1}$. Note the key difference between x_I^* and x_U caused by this information asymmetry: while x_I^* depends on the price bundles offered by both of the firms, x_U depends only on prices of product 1, the advertised prices. The uninformed type will base their store-selection decisions on observed prices. Unobserved prices of product 2 play no role in attracting uninformed consumers.

Next consider firms' pricing decisions in Stage 2. In this stage, firms choose prices for product 2 and uninformed consumers form expectations about prices. Any informed consumer located to the left of x_I^* and any uninformed consumer located to the left of x_U will buy one unit of product 2 from firm i. It is therefore straightforward to derive firm i's demand for product 2, which is given by $\theta x_I^* + (1-\theta)x_U$. A profit-maximizing firm solves

$$\max_{p_{i2}} \left[\theta x_I^* + (1-\theta)x_U\right] p_{i2} \qquad (3.2.8)$$

and the first order condition is

$$\theta p_{i2} \cdot \frac{\partial x_I^*}{\partial p_{i2}} + \theta x_I^* + (1-\theta) x_U = 0, \tag{3.2.9}$$

which implies

$$p_{i2} = \frac{p_{k1} + p_{k2} - p_{i1}}{2} + \frac{z}{2n} + \frac{1-\theta}{\theta} z x_U. \tag{3.2.10}$$

Similarly, for the neighboring firm k we have:

$$p_{k2} = \frac{p_{i1} + p_{i2} - p_{k1}}{2} + \frac{z}{2n} + \frac{1-\theta}{\theta} z \left[\frac{1}{n} - x_U\right]. \tag{3.2.11}$$

Given the above two best-response functions we can solve the optimal p_{i2} and p_{k2} as a function of advertised prices in Stage 2, that is,

$$p_{i2} = \frac{p_{k1} - p_{i1}}{3} + \frac{2+\theta}{3\theta} \cdot \frac{z}{n} + \frac{2(1-\theta)}{3\theta} \cdot z x_U \tag{3.2.12}$$

and

$$p_{k2} = \frac{p_{i1} - p_{k1}}{3} + \frac{2+\theta}{3\theta} \cdot \frac{z}{n} + \frac{2(1-\theta)}{3\theta} \cdot z \left[\frac{1}{n} - x_U\right]. \tag{3.2.13}$$

It is clear that p_{i2} and p_{k2} will depend on both rival's advertised prices and their own advertised prices. Note how this differs from results shown in Lal and Matutes (1994). In their model, all consumers are of the uninformed type, i.e., $\theta = 0$. If that is the case, the profit function in (3.2.8) is linear in p_{i2}. Hence the optimal price for product 2 will be set at the reservation price R, independent of advertised prices. Intuitively, when consumers have to incur a positive travel cost to visit stores, firms can charge a monopoly price on the unadvertised product−−the logic behind which can be traced back to Diamond (1971). However, in our current setting, the presence of informed consumers will induce competition between firms fighting for demand from the informed type, even though firms still possess some monopoly power on uninformed consumers. As a result, firms have to set p_{i2} by taking rivals' pricing decision into account.

Uninformed consumers are assumed to be rational: that is, they will correctly forecast how prices would be set on product 2, and will make their shopping decisions on the basis of their forecasts. Hence $p_{i2}^e = p_{i2}$ and $p_{k2}^e = p_{k2}$. These forecasts of prices, in turn, will determine, through (3.2.6), the location of the uninformed consumer who is indifferent to visiting either of two stores:

$$x_U^* = \frac{\theta(p_{k1} - p_{i1}) + (2+\theta)\frac{z}{n}}{2(2+\theta)z}. \tag{3.2.14}$$

The above equation confirms that demand from the uninformed will exclusively depend on advertised prices from neighboring firms.

In Stage 1, firm i sets the price of advertised product, p_{i1}, anticipating what happens in the following stages. Firm i chooses optimal p_{i1} to maximize total profits:

$$\pi \equiv \max_{p_{i1}} [\theta x_I^* + (1-\theta)x_U^*](p_{i1} + p_{i2}). \tag{3.2.15}$$

The first order condition is

$$\left[\theta\frac{\partial x_I^*}{\partial p_{i1}} + (1-\theta)\frac{\partial x_U^*}{\partial p_{i1}}\right](p_{i1}+p_{i2}) + [\theta x_I^* + (1-\theta)x_U^*]\left(1+\frac{\partial p_{i2}}{\partial p_{i1}}\right) = 0. \tag{3.2.16}$$

We will focus on the pure-strategy symmetric equilibria of this game. After the conditions in (3.2.3) are imposed, the f.o.c. becomes

$$\left[-\frac{\theta}{2z} - \frac{(1-\theta)}{2z}\frac{\theta}{2+\theta}\right](p_{i1}+p_{i2}) + \left[\frac{\theta}{2n} + \frac{1-\theta}{2n}\right]\left[\frac{2}{3} - \frac{1-\theta}{3(2+\theta)}\right] = 0, \tag{3.2.17}$$

which can be further simplified to

$$p_{i1} + p_{i2} = \frac{1+\theta}{3\theta}\cdot\frac{z}{n} > 0. \tag{3.2.18}$$

p_{i2} is determined through (3.2.12) by imposing symmetric conditions, i.e.,

$$p_{i2} = \frac{1}{\theta}\cdot\frac{z}{n} > 0, \tag{3.2.19}$$

and so

$$p_{i1} = \frac{\theta-2}{3\theta}\cdot\frac{z}{n} < 0. \tag{3.2.20}$$

Several observations follow. First, the advertised price, p_{i1}, is priced below cost; hence, product 1 is often labelled as "loss leader" in the marketing literature. Second, although firms incur a pure loss by selling the advertised product, they make positive profits on the product bundle ($p_{i1} + p_{i2} > 0$). Third, if the unit travel cost is equal to zero, then this game is reduced to a Betrand price game with perfect information (because the uninformed consumers can now visit all stores to collect price information before they make their purchase decisions). As a result, p_{i1} and p_{i2} would be set equal to marginal cost ($= 0$). Of particular interest to this chapter are the simple comparative statics that the model generates, and they will be taken to the data for testing in the following sections.

Remark $\frac{\partial p_{i1}}{\partial n} > 0$ and $\frac{\partial p_{i2}}{\partial n} < 0$. This is to say, if a merger reduces the number of firms in the market, the model predicts a further price decrease on the "loss-leader" product and a further price increase on the unadvertised product. Note that the after-merger price drop of the unadvertised product is not a result of efficiency gains, as classical merger theory would argue, because no change of marginal cost is assumed before and after the merger. Instead, this is a result of strategic pricing of multiproduct firms: compared with the single-product environment, multiproduct firms have more freedom on price setting. For instance, they can afford to lose money on some products while earning more profit margins on others. What is consistent with classic merger analysis is that overall profit from selling the basket will still increase after the merger as a result of increased market power ($\frac{\partial \pi}{\partial n} < 0$).

As in Lal and Matutes (1994), firms use advertisement in this model to guarantee a low price for (uninformed) consumers. Once they arrive in stores, firms can execute some monopoly power on unadvertised products. An acquisition eliminating a competitor from the market will result in higher demand for incumbent firms. This provides incentives for firms to further cut loss-leader prices to retain and compete for store traffic, so that they can charge higher unadvertised prices and thus generate higher post-merger overall profit.

3.3 Market and Data Description

Supermarket pricing is complicated because of its multiproduct nature. Retailers face the profit-maximizing problem over a large number of products, and it is essential to use marketing strategies to generate high store traffic. Two major pricing formats have been discussed in the marketing literature: "High-Low Pricing" (H-L) and "Everyday Low Pricing" (EDLP), where the former refers to the charging of higher prices on an everyday basis with frequent temporary price cuts and the latter refers to the charging of a lower and constant everyday price. While H-L pricing is designed to attract price-sensitive consumers through frequent promotions, EDLP aims to retain a loyal consumer base by earning a lower profit margin. Most supermarkets fall into one of these two pricing categories.

This chapter studies the supermarket industry of Madison WI, an area dominated by several grocery chains owned by different national or regional supermarket operators. Unlike those conventional small grocers, which mainly serve their neighborhood markets and charge higher prices for their convenience, supermarket chains usually operate at multiple locations in the market and conduct pricing at a chain-wide level.

Table 3.1: Characteristics of Supermarket Chains in Madison, WI

SUPERMARKET CHAINS	K	S	C	U	W
Chain Type	National	Regional	Regional	National	Regional
Number of Stores	8	4	2	3	2
Sales Area (square feet)	222,100	88,300	88,800	127,400	203,000
Weekly Sales (per store)	$230K	$285K	$690K	$441K	$1,950K
Market Share (%)	10.38	8.92	12.81	9.49	27.91
Advertising: Weekly Fliers	Yes	Yes	Yes	Few	No
Advertising: In-store Display	Few	Yes	Yes	Few	Few
Pricing Format	H-L	H-L	H-L	−−	EDLP

Source: Dakota Worldwide Corporation, *Natural Foods Propensity Study: Madison Wisconsin, May 2003.*

The major players in the Madison market are Kohl's Food Stores Inc., Sentry Foods, Copps Corporation, Cub Foods, and Woodman's, each of which runs a number of stores spread through the city. For ease of description, we label them as "Chain K," "Chain S," "Chain C," "Chain U," and "Chain W" respectively hereafter. These five chains, with their 19 stores as of March 2003, accounted for roughly 70% of the market share. The weekly dollar sales in Madison WI were estimated to be $10.7 million, with an average per capita weekly food expenditure of roughly $34. All other grocery facilities have a market share of less than 3%.[3]

Table 3.1 provides a more detailed description for these five chains. Two pricing categories emerge. Chain W is clearly a chain with EDLP pricing. It operates two "superstores" which almost double the size and sales volume of any other stores in the market. It carries out significantly fewer promotional activities, and a brief look at its food prices reveals significantly smaller price fluctuations. Conversations with industry experts and analysis of our mean data (see chapter 1) confirm that Chain W is a low-priced chain. Not surprisingly, Woodman's is also leads in market share. Chain U is

[3]Dakota Worldwide Corporation, *Natural Foods Propensity Study: Madison Wisconsin, May 2003*

the second-lowest priced chain and offers infrequent promotions. On the other hand, each of the remaining supermarket chains (K, S, C) maintain around 10% shares of the market. They are comparable in their sizes and weekly sales, and they all use “High-Low” promotional strategies to stimulate sales. These observations suggest a likely market segmentation with Chain W (and possibly Chain U) serving a lower end of the consumer base. At the same time, one would expect a higher degree of competition among H-L pricing chains.

Chain K, S and C all routinely use advertising for promotional purposes, largely taking the form of weekly “features” and in-store “displays.” Supermarket chains are usually presented with a significant amount of trade deals and discounts offered by manufacturers hoping that their products get advertised on fliers each week. However, chains remain independent on their advertising decisions. Only a very small fraction of those products will be eventually put on the weekly fliers sent to a large number of consumers. And how much discount to pass to consumers is at the sole discretion of each chain. Typically a chain will advertise 30-50 food products on fliers and on their individual web sites. Once advertised, prices are usually valid for one week and guaranteed in all local stores. This type of advertising plays important roles in competition for market shares. Fliers from different chains are inserted in one local shopper guide and distributed to a large number of households for free. This way, a direct price comparison from shoppers could be immediate. As a result, “features” are most effective in incurring customer migration across chains. Another type of frequently used form of promotion is in-store "displays." Its main function is to provide a valuable guide to consumers' shopping upon their arrival at a certain store. Unlike "feature" advertising, price information that is "displayed" will not reach consumers until they physically visit a store.

3.3.1 Data and Descriptive Statistics

Our first set of data was collected in Madison WI shortly after we learned the news of the upcoming acquisition. We carefully planned a list of more than 40 branded grocery items including fresh produce, canned foods and soft drinks, most of which are leading national branded products in their respective food categories. Each item can be uniquely identified by brand and size (e.g., a 2-liter bottle of Mountain Dew) or by a UPC (Universal Product Code). Shelf prices for each item in our sample were recorded by physically visiting each store on a weekly basis. The data were collected with the assistance of the University of Wisconsin Survey Center from March 24th to September 14th 2003, a period of 25 weeks. Therefore the data cover three phases of the acquisition event: the five-week pre-acquisition period, Chain K's five-week closure period, and the fifteen-week post-acquisition period. At the same time, we obtained all weekly fliers from each chain. Advertising information was then coded into a dummy variable of our data if an item in our sample was advertised by a flier. If an item was displayed in a particular chain in a particular week, this information was recorded and coded as well. Prices advertised from a particular chain's flier were typically valid at all of its local supermarkets from the first day of a week through the weekend. Prices of unadvertised items, according to

Table 3.2: Summary Statistics: Average Prices and Promotion Frequency

Product: Brand (Size)	$\overline{P}_K$	$\overline{P}_S$	$\overline{P}_C$	$\overline{P}_U$	$\overline{P}_W$	Flier Freq.	Display Freq.
Most-Advertised Products							
Bacon: Oscar Mayer Heavy Thick Cut (1 lb)	4.13	4.55	4.24	4.25	3.06	8.0 %	10.0 %
Tuna: Starkist Spring Water Chunk Light (6 oz can)	0.75	0.63	0.55	0.47	0.52	10.6 %	4.0 %
Sugar: *C&H* (4 lb)	2.19	1.76	1.64	1.71	1.59	8.0 %	20.0 %
Cereal: Cheerios Honey Nut Whole Grain (20 oz box)	4.19	4.20	3.83	3.75	3.27	10.6 %	10.0 %
Cookie: Oreo (15 oz)	3.26	3.31	3.12	2.68	2.51	10.6 %	28.0 %
Orange Juice: Florida's Natural (1/2 gallon)	2.84	3.03	2.76	2.52	2.48	20.0 %	24.0 %
Salad Dressing: Kraft Ranch Low Fat (16 oz bottle)	2.89	2.70	2.64	2.65	1.87	14.7 %	16.0 %
Ketchup: Heinz (24 oz bottle)	1.75	1.50	1.41	1.54	1.32	12.0 %	14.0 %
Soda: Coca-Cola (12 cans)	3.28	3.11	3.35	3.18	3.32	41.3 %	46.0 %
Ice Cream: Breyer's Vanilla (1/2 gallon)	5.09	5.39	4.59	3.84	3.49	16.0 %	30.0 %
Least-Advertised Products							
Cheese: Kraft American Single (24 slices)	3.84	3.81	3.48	3.50	2.98	0.0 %	16.0 %
Pasta: Creamette (1 lb box)	1.39	1.21	1.11	0.96	1.04	0.0 %	4.0 %
Peanut Butter: Skippy Creamy (10 oz can)	2.27	2.12	1.66	1.91	1.69	1.3 %	14.0 %
Cereal: Kellogs Corn Flakes (24 oz box)	4.25	3.55	3.37	3.29	2.71	1.3 %	2.0 %
Corn Oil: Mazola (48 oz bottle)	2.84	3.27	2.95	3.05	2.81	0.0 %	8.0 %
Soup: Progresso Chicken Noodle (19 oz can)	2.14	2.06	1.91	1.95	1.90	1.3 %	4.0 %
Salad Dressing: Wishbone Italian (16 oz bottle)	2.77	2.60	2.49	1.81	2.19	1.3 %	12.0 %
Frozen Pie: Sara Lee Cherry Pie (37 oz)	4.34	4.80	4.71	4.72	4.32	0.0 %	2.0 %
Soda: Mountain Dew (2 liter bottle)	1.24	1.49	1.28	1.17	0.99	1.3 %	22.0 %
Dog Food: Purina Dog Chow (8.8 lb bag)	6.39	6.20	5.55	5.74	5.79	0.0 %	0.0 %

1. This table reports average prices of different products by chain, with $\overline{P}_i$ referring to average price level at chain i.
2. Flier frequency is calculated on the basis of observations from all chains that sent out weekly fliers. It is defined as the proportion of weeks an item was advertised in a flier.
3. Display frequency is calculated on the basis of observations from only Chain S and Chain C because other chains used very few in-store displays. It is calculated as the proportion of weeks an item was displayed in a chain.

our experience, did not change on a day-by-day basis. Hence, we believe that our weekly data captured most price variations (if there was any) during the sample periods.

Of interest to the research in this chapter is a subset of items in the data: those most-advertised products and those least-advertised products. As chains price (and advertise) items uniformly in all their local supermarkets, we essentially generate individual price series with 25 observations for each specific item of each chain in our sample period. Table 3.2 lists detailed product information and reports average price levels of different products by chain. It confirms that some consistent price differentials remain among chains. Chain W is priced significantly lower than other players in the market. The top ten most- and least-advertised products were selected according to how frequently they were “featured” on weekly fliers. In-store “displays,” whose advertising timings can differ from those of “features,” seem to be used more often and more widely.

The nice features of the data are that they cover three phases of an acquisition event and that they provide pricing and advertising information for both acquiring and non-acquiring chains. Therefore, the data facilitate a direct comparison of price change before and after the acquisition, and of price differentials among chains in different periods. It is well documented that many grocery items have seasonal demand patterns and that prices tend to move counter-cyclically.[4] In our sampling periods, four major holidays were observed: Easter, Memorial Day, July 4th, and Labor Day. Aggregate demand during holidays will be higher than usual. Therefore, it is also reasonable to expect that individual items could also have periodic and systematic change in demands at certain times of the year. These aggregate and idiosyncratic seasonal patterns in turn will be likely to affect supermarket pricing decisions. If demand changes happened to have the same timing as the acquisition event, then a prima-facia price change cannot be safely concluded as an acquisition effect. Because quantity information and cost information were not available, we cannot directly attribute a price change to an acquisition effect. For example, a price increase of a “39 oz can of Folgers coffee” after the acquisition might not be a result of increased market power; instead, it might be the result of a coincidental cost increase for coffee during the post-acquisition period, possibly an exogenous negative supply-side shock (e.g., bad weather). To effectively address this kind of problem, we

[4]See, for example, Warner and Barsky (1995).

Table 3.3: Data Structure and Variable Definitions

Market	Data Structure			Variable Definition	
	Phase I	Phase II	Phase III	Variables	Definition
Madison Area	M1	M2	M3	P_{ijt}^{MA}	Price of item i in chain j at week t
				$A_{ijt} = 1$	if chain j advertised item i at week t
				$A_{ijt} = 0$	if otherwise
Green Bay Area	G1	G2	G3	DS_{it}, DS_{ct}	Dollar sales of item i (food category c) at week t
				VS_{it}, VS_{ct}	Volume sales of item i (food category c) at week t
				P_{it}^{GB}, P_{ct}^{GB}	Weighted avg. price of item i (category c) at week t

1. Dollar Sales = Retail Price × Unit Sales. *Unit sales* is defined as the number of physical packages scanned regardless of size. For example, if three 10 oz. cans of Campbell's soup are sold at \$1/each and two 16 oz. cans of Campbell's soup are sold at \$1.5/each, total unit sales are 5. Dollar Sales = $1 \times 3 + 1.5 \times 2$.
2. Volume Sales = (Product Volume/Category Volume Equivalency) × No. Units Sold. Category Volume Equivalency is predetermined and standard for each individual category. In the above example, suppose volume equivalency for Campbell's soups is 16 oz. can; then Volume Sales = (10 oz/16 oz) × 3 + (16 oz/16 oz) × 2.
3. Weighted Average Prices Per Volume = Dollar Sales/Volume Sales.
4. P_{ijt}^{MA} is standardized price using category volume equivalency so that prices in both of the markets are per volume prices.

obtained similar data covering the same time period for Green Bay, WI. These data were used to control for cost and seasonal variations during our sampling periods in Madison, WI.

The control group consisted of weekly scanner data collected by IRI in the Green Bay WI market area. Each food item in our sample was uniquely identified by its UPC, and relevant weekly information was then pulled from the IRI database accordingly from March to September 2003, exactly the same 25-week period covered by the Madison area data. For each item *and* for its respective food categories, variables in the Green Bay data include weekly dollar sales, volume sales and weighted average price per volume. Table 3.3 provides variable definitions and data structure in Madison and Green Bay markets. The notation is self-explanatory, with "M1," for example, indicating data collected in the Madison market during phase I. It is worth noting that IRI was able to provide only market-level (rather than chain-level) information for the Green Bay market owing to confidentiality concerns. For example, let P_{ijt}^{MA} denote price of product i charged in chain j during the week t in the Madison market. Then the best match available in the Green Bay market would be P_{it}^{GB}, a weighted average price across major supermarket chains for product i during week t. Nevertheless, there are several reasons to believe why the Green Bay market could served as a reasonable control group for this study. First, population demographics are very close in these two markets. Although the absolute population in the IRI-defined Green Bay market[5] is larger than that in Madison WI, both markets have similar ethnicity compositions, household size, and so on. So similar seasonal activities are expected. Second, almost all supermarket chains (except Chain K) in our sample operate stores in both of the market areas, where they face the same state policies and regulations. This similarity is likely to result in a similar cost structure and competitive environment in both of the markets. Third and most important, to the best of our knowledge there were no other merger and acquisition events or other city-wide shocks in either sample. As a result, we believe price or promotion changes in the Madison market, relative to the control market, can be confidently attributed to the acquisition event.

3.3.2 Testable Implications

It is useful to justify why the Madison data and the acquisition event would be reasonably good for the testing of the model predictions. First, chains that sent out weekly fliers

[5]The IRI-defined Green Bay market includes the City of Green Bay and several surrounding counties. The Madison market includes only the City of Madison.

had close market shares (around 10% each, see Table 3.1) and adopted similar pricing and promotion formats before the acquisition, and so it is reasonable to think of them as symmetric firms. Second, each chain differs in some degree in their service, shopping environments, and so forth. So it is suitable to characterize them as differentiated products in a product space. Price differentials are significant among chains, and hence we should expect more competition for adjacent chains in the "price ladder"−−this justifies the idea of "localized competition" typical of a spatial model. It is worth pointing out that our theory implicitly assume that the merging firm does not differ from other firms. In the post-merger symmetric equilibrium, no firm is "larger" than others as a result of merging, and firms will split the market equally both before and after the merger. The assumption of symmetry implies that all firms respond to the acquisition event in the same way. While the theory is constructed to be analytically tractable, it would be possible to break down the symmetry assumption as a result of the merger[6] However, such a step would not alter the comparative statics. On the other hand, we can reinterpret this by defining firms according to their degree of differentiation. In other words, how many stores each firm operates is irrelevant if all stores adopt uniform pricing and provide same-quality products and services. In the data, the exit of Chain K amounted to the elimination of one product variety from the market, so the number of firms was reduced in phase 2 and phase 3. In phase 3, Chain C opened former Chain K's stores under its banner, and priced them the same as other Chain C's stores. In the concept of

[6] For a related analysis in a single-product case, see Levy and Reitzes (1992).

the model, this did not increase the number of firms in the market in phase 3 (compared with phase 2) because no new product variety was offered.

The above argument, therefore, does not distinguish phase 2 from phase 3. This may result in the loss of some insights on how prices will change in these two phases. After all, because all Chain K's eight stores were closed in phase 2, one would expect that incumbent firms would have faced larger demand increase than in phase 3. If this is the case, applying the loss-leader logic would lead us to conclude that prices of unadvertised products would go even higher and that loss-leader prices would drop even further in phase 2 than in phase 3. As we shall see shortly, this pattern is evident in the data. Keeping all these discussions in mind and assuming that the acquisition did not change firms' pricing strategy, we have the following testable implications.

Implication 1: Everything else equal, the average price level of advertised products should be lower during Chain K's closure and post-acquisition periods.

Implication 2: Everything else equal, the average price level of unadvertised products should be higher during Chain K's closure and post-acquisition periods.

3.4 Empirical Evidence

There are several empirical issues that need to be clarified before we proceed. First, we needed to define a selection criteria for determining the most- and least-advertised products. One concern was that an item frequently advertised in one chain was not necessarily the one that other chains used to attract consumers. In different sampling periods, different chains may focus on a different set of products for advertisement. Therefore, we used two criteria to define a candidate for most-advertised products. To be selected, a product must be: (1) advertised at least once by each chain that sends out fliers; and (2) advertised in weekly fliers at least once in each sampling period. The first criterion means that this study focuses chiefly on those items that were possibly in the "crossfire" of different chains. The second criterion aims to guarantee some minimum consistency of the definition across periods. We then selected as "loss leaders" 10 products that survived the above two qualifications and that were also most advertised (see Table 3.2). Least-advertised products are identified as those that were seldom or never advertised by any chain during the sampling periods.

Second, we relied on data drawn from two chains to test the model predictions: Chain C, the acquiring chain, and Chain S, the non-acquiring chain. The reason is straightforward. The two aforementioned chains are close both strategically (i.e. they are similar in that they practice high-low pricing and use similar advertising mechanisms) and they compete in close geographic proximity throughout Madison. (see Figure 1.1). As a result, they constitute a natural pair for use in testing of the model. Furthermore, as Table 3.2 shows, Chain S's and Chain C's average price levels are also close and that each of them had similar market shares before the acquisition. On the other hand, Chain W, is unlikely to adopt loss-leader pricing. Its price information, however, could provide some measure of costs. This information will be used when appropriate. Chain U, which claims itself to be the "low price leader," is the second lowest-priced chain in our sample (see Table 3.2). It also utilizes significantly fewer in-store "displays," so it is questionable whether it competed with Chain C or Chain S for the same set of consumers.[7] To minimize the possible noises from misclassifying we focus on Chain C and Chain S in the following sections.

3.4.1 Pre- and Post-acquisition Average Price Change

The first level of analysis is a direct comparison of pre- and post-acquisition price levels. As mentioned earlier, we control for possible contemporaneous factors in the Madison market by using a set of control prices in Green Bay area. Assuming that items sold in the Green Bay area were reflecting seasonal patterns similar to those sold in the Madison area and their wholesale cost structure was also close to that of the Madison market, then a "difference-in-difference" approach can be adopted for an evaluation of the acquisition effect. Specifically, we plan to sign

$$\triangle_{21} = (M_2 - G_2) - (M_1 - G_1) \quad and \quad \triangle_{31} = (M_3 - G_3) - (M_1 - G_1). \tag{3.4.1}$$

Empirically, the following regression is estimated at the product level:

$$log(P_{ijt}^{MA}) - log(P_{it}^{GB}) = \alpha_1 + \alpha_2 \times D_2 + \alpha_3 \times D_3 + \epsilon_{ijt}, \tag{3.4.2}$$

[7]Majority of Chain U's fliers were actually sent out on a bi-weekly basis.

where D_2 and D_3 are dummy variables for the second and third phases during our sampling period (see Table 3.4).

The result shows dramatically different patterns for those most-advertised products and those least-advertised products after the Green Bay data were used as controls. For those items designed as "loss-leaders," none was priced higher after the acquisition. In fact, the data show a dramatic price drop for bacon, tuna, and sugar, and this pattern is found in both Chain S and Chain C. However, other than sugar's price decline in phase 3, Chain S maintained much steeper price declines. Cereal and cookie in Chain S and ketchup, soda (Coca-Cola), and ice cream in Chain C all show the expected negative signs, although they are not statistically significant. For other products, no significant price change was discovered. Because the data have a relatively short duration, we also a estimated the model based on pooled data and including an item-specific fixed effect. These results appear in the last two rows of Table 3.4. The second-to-the-last row reports results where the Green Bay data were not used as controls (i.e., the dependent variable is simply $log(P_{ijt}^{MA})$), and the last row reports results with controls. They confirm that Chain S' average price level for those most-advertised products dropped a significant 10% during Chain K's closure period and 5% in the post-acquisition phase compared with pre-acquisition price levels. Price cuts in Chain C smaller and not significant, yet a tendency of price drop is evident. This result stands against classical merger analysis, which usually suggests price increases when there are fewer competitors in the market. It is, however, consistent with a loss-leader explanation. The key is that firms use advertised products

Table 3.4: Pre- and Post-acquisition Average Price Change in Chain S and C

Most-advertised Item	Chain S $\triangle_{21}^{S}$	Chain S $\triangle_{31}^{S}$	Chain C $\triangle_{21}^{C}$	Chain C $\triangle_{31}^{C}$	Least-advertised Item	Chain S $\triangle_{21}^{S}$	Chain S $\triangle_{31}^{S}$	Chain C $\triangle_{21}^{C}$	Chain C $\triangle_{31}^{C}$
Bacon	−0.259**	−0.207*	−0.096*	−0.078*	Cheese	0.092*	0.045	0.075	−0.020
(Oscar Mayer)	(0.129)	(0.105)	(0.051)	(0.043)	(Kraft)	(0.051)	(0.040)	(0.099)	(0.084)
Tuna	−0.458**	−0.498**	−0.331**	−0.325**	Pasta	0.031	−0.048	0.269**	0.065
(Starkist)	(0.127)	(0.107)	(0.141)	(0.118)	(Creamette)	(0.085)	(0.069)	(0.092)	(0.077)
Sugar	−0.299**	−0.070	−0.096	−0.174*	Peanut Butter	0.233**	0.114*	0.095**	−0.001
(C&H)	(0.072)	(0.059)	(0.110)	(0.092)	(Skippy Creamy)	(0.077)	(0.063)	(0.022)	(0.018)
Cereal	−0.167	−0.051	−0.079	0.095	Cereal	0.099**	0.046	0.035	0.030
(Cheerios)	(0.149)	(0.122)	(0.166)	(0.139)	(Kellogs)	(0.040)	(0.032)	(0.032)	(0.026)
Cookie	0.001	−0.040	0.031	0.092	Corn Oil	−0.002	0.052**	−0.026	0.004
(Oreo)	(0.090)	(0.073)	(0.126)	(0.106)	(Mazola)	(0.022)	(0.018)	(0.033)	(0.028)
Orange Juice	0.011	0.096	0.043	0.072	Soup	0.161*	0.134*	0.004	0.065
(Florida's Natural)	(0.142)	(0.109)	(0.163)	(0.136)	(Progresso)	(0.085)	(0.069)	(0.083)	(0.070)
Salad Dressing	0.005	0.012	0.045	0.054	Salad Dressing	0.137*	0.184**	0.037	0.091
(Kraft)	(0.094)	(0.076)	(0.094)	(0.079)	(Wishbone)	(0.069)	(0.056)	(0.100)	(0.083)
Ketchup	0.001	0.024	−0.047	−0.096	Frozen Pie	0.062	0.081	0.014	0.022
(Heinz)	(0.105)	(0.085)	(0.147)	(0.124)	(Sara Lee)	(0.072)	(0.056)	(0.076)	(0.063)
Soda	0.034	0.104	−0.078	−0.117	Soda	0.111**	0.046**	−0.047	−0.006
(Coca-Cola)	(0.131)	(0.101)	(0.122)	(0.102)	(Mountain Dew)	(0.027)	(0.021)	(0.131)	(0.109)
Ice Cream	−0.011	0.051	−0.047	−0.096	Dog Food	0.022**	0.017**	0.023**	0.013*
(Breyer's)	(0.093)	(0.072)	(0.147)	(0.124)	(Purina)	(0.010)	(0.008)	(0.009)	(0.007)
Overall	−0.040	−0.005	0.008	0.007	Overall	0.047**	0.044**	0.001	−0.020
(w/o control)	(0.029)	(0.023)	(0.028)	(0.033)	(w/o control)	(0.016)	(0.013)	(0.021)	(0.018)
Overall	−0.100**	−0.051*	−0.060	−0.046	Overall	0.095**	0.067**	0.048**	0.002
(w/ control)	(0.038)	(0.030)	(0.039)	(0.033)	(w/ control)	(0.019)	(0.015)	(0.025)	(0.021)

1. Dependent variable: $log(P_{ijt}^{MA}) - log(P_{it}^{GB})$. Prices collected in Madison WI were normalized with predetermined category volume equivalency such that they are comparable with the Green Bay WI data .
2. Standard errors are in parentheses. Coefficients highlighted with ** are significant at the 5% level. Coefficients highlighted with * are significant at the 10% level.
3. I estimated the overall price change by including an item-specific fixed effect.

primarily to improve store traffic by committing to a low price. Only when (uninformed) consumers are attracted to visit their stores can chains execute their monopoly power on unadvertised product. After a firm (or a product variety) is eliminated from the market, incumbent firms will have incentives to further lower advertised prices to capture the residual demand so that higher price could be charged on unadvertised products.

The second part of Table 3.4 shows price changes for those items seldom advertised. In sharp contrast to loss-leaders' prices, 8 out of 10 least-advertised products in Chain S experienced a statistically significant price increase, ranging from 2% to 23% during phase 2 and phase 3. Chain C essentially shows similar patterns. However, the price changes are less dramatic and not statistically significant as often compared to Chain S. When the model was estimated using pooled data, the overall price level for those rarely advertised products went up by 9.5% in Chain S and 4.8% in Chain C during Chain K's closure period. As the results make clear, post-acquisition prices of unadvertised products were driven up by higher post-acquisition demand (from both informed and uninformed consumers). Hence, the price increase on those least-advertised products again is consistent with the model predictions. It is also interesting to note that merging (Chain C) and non-merging (Chain S) firms behaved in a similar manner both before and after the acquisition event. Both firms raised the price of unadvertised products and dropped loss-leader prices even lower in response to a higher-demand state in phase 2 than in phase 3.

The results underscore critically the importance of introducing a control group.

Recalling from chapter 2, failure to include the Green Bay control would have generated a type-I error in interpreting the acquisition price effects. In this chapter, the errors introduced are quite different but important. For the most advertised products, we observe a type II error for Chain S for both phase 2 and 3 and significantly different results for both chains in both phases. For the least advertised product, we observe a type-II error for Chain C in phase 2 and significantly different results for both chains in both phases. These findings suggest strongly that anecdotal evidence of price changes after a merger are highly untrustworthy and lead to erroneous results.

To further check the robustness of the results, we replaced Green Bay as the control group with the lowest-priced chain (Chain W) in the Madison market. In other words, we put the prices from Chain W on the right-hand side of equation 3.4.2) and reran the regression. The results were almost identical to those reported in Table 3.4. The findings here suggest that Chain W in Madison did not view the merger as much of a threat to it market position and simply stayed the course as being the lowest price competitor in the market. The result points to a highly segmented market across retail grocery product space. Antitrust authorities should be aware that supercenter formats such as Wal-Mart may not be much of a force to entice competition in spatial supermarket oligopolies.

What happened to other chains (e.g., Chain W) in the market? If the price patterns we observed for Chain C and Chain S also exist for those chains which did not use the "loss-leader" pricing, then it is an indication that the heterogeneous price movement could have been caused by some common unobservable factors, rather as a

Table 3.5: Pre- and Post-acquisition Average Price Change in Chain W and U

Most-advertised Item	Chain U $\triangle_{21}^{U}$	Chain U $\triangle_{31}^{U}$	Chain W $\triangle_{21}^{W}$	Chain W $\triangle_{31}^{W}$	Least-advertised Item	Chain U $\triangle_{21}^{U}$	Chain U $\triangle_{31}^{U}$	Chain W $\triangle_{21}^{W}$	Chain W $\triangle_{31}^{W}$
Overall	0.065**	0.046**	0.014	0.011	Overall	−0.057**	−0.020	0.003	0.064**
(w/o control)	(0.026)	(0.022)	(0.012)	(0.010)	(w/o control)	(0.017)	(0.019)	(0.018)	(0.015)
Overall	0.003	−0.001	−0.005	−0.040	Overall	−0.010	0.002	0.049**	0.087**
(w/ control)	(0.031)	(0.026)	(0.032)	(0.028)	(w/ control)	(0.022)	(0.018)	(0.025)	(0.020)

1. Dependent variable: $log(P_{ijt}^{MA}) - log(P_{it}^{GB})$. Prices collected in Madison WI were normalized with predetermined category volume equivalency such that they are comparable with Green Bay, WI data .
2. Standard errors are in parentheses. Coefficients highlighted with ** are significant at the 5% level. Coefficients highlighted with * are significant at the 10% level.
3. Overall price change was estimated by including item-specific fixed effect.

result of strategic pricing. For this reason, I checked pre- and post-acquisition price changes in Chain W, the chain which was least likely to adopt the loss-leader pricing strategy (as shown in Table 3.1). The results were reported in Table 3.5. The pattern of price drops on those most-advertised products in Chain C and Chain S essentially disappears in Chain W.[8] The results seem to point to that loss-leader pricing was the driving force which generated the post-acquisition pricing difference between "H-L" and "EDLP" chains.

3.4.2 Changes in "Featured" Prices and "Displayed" Prices

It is worth pointing out that the above analysis compares *average* price levels in three different time periods. It is frequently observed that items are priced at a "regular" level most of the time and that a temporary price cut is observed when they are put on sales (High-Low pricing). After all, in the data, even the most advertised product, Coca-Cola,

[8] That pattern also disappears in Chain U, which we are less certain about whether it adopted the loss-leader pricing strategy.

appeared only on fliers less than 50% of the time. So an average price drop could result from a drop in regular price, a further discount on advertised price, or a combination of both. The model emphasizes the role of advertising as a commitment device, by which firms can attract store traffic. If this is true, we should expect that advertised prices of those most-advertised products will be further lowered so that firms can compete for residual demand after the acquisition.

Conjecture 1: Everything else equal, the "featured" prices of those most-advertised products should be lower during Chain K's closure and post-acquisition periods.

Our data include information about two primary promotional forms used by supermarkets: "features" and in-store "displays." However, their functions are distinguished. Displays promote prices in store and are mainly designed to guide in-store consumer shopping. In contrast to "featured" advertising, consumers have no way to know prices in display until they arrive at a store. Therefore, displays do not affect consumers' store-picking decisions and play little role in attracting consumer shopping. A direct implication f this difference, in the framework of our loss-leader story, is that firms have no incentive to lower in-store displayed prices after the acquisition. This leads to another conjecture.

Conjecture 2: Everything else equal, "displayed" prices of those most-advertised

Table 3.6: Pre- and Post-acquisition Change in Advertised Prices

Promotional Form	Flier				Display			
	Chain S		Chain C		Chain S		Chain C	
Promotion	−0.304** (0.032)	−0.303** (0.033)	−0.289** (0.039)	−0.269** (0.042)	−0.274** (0.029)	−0.272** (0.031)	−0.407** (0.021)	−0.397** (0.022)
Promotion$\times D_2$	−0.108** (0.046)	−0.091** (0.047)	−0.039 (0.051)	−0.061 (0.055)	−0.069* (0.040)	−0.066 (0.043)	0.027 (0.026)	0.011 (0.028)
Promotion$\times D_3$	−0.070* (0.037)	−0.077** (0.038)	−0.058 (0.044)	−0.080* (0.045)	−0.012 (0.033)	−0.011 (0.036)	0.054** (0.022)	0.047* (0.025)
Linear Time Trend	−−	0.001 (0.003)	−−	0.006 (0.005)	−−	0.002 (0.004)	−−	0.001 (0.003)
Quadratic Time Trend	−−	−0.001 (0.001)	−−	−0.001 (0.001)	−−	−0.001 (0.001)	−−	0.001 (0.001)
Easter	−−	−0.050* (0.028)	−−	0.062 (0.039)	−−	−0.035 (0.031)	−−	0.037* (0.020)
Memorial Day	−−	−0.053** (0.020)	−−	0.014 (0.027)	−−	−0.021 (0.023)	−−	0.027* (0.014)
Independence Day	−−	0.011 (0.027)	−−	−0.031 (0.036)	−−	−0.014 (0.023)	−−	−0.009 (0.189)
Labor Day	−−	−0.002 (0.021)	−−	−0.035 (0.028)	−−	−0.028 (0.029)	−−	−0.023 (0.015)
Fixed Effect	*product*	*product*	*product*	*product*	*product*	*product*	*product*	*product*

1. Dependent variables are $log(P_{iSt}^{MA})$ and $log(P_{iCt}^{MA})$, i.e., prices in logs from chain S and chain C that were observed in the Madison market at time t for those most-advertised products.
2. Standard errors are in parentheses. Coefficients highlighted with ** are significant at the 5% level. Coefficients highlighted with * are significant at the 10% level.

products should not be lowered during Chain K's closure and post-acquisition periods.

To test these two conjectures, the following regression was run:

$$log(P_{ijt}^{MA}) = \beta_0 + \beta_1 Pro_{ijt} + \beta_2 Pro_{ijt} \times D_2 + \beta_3 Pro_{ijt} \times D_3 + \beta' \mathbf{X} + I_i + \epsilon_{ijt}, \quad (3.4.3)$$

where Pro_{ijt} is a dummy for promotion (of item i in chain j at time t), which can take the form of "feature" or "display." $\mathbf{X}$ includes a set of dummies that control for trend and seasonal variations. I include linear and quadratic time trends as well as dummies for the four major holidays in the regression. I_i is an item-specific fixed effect. The two conjectures imply that $\beta_2 < 0, \beta_3 < 0$ if promotion takes the form of "featured" advertising and that $\beta_2 \geq 0, \beta_3 \geq 0$ if promotional form is an in-store "display." Regressions were run for each promotional form and each chain. The results with and without controls for trend and seasonality are reported in Table 3.6.

It is not surprising that prices were much lower when in promotion. What is more interesting is that "featured" prices were further lowered by up to 10% in both of the chains after the acquisition. And the results are robust when we add trend and holiday dummies to the regression. This is consistent with our hypothesis that firms used "featured" prices to retain and compete for post-acquisition higher demand. In contrast, "displayed" prices showed no significant change in Chain S. In Chain C, prices in display even went up by 5% during the post-acquisition period. The logic is that firms did not use displayed prices to affect consumers' decisions as to where to shop. Displayed prices can be observed by consumers only after they incur a sunk cost to visit stores, and therefore firms have no incentive to further lower in-store displayed prices after acquisition.

Chapter 4

Summary and Concluding Remarks

Understanding and measuring the economic impact of mergers is an elusive practice for many important reasons. Most mergers involve spatial complexities associated with multiple markets with varying competitive dimensions. Defining market boundaries can be challenging. Oftentimes, there are complicating vertical and horizontal implications that might involve contractual arrangements, franchises/dealerships, or other business arrangements. Finally, the data to evaluate such mergers may not be available or its dimensions may not be suited to provide sufficient coverage of the key public policy issues. The research in this monograph represents a unique opportunity to examine a merger event that overcomes many of these issues. On February 25, 2003, the plans were made public for an acquisition event involving two supermarket chains in the small city of Madison, WI. Specifically, the announcement indicated that seven Kohl's stores would be sold to Roundy's Inc. Six would reopen under the Copps banner and one would be closed permanently. An eighth store owned by Kohl's would not be sold but would permanently close. At that time, Madison was serviced by five major supermarket chains in a typical pattern of spatially distributed stores located at convenient access points throughout the city. Also, each of the five chains had developed along various differentiated market strategies ranging from a low-priced warehouse format to higher-priced supermarkets with better service and ambience. After the merger, the old Kohl's stores were closed for renovations and reopened a month later under the Copps banner. Before this acquisition, Copps operated only two local stores. After the grand opening, Copps was operating eight stores and the Madison market had dropped from 19 stores to 17 stores.

Shortly after the merger announcement, we developed a list of branded grocery items that provided broad coverage of the typical supermarket food categories. Beginning in the last week of March, 2003, the FSRG began the process of manually price-checking each product in each supermarket and collecting all the promotion information distributed from each chain. The 2003 data collection ended in second week of September. The same collection procedures were conducted for the same weeks in 2005. A distinct feature of our data is that it allowed us to assemble price and promotion information for *all* major competitors in Madison's supermarket sector. While purchasing scanner data was an option, we would not have been allowed to report on individual firm behavior. Thus, with both pre- and post- merger information, the research provides empirical evidence of how *acquiring* and *non-acquiring* firms responded in the short- and long-run to a significant structural change in two primary strategic variables: price and advertising. To control for a wide range of potential demand and supply shocks, the price impacts of the merger were carefully controlled using same period and product prices in the Green Bay, Wisconsin market area. Our analysis is broken into four phases: I) pre-merger, II) Kohl's closure and renovation, III) grand-opening of new Copps stores, and IV) post-grand opening.

The promotion behavior of each competing firm was an important part of the research project. Supermarkets in Madison promote mainly through newspaper features or in-store displays. Both forms of promotion serve to reduce search costs. Of course, newspaper features compete to attract consumers to the store while in-store displays reinforce loyalty and provide a valuable guide to consumers' shopping upon their arrival at a certain store. Our study used the collected promotion materials to evaluate the responsiveness of each chain to each other's promotions and to look at the price patterns inherent in promoted versus non-promoted products.

There are several major findings from this study. We found little evidence of a merger-induced structural adjustment to short-run pricing. All supermarket chains reacted to the merger in a manner consistent with a long-run battle for market share rather than trying to extract rent through increased market power. This was most evident during a store closure phase in which the market dropped from 19 stores to 11. The evidence strongly suggests each chain viewed the demand shock in this phase as purely transitory in nature. On the other hand, the long-run (i.e., 2005) price effects suggest a permanent structural adjustment occurred in the Madison market. In particular, we found that by 2005, Copps had increased prices by significant levels, relative to the Green Bay market, in two of the three post-merger phases. As the map of Madison on page 10 shows, the two northeast Kohl's stores that were closed left Copps with an important strategic opportunity to raise prices without much competitive pressure. It seems that after the "dust settled" from the merger shock, Copps moved fairly quickly to establish higher prices. These short- and long-run results are quite consistent with a news article on November 7, 2003 in which a Roundy's spokesperson indicated that its Kohl's acquisitions had not yet delivered on increased anticipated profits and sales (Capital Times 2003).

On the issue of merger-induced promotion behavior, we looked at two issues. One was the timing of promotions in response to rival promotions during the post-merger phases. Our results suggest that chains were significantly more sensitive to rivals' "feature" promotions during the Kohl's closure period (phase II). Because "feature"-styled promotions are designed to increase store traffic, this result appears consistent with a battle for market share. Our analysis of "in-store" displays confirms this finding: there was no increased sensitivity to "in-store" promotion activity. We also analyzed the strategies associated with "loss-leader" pricing, a practice widely adopted in the supermarket industry. We found that, after controlling for seasonality and cost shocks, the average price level dropped for those most-advertised products ("loss leaders") and the average price level increased for those least-advertised products ("non-loss leaders") after the acquisition event. We argue that this post-merger asymmetric price movement was primarily due to strategic concerns rather than cost efficiencies associated with the merger.

While the results provide for very interesting conclusions, it is important to proceed with caution. In this light, our results are subject to two caveats. First, evidence shown here is subject to the challenge that this study uses short-duration data and restricted sample items. With longer time-series data (e.g., scanner data) before and after the acquisition, and with more complete product variety in the sample, a more thorough and accurate assessment of the acquisition event's price effect could be performed. At the present time, obtaining food retail scanner data has become quite easy, but reporting individual firm behavior in specific markets is strictly forbidden due to required nondisclosure agreements imposed by the data suppliers. Additionally, not all firms participate in developing food retail scanner databases. Most evident is the Wal-Mart chain. The question of controlled access to public prices is worthy of serious debate. If firms wish to participate in the food industry, perhaps some form of delayed public access to reportable data should be required of them. Certainly, governments need inexpensive ways to evaluate markets, and some form of internet reporting could be put into place. Second, our results depend on the assumption that the announcement of the acquisition event did not alter firms' pricing strategies before the acquisition. For example, firms anticipating a forthcoming merger might have behaved strategically in advance of the merger. In the data, a primary concern is whether the merged chain (Kohl's) was involved in substantial price cuts before the acquisition in order to empty its inventories. Should this have happened, it could have triggered other competitors' price reductions. We believe this was not the case. An examination of the pre-merger prices of Kohl's shows no sign of product dumping: Kohl's prices exhibited a price pattern similar to those of other chains in the market, with easy-to-identify "regular" prices on most items and some periodic price promotions. Our conversations with Kohl's managers also suggest that it had no or very limited incentives to shed unsold products by offering unusually low prices before the merger because of inventory purchase arrangements.[1]

Two final points are worth noting from this study. Previous to the merger, Kohl's operated under United Food and Commercial Union labor contract. By re-hiring below than the threshold (50% of about 450 workers) number of Kohl's laborers that would have bound them to the union contract, Copps was able to dissolve the contract potentially yielding large cost savings for the firm (Turner 2003). If such cost reductions were present, they were not passed on in the form of lower food prices to Madison residents. Depending on the pre-merger wage levels and potential gains from dissolution of the union contract, both Copps and Kohl's appears to have had much to gain from the merger in a dimension (union-busting) that does not draw much attention from antitrust authorities. A second and perhaps more important issue has to do with a second acquisition by Roundy's of Kohl's supermarkets in the Milwaukee, WI area later in 2003. Because the acquisitions in both Madison and Milwaukee were below the 50 million dollar threshold

[1] We were told that unsold perishable products would be shipped to Kohl's stores in a nearby city. Storable products would be acquired by Copps as part of the acquisition deal.

that automatically triggers a U.S. Department of Justice merger review, neither mergers would have drawn much federal attention (Associated Press 2003). Had all of the stores been part of a single acquisition, a merger review might have yielded a challenge. While there is no formal evidence of a strategic merger pattern, the cascading acquisition approach may have allowed Roundy's to simply "fly under the radar" of the antitrust laws designed to protect consumers from mergers that significantly lessen competition.

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