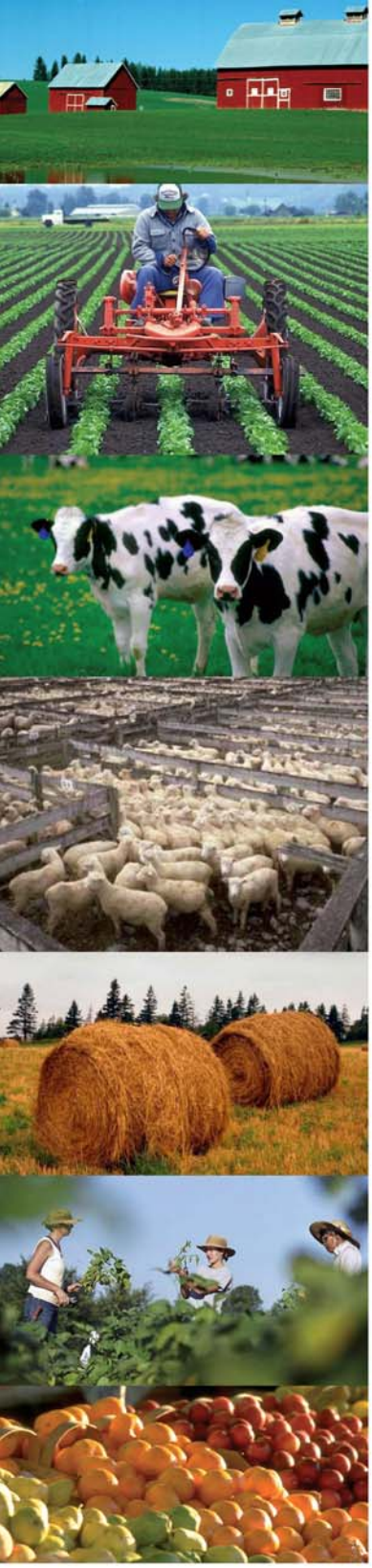


*FSRG Monographs*

# Impacts of Nontraditional Food Retailing Supercenters on Food Price Changes

**Todd Sharkey and Kyle Stiegert**

Food System Research Group

FSRG Monograph Series, #20, February 2006

*FSRG Monographs*

# Impacts of Nontraditional Food Retailing Supercenters on Food Price Changes

by

**Todd Sharkey**
Business Banker, Associated Bank,
Red Wing, Minnesota

**Kyle Stiegert**
FSRG Director
Associate professor, Department of Agricultural and Applied Economics,
University of Wisconsin-Madison


FSRG Monograph Series, #20, February 2006

**Todd Sharkey**
todd.sharkey@associatedbank.com

**Kyle Stiegert**
kwstiegert@wisc.edu

The authors would like to thank Brian Gould, Jean-Paul Chavas, Bruce Marion, Fritz Mueller, and Ron Cotterill for helpful comments. Any errors or omissions are the responsibility of authors.

This paper is dedicated to Luke Sharkey.

**Food System Research Group**
Department of Agricultural and Applied Economics
University of Wisconsin-Madison
**http://www.aae.wisc.edu/fsrg/**

# Table of Contents

# List of Tables and Figures

# Executive Summary

Over the past 150 years, grocery retailing has undergone numerous periods of major structural adjustment, antitrust challenges, and technological change. Arguably, the first attempt to capture in-store scale economies and to consolidate across stores and cities began in the mid-1800s with the introduction of the chain grocery store by The Great American Tea Company, which later came to be named The Great Atlantic & Pacific Tea Company (Adelman, 1959). The typical chain store was 500 to 600 square feet, containing a relatively limited assortment of goods. From 1915 to 1930, the marketing structure gave way to the introduction and proliferation of self-service stores, two-sided aisles, and checkout counters. During the 1930s, supermarkets were introduced: stores characterized by very large floor designs (>5000 sq. ft), reduced warehousing, self-service, and cash and carry ( Mayo, 1993). By 1941, thousands of chain grocery stores were replaced by supermarkets with new advances in store shelving and the introduction of the wheeled shopping carts.

From 1940 to 1980, supermarkets consolidated power through mergers, increased entry barriers, and technological advancements. Antitrust cases emerged in the 1940s to challenge and/or redirect the industry to more competitive practices. Driven in part by economic recessions and energy crises of the 1970s, the warehouse supermarket format was released, which deemphasized quality design and atmosphere. In the late 1970s, wholesale clubs and "hypermarkets" were introduced. Targeting customer clientele and combining wholesale and retail functions were key cost controls.

The latest major structural adjustment has been the advance of the "supercenter." The supercenter, which is closely related to the hypermarket, combines food retailing with general merchandising and pharmacy under one roof, devoting up to 40 percent of floor space to grocery items. Nontraditional food retailers entered the supercenter format when Wal-Mart entered the grocery sector with the Wal-Mart Supercenter format, in 1988, followed shortly by Kmart and later, Target, which signified the entry into grocery retailing by the nation's three largest general merchandisers. As the supercenter segment slowly eroded away market share from traditional supermarket retailers during the 1990s, the supermarket industry underwent large mergers and acquisitions, which created fewer but larger firms.

Food retailing policy research over the past three decades tended to focus on the role of increased concentration on supermarket prices and/or the role of warehouse stores on food prices (Cotterill, 1983, Kaufman and Handy, 1989, Marion et al., 1993, Marion, 1998). Thus far, there has been limited focus on the impact of supercenters. Since their introduction to food retailing in 1988, the number of nontraditional food retailing supercenters in the U.S. has increased to over 1600 stores, and the three retailers (Wal-Mart, Kmart, and Target) are listed on Progressive Grocer's "Super 50" largest food retailers for 2004 (Tarnowski et al., 2004).

The primary goal of this study is to examine the impact of supercenters and supermarket consolidation in the supercenter era on food prices in major urban centers. Previous studies by Marion et al. (1979), Meyer et al. (1983), Cotterill (1986), Marion (1998) and Yu and Connor (2002) to name several, have found a positive relationship between concentration levels and consumer food prices. Since the merger trend of the late 1990s, there have been no studies measuring the price-concentration relationship. Our study extends the literature to include pricing data in what is now the most concentrated food retail market in U.S. history. Data from 1993 through 2003 for 23 demographic metropolitan areas were used in the analysis.

Several key findings from the study are reported. First, we found that the marginal impact of supercenter entry and the time series effects of increasing supercenter market share did not have a significant impact on food prices in the metropolitan areas analyzed. This is a significant finding in light of so many claims that supercenters raise the level of competition in retail markets. Second, market concentration was significantly and positively related to food price changes, consistent with many previous price-concentration studies in food retailing. Third, we partitioned the study into halves best described by a pre-merger period (1993-1997) and the period of intensive merger activity (1998-2003). The Chow test indicated these are indeed two statistically different periods. Not surprising, the concentration parameter was highly significant in the latter period and not significant in the former period. Fourth, only the rental rate was found significant in affecting prices among the major cost variables used in the study. It appears supermarkets do not change prices when other, perhaps less permanent, cost shocks occur.

In 1992, the top five supermarket chains had control of 19% of the market; by 1999, that share had almost doubled to 33% (Bergmann, 1999). The two primary efficiencies sought by the mergers were thought to be increased buying power and economies of scale (Balto, 2001). To some extent, the merger wave that swept the industry may have been a response to the supercenter format (Foer, 1999). While our analysis does not directly address questions about why the mergers occurred, our findings suggest if supermarkets did receive efficiency gains from mergers, they did not pass cost savings on to consumers. If indeed mergers drove the marginal cost of food retailing lower, then supermarkets now have greater output market power.

# Impacts of Nontraditional Food Retailing Supercenters on Food Price Changes

Todd Sharkey and Kyle Stiegert

## Chapter 1: Background to the Study

### Introduction

Over the past 15 years, food retailing has undergone many transitions, some of which were meant to help traditional supermarkets respond to the newest source of competition, the nontraditional food retailing "supercenters" (hereafter supercenter).[1] Initially used by Meijer in 1962, the supercenter format became a new avenue for growth for some of the nation's largest general merchandise chains beginning in the late 1980s. The supercenter became a one-stop shopping destination for many budget-minded consumers. With over 1600 supercenters throughout the U.S., and estimated annual food sales of over $70 billion that account for over 15% of total grocery sales (Progressive Grocer, 2004), they have become a new force in grocery retailing. The leading supercenter retailer, Wal-Mart, emphasizes "Always Low Prices. Always," but are such claims true? As the number and market share of supercenters continues to grow, it is becoming more important to analyze whether the supercenter is helping consumers stretch their grocery dollar or if the increasing market power of supercenters is leading to higher food prices.

### Motivation for the Research

Previous research in the food retailing industry has examined the impact of different food retailing formats, most notably warehouse stores, on traditional supermarket prices (Cotterill, 1983, Kaufman and Handy, 1989, Marion et al., 1993, Marion, 1998). So far, there has been limited focus on the impact of supercenters. The primary goal of this study is to examine the impact of supercenters on food prices. In addition, continued consolidation in the food retailing industry has occurred in the past 15 years, increasing the clout of some of the nation's largest supermarket retailers. Studies by Marion et al. (1979), Meyer et al. (1983), Cotterill (1986), Marion (1998) and Yu and Connor (2002) to name several, have found a positive relationship between concentration levels and consumer food prices. Since the merger trend of the late 1990s, there have been no studies measuring the price-concentration relationship in this even more concentrated retailing environment. For that reason, a second objective of this study is to examine the link between seller concentration and retail food prices.

---

[1] We define stores that began as general merchandisers and expanded into food retailing as nontraditional food retailing supercenters.

## History of Supermarkets

Before the introduction of supermarkets, the most widespread form of grocery retailing in the U.S. was the chain store. The chain grocery store began in 1859 when George Huntington Hartford and George Gilman founded The Great American Tea Company, which later came to be named The Great Atlantic & Pacific Tea Company (Adelman, 1959). The typical chain store was 500 to 600 square feet, containing a relatively limited assortment of goods.

The major advantage of the chain store over its single store counterparts was its volume purchasing power. Volume purchasing allowed chains to lower overhead costs, due to the lower prices per unit charged to chains purchasing larger quantities of goods. The chain store also thrived because of changes in food production, most notably, the mass production of consumable goods.

In 1916, a major change in grocery retailing took place when Clarence Saunders opened in Memphis, Tennessee his patented Piggly Wiggly store; the (debatable) first "truly self-service market." This revolutionary idea gave customers the opportunity to make direct choices of consumables without the assistance of the store clerk, which significantly cut labor costs. The chain store thrived and by 1930, A&P, American, First National, Kroger, Safeway, and National Tea companies combined for over 30,000 stores (Mayo, 1993).

As the U.S. entered the great depression, negative demand shocks led to additional developments in food retailing. The true origins of the supermarket are debatable, but one firm that is widely regarded as the first "supermarket" was King Kullen opened by Michael Cullen in Jamaica, New York. Originally an employee of Kroger, Cullen had the idea to offer lower prices, operate enough stores to reduce wholesale costs, and eliminate the need for warehousing, by using a planned retailing outlet with its store size between 5,200 to 6,400 square feet. To further lower overhead costs, self-service and cash-and-carry were fully implemented (Mayo, 1993).

Soon after the introduction and success of King Kullen, Robert M. Otis and Roy A. Dawson joined with a grocery wholesaler to form Big Bear, in Elizabeth, New Jersey. Otis and Dawson combined 15,000 square feet of grocery retailing with another 35,000 square feet of various departments, such as automotive accessories, hardware, and drugs. As King Kullen's and Big Bear's success attracted national attention, the chain stores were no longer able to ignore the supermarket experiment, and for good reason; in 1932, the Big Bear supermarket generated a sales volume equal to 100 A&P chain stores located in the same New Jersey vicinity (Mayo, 1993).

Despite its success as a retailing format, the supermarket concept drew criticism. Even though it was the size of 10 chain stores, it required significantly fewer workers. Wholesalers who refused to stop supplying supermarkets were subsequently blacklisted in New Jersey. Pressure was placed on newspapers to stop printing advertisements for supermarkets. Legislation was also aimed at limiting the spread and number of supermarkets in various communities (Mayo, 1993). Despite numerous hurdles, the

supermarket survived political onslaughts by being a more economical vehicle for retail trade than the traditional chain grocery store.

Resistance against the supermarket by chain stores did not last long. Many chain store owners realized the benefits of converting chain stores to the supermarket format. From 1936 to 1941, A&P eliminated approximately 10,000 chain stores while building replacement supermarkets, which increased total sales from $864 million to over $1.3 billion (Adelman, 1959). Over roughly the same period, Kroger, Safeway, and other major chains made similar conversion to supermarkets and subsequently grew. During this growth period, supermarkets entered into the non-foods market, providing supermarkets further economic stability and diversity, while strengthening its hold as a one-stop shopping destination.

Major in-store developments also helped establish the supermarket as the food retailing format of the future. Sylvan Goldman, owner of Standard Food Stores in Oklahoma City, Oklahoma, noticed that customers usually quit shopping when the baskets became too heavy. In 1937, he invented the shopping cart, alleviating fatigue problems, while expanding the customer's ability to hold and purchase more goods at the same time. Gondola shelving, with cantilevered shelves that served two aisles, was introduced, allowing grocers to efficiently stack goods within a customer's reach. Store aisles were spaced at least two shopping carts wide to allow fluid movement throughout the store. The gondola shelf and shopping cart were innovations that established module dimensions on a micro scale, but were capable of being multiplied many times over to build larger supermarkets (Mayo, 1959).

Though the supermarket was introduced to many market areas in the 1930s, it wasn't until the post-WWII period that it flourished. Food production developments, changes in urban transportation, development and rapid expansion of the suburb, and newfound household affluence were influential factors that led to the continued progression of the supermarket. The sale of refrigerators in the U.S. increased dramatically, allowing households to increase their ability to store perishable food, and thereby lowering the number and frequency of shopping trips a household had to make. As the amount of disposable income available for food and non-food items grew, the supermarket inevitably grew as well to meet the suburban demand, increasing the average supermarket size to 18,000 square feet by 1956 (Mayo, 1993). The number of items sold in a supermarket increased as well, while major corporate chains reduced the total number of stores by over 31 percent, closing multiple chain stores to accommodate the larger and more efficient supermarkets. At this time, unions also became a major movement in the retail grocery trade, with grocery workers unionizing under the Retail Clerks International Association and the Meat Cutters Union (Mayo, 1993).

As the number of supermarkets grew, gaining access to preferred store sites became increasingly difficult, becoming an important barrier to new grocery entrants and limiting the expansion of independent retailers. Sometimes, restrictive lease agreements with established firms would act to increase the market power of leading retailers by limiting or

eliminating new competition from a market area. Entry barriers also existed when incumbent firms would engage in selective price cutting aimed at the new entrant's stores (Marion, et al., 1979). It was this price-cutting practice that laid the groundwork for an investigation of A&P in the early 1940s.

The National Association of Retail Grocers petitioned for an investigation of A&P pricing practices in 1939. By November 1942, a grand jury indictment was secured at Dallas, Texas, charging that A&P conspired to restrain and monopolize the trade of food, in violation of Sections 1 and 2 of the Sherman Act[2]. The indictment was sustained by the District Court, later reversed by the Court of Appeals, and the Supreme Court denied certiorari. The case was set to go to trial in early 1944, but the Antitrust Division dropped the Dallas case, only to open a new case in the District Court of Danville, Illinois. The trial ended in April, 1946, finding A&P guilty of violating both sections of the Sherman Act. An appeal by A&P was taken up in late 1946, but to no avail. The conviction was affirmed in February, 1949, with A&P paying all fines, totaling $175,000. Civil suits followed and a consent decree was entered by the Department of Justice and A&P in January, 1954. The terms mostly imposed certain minor disadvantages on the purchasing side of the company[3] (Adelman, 1959).

In 1946, supermarkets accounted for 3 percent of the total number of grocery stores in the U.S., but accounted for 28 percent of the total sales volume. These numbers increased to 5.1 percent and 48 percent respectively by 1954 (Mayo, 1993). While the total number of grocery stores in the U.S. continued to decline, the total square footage of store space rose in order to match the nation's growing population. The number of items carried by supermarkets doubled from 1946 to 1966, but the ratio of the number of food items to store square footage remained generally stable. Margins increased as well, driven by growing overhead costs from new developments such as air conditioning, better mechanical equipment, finer building materials, and large building lots.

Mergers were also commonplace in the supermarket trade during the postwar period. From 1949 to 1958, 83 companies acquired 315 grocery chains, resulting in 2,238 stores being sold that cumulatively had done $1.9 billion in annual sales at the time of purchase. The National Tea Company, Winn-Dixie Stores, Inc., the Kroger Company, and the Grand Union Company accounted for 51 percent of all mergers during this time period (Mayo, 1993). This trend gradually began to concentrate the control of space and sales into fewer

---

[2] Section 1 of the Sherman Act prohibits any agreement among two or more persons that restrains trade in any way (i.e., price-fixing, market division between competitors, and boycotts by competitors), while Section 2 prohibits monopolization and attempts to monopolize.

[3] The provisions, as given by Adelman, provided that "the company was barred from dictating systematically to … suppliers (1) to refrain from [using] … brokers, (2) … offering of premium deals, (3) [increasing] the prices charged to the outside trade for store delivered … food products" The company was also barred from "dictating systematically … the prices or other terms or conditions of sale, upon which such suppliers shall sell or distribute … food products to the outside trade."

and more powerful chains. This spread was slowed after the 1950s, limited primarily by the federal government's stepped-up anti-merger threats.

In the early 1960s, the Federal Trade Commission (FTC) entered agreements with six food chains that prohibited future grocery store mergers without prior FTC approval for 10 years (Marion, et al., 1979). During the agreement's time period, National Tea Co. was involved in the only fully litigated case from the six chains (National Tea, 1966). The major finding of this case was that National Tea's acquisition of 26 grocery retailers violated Section 7 of the Clayton Act. The FTC found that National Tea's activities portended a drastic restructuring of national food markets, achieved substantial power, and had eliminated many viable potential competitors, thus depriving consumers of the benefits of potential competition (Marion, et al., 1979).

At around the same time, the Supreme Court began to establish market extension merger standards, motivated by decisions made in the case of U.S. vs. Von's Grocery Co (1966). In the case, the Justice Department challenged Von's acquisition of Shopping Bag Food Stores. This merger would have resulted in a firm with fewer than 9% of the market share in the Los Angeles area, increasing the relevant market area's Herfindahl-Hirschman Index (HHI), which is the sum of squared firm market shares within a market, by 20, in a market whose HHI concentration would have been less than 300 (Lande, 2001). The major focus of the case was on the presumption that there was an increasing trend toward consolidation in the relevant market (Foer, 1999). Because of the strict enforcement toward a small impact market consolidating merger, this case is often credited as the high water point of antitrust action in U.S. food retailing. It was shortly after this case that the antitrust agencies, under the Department of Justice, adopted the food distribution merger guidelines, which said that any but very small acquisitions by large chains would be carefully scrutinized (Marion, et al., 1979).

Shopper preferences were also changing after the 1950s. The nation was prosperous in the 1960s and the American public wanted a more diverse assortment of goods and services than the conventional supermarket offered. Delicatessen and bakery departments were added into the supermarket to compete more closely with the growing fast food market (Mayo, 1993). Additionally, greater emphasis was placed on the quality of goods sold at supermarkets.

Technology became a driving force in grocery retailing in the 1970s. The Uniform Pricing Code (UPC) was introduced to supermarkets in the 1970s. This retailing innovation had a significant impact on the efficient use of interior space by allowing management to make exact estimates as to when and how much of a store item was needed, along with timelier warehouse deliveries. Shortly thereafter, the first supermarket checkout scanner went into operation in 1974 at Marsh Supermarkets in Troy, Ohio (Mayo, 1993).

Driven in part by economic recessions and energy crises of the 1970s, the warehouse supermarket format was released, which deemphasized quality design and atmosphere. In warehouse stores, sacking clerks were eliminated and a pivoting board, acting as a divider

for the checker, was installed to help move customers along efficiently. The use of metal shelves, food goods in cartons, simplified designs of food departments, and the checkout stand gave bleakness to the warehouse supermarket. Store displays were straightforward, and visual absence of a concern for aesthetics gave customers the message that warehouse markets were saving them money (Mayo, 1993).

In the late 1970s, new supermarket competition was beginning to surface in the form of wholesale clubs and "hypermarkets." The hypermarket, predecessor of the supercenter, first opened in 1963, in Sainte-Geneviève-des-bois, France by Carrefour. With a floor area of 2,500 sq. m (~26,900 sq. ft.), 12 checkouts and 400 parking spaces, the venture joined a non-food retailer and a food wholesaler, completely encompassing the concept of total one-stop shopping (Carrefour, 2004). Hypermarkets typically combined 30 percent dedicated floor space to food retail, with the remaining space dedicated to non-food general retail. The hypermarket entered the U.S. in 1984 when the Bigg's Company opened Bigg's hypermarket in Batavia, Ohio. The average size of a hypermarket increased to 175,000 square feet by 1989, combining as one bystander said "the supermarket, the discount store, and the shopping mall" (Mayo, 1993).

The wholesale club store began in 1976 with the opening of Price Club. Wal-Mart and Kmart followed shortly after with Sam's Club and Pace stores, respectively. Targeting customer clientele and combining wholesale and retail functions were key cost controls, making the wholesale club a profitable format. The wholesale club emphasized tight control of overhead expenses with a quick turnover of goods. Whereas large chain supermarkets contained as many as 30,000 items, warehouse clubs carried only 3,000 to 4,000 items. By 1990, warehouse clubs comprised roughly 3 percent of total U.S. food sales.

In the early 1970s, Safeway overtook A&P in total volume sales, becoming the nation's leading grocery chain, thereby ending A&P's unprecedented run since its beginning in 1859 as the leading grocery chain in the U.S. At the end of the 1970s, the Retail Clerks International Association and the Meat Cutters Union merged to form the United Food and Commercial Workers Union. By 1990, half of chains and 12 percent of the independents were unionized (Mayo, 1993).

Supermarket merger analysis began to mature in the 1980s after the 1982 Merger Guideline revisions were made, with the leading example of this maturity demonstrated in California vs. American Stores Co. (1990). In the case, the FTC conducted an investigation of American Stores and its recent acquisitions, entering into a settlement with American Stores that required the divestiture of 31 to 37 stores in California (Foer, 1999). The State of California then filed suit alleging the acquisitions made by American Stores were still unlawful and competition restricting. The Supreme Court held that divestiture was allowable, finally resolving the case by ordering a divestiture of 161 stores.

The latest major threat to the retail grocery sector has been the advance of the supercenter. The supercenter, which is closely related to the hypermarket, combines food retailing with

general merchandising and pharmacy under one roof, devoting up to 40 percent of floor space to grocery items. The supercenter began in Grand Rapids, Michigan in 1962, when Meijer opened its first Thrifty Acres store. Meijer was followed by Fred Meyer in the 1980s into the supercenter realm, becoming the two major supercenter firms. Both chains began in grocery retailing and then extended into general merchandise. Nontraditional food retailers entered the supercenter format when Wal-Mart entered the grocery sector with the Wal-Mart Supercenter format, in 1988, followed shortly by Kmart and later, Target, which signified the entry into grocery retailing by the nation's three largest general merchandisers.

As the supercenter segment slowly eroded market share from traditional supermarket retailers during the 1990s, the supermarket industry underwent large mergers and acquisitions, which created fewer but larger firms. Since the late 1970s, major mergers and acquisitions included but were not limited to:

1. Safeway merged with Vons (1997), Dominick's Supermarkets, Inc. (1998), Randall's Food Markets (1999), and Genuardi's Family Markets (2001),
2. Kroger merged with Dillon Companies (1983) ,which included Quality Food Centers, and Fred Meyer Inc. (1999), which included Ralphs Grocery Co. and Quality Food Centers,
3. Albertson's merged with American Stores which included Acme, Jewel-Osco, Osco Drug and Sav-on drugs and Lucky stores (1999) and acquired Shaw's Supermarkets (2004),
4. Bi-Lo (1977), Giant Foods (1981), Finast Supermarkets (1988), and Stop & Shop (1996), were purchased by Royal Ahold,
5. A&P purchased Kohl's Food Stores (1983), Waldbaum's Inc. (1986), and the Farmer Jack chain from Borman's Inc. (1989).

As the number of mergers and acquisitions increased, the concentration levels of the grocery industry increased as well. A chart of merger and acquisition activity is shown in Figure 1.1.

In 1992, the top five supermarket chains had control of 19% of the market; by 1999, that share had almost doubled to 33% (Bergmann, 1999). The two primary efficiencies sought by the mergers were to increase buying power and economies of scale (Balto, 2001). To some extent, the merger wave that swept the industry was a response to the supercenter format (Foer, 1999).

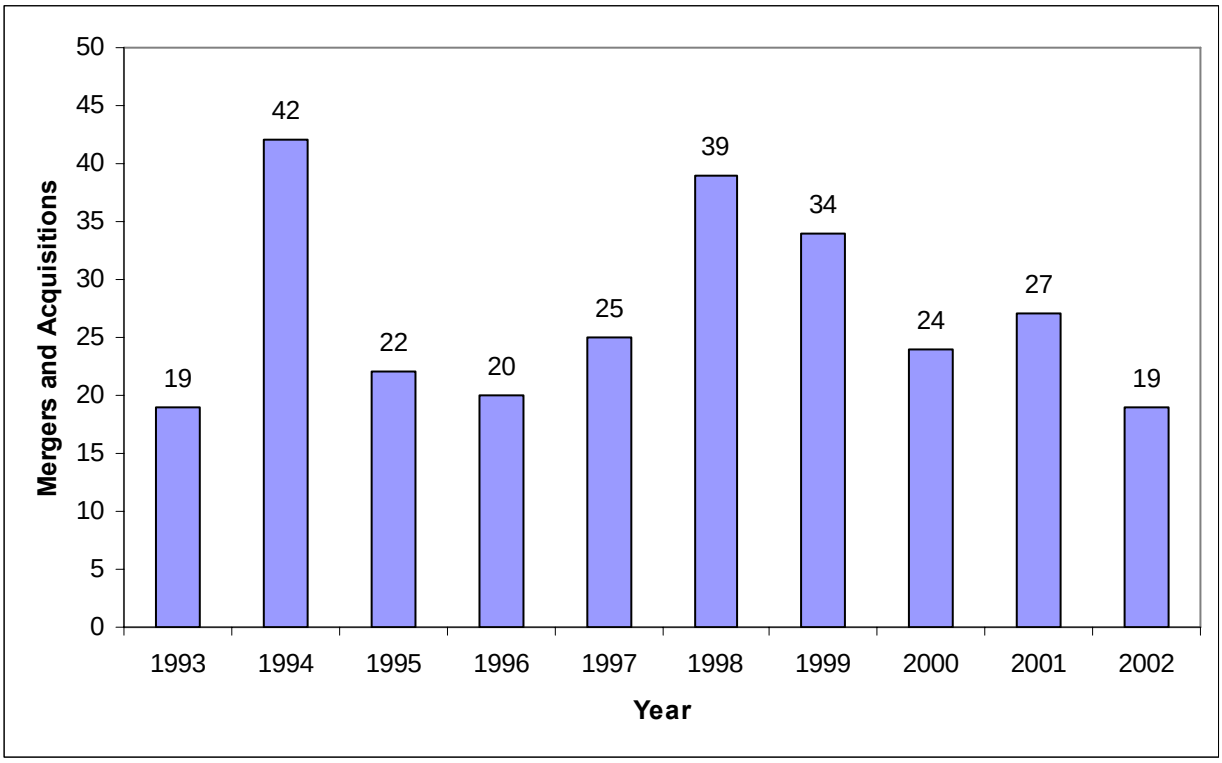
The most current Merger Guidelines (1992, revised in 1997) stated the general standards for market concentration levels post-merger were as follows:

1. Post-Merger HHI Below 1000. The Agency regards markets in this region to be unconcentrated.

2. Post-Merger HHI Between 1000 and 1800. The Agency regards markets in this region to be moderately concentrated.
3. Post-Merger HHI Above 1800. The Agency regards markets in this region to be highly concentrated.

where $HHI = \sum_{i=1}^{n} s_i^2$ is the Herfindahl-Hirschman Index of concentration, $s_i$ is the market share of firm i ($0 \le s_i \le 100$), and Agency refers to the Department of Justice.

**Figure 1.1: Mergers and Acquisitions 1993-2002**




Source: Food Institute, 2003.

The latest round of merger activity has consolidated many of the nation's largest grocery retailers, leading to even fewer sellers, and hence, more concentrated markets, with many metropolitan and local markets falling into the highly concentrated range. Structure-price theory, covered in chapter 2, suggests that as concentration increases, prices tend to increase as well; therefore, it is possible that the latest merger trend will result in higher food prices for many areas of the U.S.

The retail grocery sector has undertaken many changes in the last century. With the supercenters accounting for 5.4% of total supermarket sales in 2002 (Progressive Grocer, 2003), they are an unmistakable force that will likely continue to reshape the grocery sector while pushing the efficiencies of traditional supermarket retailers.

## A Closer Look at the Nontraditional Food Retailing Supercenters Merchandisers

> "The grocery war of the future will likely be between supermarkets and supercenters."[4]

Supercenters have been part of the supermarket landscape since 1962, when Meijer opened its first Thrifty Acres store in Grand Rapids, Michigan. Although not touted as a "supercenter," the store combined a mixture of general merchandise and food goods. Fred Meyer joined the supercenter trend in the 1980s, along with other retailers who transitioned from providing traditional grocery retailing to adding general merchandise into its product offering. This all changed in 1988, when Wal-Mart opened its first supercenter, offering meats, produce, dairy products, and baked goods in addition to the line of general merchandise.

Discount merchandisers Kmart and Target followed Wal-Mart into food retailing with their own versions of the supercenter. At the time of supercenter entry into grocery retailing, the discount store business was rather mature. Continued growth demands meant an expansion into other product categories, other lines of business, or expansion outside the U.S. The opening of supercenters allowed discount retailers to leverage technological, logistical, and distributional capabilities into the food business. It also gave discount retailers the opportunity to use food to increase shopping frequency in their stores, providing more opportunities to sell high-margin general merchandise products. As reported in the Food Industry Review, an AC Nielsen "Channel Blurring" report found that between 1999 and 2002, consumers' visits per year to supermarkets were down 12 percent, while visits to supercenters were up 40 percent, plus supercenters received $12 more per customer visit than traditional grocers.

At the end of 2003, there were 1,936 total supercenters nationally, with food sales over $71 billion, or 16.4% of total supermarket sales, up from 11.1% of total supermarket sales only one year earlier (Progressive Grocer, 2004). Table 1.1 provides supercenter store counts for Wal-Mart, Kmart, and Target since 1988.

---

[4] Garry, M. (1993). "Showdown! Standing Up to Supercenters." *Progressive Grocer*. V. 72(2).

**Table 1.1: Supercenter Store Count as of January 31, 2005**

| Year | Super Kmart | Wal-Mart Supercenter | Super Target |
|---|---|---|---|
| **1988** | 0 | 0 | 0 |
| **1989** | 0 | 2 | 0 |
| **1990** | 0 | 3 | 0 |
| **1991** | 0 | 5 | 0 |
| **1992** | 0 | 6 | 0 |
| **1993** | 5 | 30 | 0 |
| **1994** | 19 | 68 | 0 |
| **1995** | 67 | 143 | 0 |
| **1996** | 87 | 239 | 2 |
| **1997** | 96 | 344 | 8 |
| **1998** | 99 | 441 | 14 |
| **1999** | 102 | 564 | 16 |
| **2000** | 105 | 721 | 23 |
| **2001** | 104 | 888 | 30 |
| **2002** | 124 | 1066 | 62 |
| **2003** | 114 | 1,258 | 94 |
| **2004** | 60 | 1,471 | 118 |
| **2005** | 58 | 1,713 | 136 |

Source: Wal-Mart Stores Annual Reports, Kmart Corporation Annual Reports, and Target Corporation Annual Reports

As supercenters continue to expand into grocery retailing, the landscape of grocery retailing will change with it. Supercenters have benefited traditional supermarkets by helping them sharpen store operations and merchandising, compete on price with selected grocery items without going into all-out price wars, perfecting individual niches, improving perishable presentation, and virtually making a fetish of customer service (Weinstein, 1995). Even with the rapid expansion of supercenters, no food retailer has achieved a presence in all 50 states, so there still is not a true national grocery chain.

To get a picture of the supercenter format expansion by nontraditional food retailers, a closer look at the three largest U.S. retail firms and their extension (and in one case, contraction) into grocery retailing helps to explain where they came from, what they have done, and where they are going.

### Wal-Mart

The nation's largest retailer started in Rogers, Arkansas in November, 1962 when Sam Walton opened the Wal-Mart Discount City store, a sixteen-thousand-square-foot discount outlet proclaiming, "We Sell For Less." The number and popularity of Wal-Mart discount stores rose quickly, and so the need for capital to continue expansion followed with the company going public March, 1970, by offering for public sale 300,000 shares of stock. Later, in 1972, Wal-Mart was listed on the New York Stock Exchange (Vance and Scott, 1992).

Wal-Mart's entrance into the warehouse club format was Sam's Club, which opened in April, 1983 in Oklahoma City and was patterned after the warehouse club concept originator, Price Club of San Diego. This format gave Wal-Mart customers no-frills operations and rock-bottom prices, while giving the company an appetite for experimentation into other retailing formats, most notably, the hypermarket.

The hypermarket began in 1963 by Carrefour, a French retail firm. The format combined full-scale supermarket offerings and a wide range of general merchandise items. Although not very successful in the United States in the 1970s, the hypermarket concept was tried by Wal-Mart with the opening of the Hypermarket USA store in 1987. During its lifetime there were only four Hypermarket USA stores opened, each at a gargantuan size of 220,000 square feet. Each store required an extremely high sales volume to break even, placing the venture in jeopardy from the beginning. The stores, in the eyes of customers, were just too big, but provided Wal-Mart the opportunity to test the food retailing waters and adjust its approach for its possibly largest growth vehicle: the supercenter.

The first Wal-Mart supercenter opened in Washington, Missouri, as a new one-stop combination grocery and discount merchandise concept. The store was a scaled down version of the Hypermarket USA store, but remained essentially a complete Wal-Mart discount store with a full-fledged supermarket under the same roof. Although it started slowly, Wal-Mart has opened supercenters at a pace of roughly 140 stores each year since 1994. Since the beginning of this rapid expansion period, roughly two-thirds of the new supercenters were either additions to or relocations of previous Wal-Mart discount stores. Wal-Mart has also varied the size of its supercenters, which range from 100,000 square feet to 261,000 square feet, to accommodate the needs and legal limitations of the various communities that a supercenter enters.

Although known as a low price leader, the real strength of the Wal-Mart supercenter expansion has been the distribution system that the company has built to accommodate it. As of January 31, 2005, there were 34 food distribution centers located throughout the U.S. Each supercenter is located no further than one day's driving distance away from a distribution center, ensuring timely and fresh deliveries for each store. While Wal-Mart initially was criticized for the quality of perishables, they have seemingly corrected this deficiency, and, in the process, closed the quality gap between its supercenters and traditional supermarkets (Lewis, 2000).

In 2000, Wal-Mart unveiled the Neighborhood Market store, a full line supermarket with a limited assortment of general merchandise items. This store format, with stores ranging from 38,000 to 55,000 square feet, allowed them to access areas with less land available to place large supercenters while establishing a foothold in more urban areas. The idea behind the Neighborhood Market was to give Wal-Mart customers a store to do fill-in grocery shopping trips when they do not plan to shop at the supercenter. Progressive Grocer stated that "Wal-Mart is pursuing a 'saturation strategy' that calls for supercenter/Sam's Club combos with satellite Neighborhood Markets to maximize distribution efficiencies" (Progressive Grocer, 2002).

Wal-Mart opened an additional 242 supercenters in 2004. Conversions, including relocations, of discount stores to the supercenter format accounted for 159 of the new supercenters, with new construction accounting for the remaining 83. With Wal-Mart ranking number one in the Progressive Grocer's Super 50 the past two years (Weir 2003), along with being number one in the Supermarket News SN75 since 2001, the grocery retailing industry is taking note of its expanding presence in many markets. Polls show that major grocery retailers view Wal-Mart as the second largest problem to their operations, just behind rising health care costs (Progressive Grocer, 2004).

As Wal-Mart continues to penetrate the grocery sector with continued success, they will consistently convert more of the traditional discount stores to the supercenter format. As reported in Progressive Grocer, a Columbus, Ohio consultancy, Retail Forward, estimated that Wal-Mart had captured 19 percent of the supermarket industry in 2003, and expects it to attain a 35 percent market share by 2008 (Progressive Grocer 2004). The first supercenter in California was opened in La Quinta on May 3, 2004, giving Wal-Mart a supercenter in 45 states. There are plans for a supercenter to be built in New York City within the next few years. Soon, Wal-Mart could become the first truly "national" grocery chain.

### Kmart

The origins of Kmart began in 1899 when Sebastian Spering Kresge opened a five and dime store in downtown Detroit. Kresge emphasized low prices, which appealed to many shoppers during the tough war and depression times, and was the first retailer to use newspaper advertising programs to get shoppers to visit his S.S. Kresge Company stores. By the 1920s, the company was opening locations that sold items for $1 or less, a precursor to the current discount store.

As the retail environment became more competitive, the company took a different turn with the promotion of Harry B. Cunningham as president of Kresge Company in 1959. It was under his leadership that the first Kmart discount store opened in Garden City, Michigan in 1962. The Kmart store concept took off, and by 1977, nearly 95 percent of S.S. Kresge Company sales were generated by Kmart stores. This success prompted the company to officially change its name to the Kmart Corporation. The remaining Kresge

stores were sold by the end of 1987 in an effort to fully concentrate all efforts on discount merchandising. In 1990, with a retailing plan that focused on new store openings, store enlargement, and store modernization, Kmart unveiled its newest store format, entering into supercenter retailing: the Super Kmart.

The first Super Kmart was opened on July 25, 1991 in Medina, Ohio, offering a full-service grocery store along with general merchandise, 24 hours a day, seven days a week. Like Wal-Mart, Kmart viewed the supercenter as the engine that would drive the growth of the company into the next century. The main focus points of the Super Kmart were on perishable foods and customer service, while operating as independently as possible from the Kmart organization itself.

The expansion of Super Kmart was slower compared to Wal-Mart and its supercenter format. While both companies slowly rolled out supercenters in the beginning, Wal-Mart steadily picked up steam, while Kmart kept to a slow and gradual approach, maintaining control of operations and focusing more on the Big K store format. Although supplied by various wholesalers initially, by 2001, Super Kmart food was supplied wholly by Fleming. The number of Super Kmart stores reached a peak of 124 stores in 2001, just prior to Kmart's filing for Chapter 11 bankruptcy protection on January 22, 2002.

At the time of reorganization, Kmart was the nation's fourth largest supercenter format retailer, following behind Wal-Mart, Meijer, and Fred Meyer stores. It ranked as high as the 24$^{th}$ largest grocer according to the Progressive Grocer Super 50, but has since lost its foothold. Since the reorganization effort, the Kmart Company has sold over 600 of its total stores and slashed its workforce. Kmart emerged from bankruptcy protection as the Kmart Holding Corporation on May 6, 2003. Since the bankruptcy revelation, the number of Super Kmart store has fallen to 59 and sales have dropped in Progressive Grocers Super 50 for 2004 to 40$^{th}$ and in the Supermarket News SN's Top 75 of 2004 to 38$^{th}$ largest grocer, respectively. In addition, Kmart's wholesaler, Fleming, exited the grocery wholesaling business in August, 2003, due in part to Kmart's bankruptcy proceedings.

On November 17, 2004, Kmart Holding Corporation and Sears, Roebuck, and Co. announced that they signed a merger agreement, combining Sears and Kmart into a new retail company named Sears Holding Corporation, thus becoming the nation's third largest retailer. Due to the changes taking place within the corporation and the competitive environment of supercenter retailing, the future of Kmart in grocery retailing and the Kmart supercenter format is uncertain. Even though supercenters are shopped by roughly 54 percent of U.S. households (Progressive Grocer, 2004), Kmart still faces monumental hurdles to overcome in its bid to compete with Wal-Mart, Target, and other supercenter competitors.

### Target

The nations newest supercenter entrant is Minneapolis, Minnesota based Target. Target's origins began in 1902, when George Dayton opened the retail store Goodfellows in

Minneapolis, but it wasn't until 1962 that the Dayton Company entered discount merchandising when they opened the first Target store in Roseville, Minnesota. With a need for more capital, the Dayton Corporation had its first public offering of common stock in 1967, and two years later, merged with the J.L. Hudson Company to form the Dayton Hudson Corporation (DHC). DHC acquired Mervyn's in 1978, making DHC the 7th largest U.S. retailer. The following year, the Target store division became the corporation's top revenue producer. Dayton's and Hudson's were combined in 1984 forming the Dayton Hudson Department Store Company, which, at the time, was the largest U.S. independent department store. Additionally, Marshall Field's department store was acquired in 1990. In 1995, following the lead of discount retailers Wal-Mart and Kmart, DHC launched their own version of the supercenter with Super Target.

The first Super Target was opened in Omaha, Nebraska in March 1995 at a massive size of 225,000 square feet. The growth of the Super Target format was initially slow, much like Kmart, as store numbers grew from two stores in 1995 to 30 by the end of 2000. Ongoing efforts to compete against and to distance itself from its direct rivals, Wal-Mart and Kmart, led Target to carve out an ever-expanding niche in general merchandising retail sales (Janoff, 2000). As the Target store became the focal point of DHC, the company changed its official name to the Target Corporation in early 2000.

Since its inception, the Super Target format has continued to open more stores each year. As of January, 2004, there were 118 Super Target stores located in the United States, with managerial expectations of opening an additional 400 Super Targets within the next 10 years. As a testament to the Super Target format's attractiveness, Target management announced that Super Target stores have seen a 50 to 100 percent increase in shopper frequency compared to conventional Target stores. Retail Forward suggests that Target could become a top 10 U.S. food player by 2007, providing further evidence of Target's emergence in the grocery sector (Hinsey, 2003). With its smaller store numbers, Target has relied on outside wholesalers to supply its groceries, the most notable wholesaler supplying Target being Supervalu.

Target's presence as a major food retailer in the past few years has been nationally recognized, as it was listed on the Progressive Grocer Super 50 list the past two years (number 27 in 2003 and number 24 in 2004) and on the Supermarket News Top 75 (number 36 in 2002, number 22 in 2003, and number 21 in 2004). This emergence of the Super Target format was further expressed by the 2003 Target Annual Report:

> "Super Target complements the tremendous growth provided by our traditional discount stores and promotes our brand experience in each store. Like Target, Super Target offers a unique, differentiated general merchandise offering, yet also provides our guests the added convenience of a high-quality, full-line grocery assortment. Both stores are focused on delivering fashion and value. Given the acceptance of this concept by our guests and its financial contribution to Target, we expect Super Target to continue to be an important element of our growth for many years to come." (Target Coporation, 2004)

As Target continues to define itself as a major player in the grocery market, they have realized that they cannot, or more appropriately, do not wish to compete with Wal-Mart on price or the gourmet grocery chains on selection, so they have aimed at a shopping experience focused on its moderately upscale shopper. With its continued growth of Super Target stores and a developed market niche, Target looks to firmly plant itself in the supercenter trenches.

# Chapter 2: Literature Review

Price theory suggests that, if barriers to entry are present in a market, an oligopoly of firms producing an identical product will earn excess profits by charging prices above marginal costs. The fewer the number of firms in the industry, the higher the price and, subsequently, profit are expected to be. This is the foundation for the reduced form equation estimation in the structure-conduct-performance (SCP) paradigm (Wen, 2001).

## SCP Studies of Food Retailing

The two key assumptions that underlie the structure-conduct-performance (SCP) study approach are:

1. "SCP studies assume a stable relationship and a line of causality that runs from structure through conduct to performance. Since conduct was thought to be difficult … to observe directly … the focus … is on identifying structure variables that are observable and measurable and that are linked with market power or collusion. If a stable relationship is established between structural variables and market power, then the SCP implication is that the structural variable facilitates the exercise of market power."
2. "SCP studies start from the premise that measures of market power can be calculated from available data." (Church and Ware, 2000)

Early studies tested the SCP paradigm across multiple industries, in an attempt to determine if increasing or larger levels of concentration led to higher firm profits. However, early measurement and conceptualization issues relating to profit analysis led to weak economic results. The Demsetz critique suggests that higher profits may be due to the superior efficiency of firms, not due to their use of market power (Demsetz, 1973). The use of accounting data to compute the firm's or industry's profit margin rarely equals true economic profit and may not represent costs correctly. Thus, accounting profits may not represent the true relationship between concentration and economic profits (Anderson, 1993). This, along with many hardships in interpreting the results of concentration-profit studies, helped deteriorate interest in performing research that concerned the relationship between concentration and profits.

As concentration-profit studies began to lose their appeal, those who believed in the SCP paradigm decided it was only natural to examine the relationship between price and concentration, instead of profits and concentration. Price is an embedded component in the price-cost margin used in concentration-profit studies. This allowed an easy extension of the SCP paradigm since price data was generally easier to access, and interpretations were easier to formulate. Since the first price-concentration study by Stigler (1964), well over 100 concentration-price studies have been performed across numerous industries, including cement, gas stations, airlines, banking, and supermarkets, where the results "seem to give overwhelming support to the concentration-price hypothesis" (Weiss, 1989).

Using later advancements in the so-called "new empirical industrial organization" (NEIO) framework, it is easy to demonstrate the relationship between the market concentration and prices. Following Cowling and Waterson (1976), we consider the generalized Cournot model, with constant and different marginal costs across firms and homogeneous goods. Firm profits are

$$\pi_i = pq_i - c_i q_i \qquad (i = 1,\ldots,n) \qquad (2\text{-}1)$$

where p is the inverse demand function

$$p = p(Q) = p(q_1, q_2, ..., q_n) \qquad (2\text{-}2)$$

Assuming profit maximizing behavior, the first-order conditions are

$$\frac{\partial \pi_i}{\partial q_i} = p + q_i p'(Q)\frac{\partial Q}{\partial q_i} - c_i = 0 \qquad (2\text{-}3)$$

where

$$\frac{\partial Q}{\partial q_i} = 1 + \frac{\partial \sum_{i \neq j} q_j}{\partial q_i} = 1 + \lambda_i \qquad (2\text{-}4)$$

and $\lambda_i$ is the $i^{th}$ firms conjectural variation, which represents the aggregated response of all firms in the industry to the quantity decisions of firm *i*. Rearranging (2-3) and dividing by p, we arrive at

$$\frac{p - c_i}{p} = -\frac{s_i}{\eta}(1 + \lambda_i) \qquad (2\text{-}5)$$

where η is the market elasticity of demand. Summing across all firms in the industry, we can define the average industry markup as:

$$\frac{p - \bar{c}}{p} = -\frac{HHI}{\eta}(1 + \lambda) \qquad (2\text{-}6)$$

where $\bar{c}$ is industry marginal costs and $HHI = \sum_{i=1}^{n} s_i^2$ which is the Herfindahl-Hirshman Index of market power. If the industry follows a Cournot strategy where $\lambda = 0$ (firms choose quantities assuming other firms will not react), industry profitability is a simply ratio of seller concentration (as measured by the Herfindahl-Hirschman Index) over the demand elasticity, consistent with the SCP framework. Even when a pure Cournot strategy is not adhered to, the NEIO framework draws a clear link between the degree of market power and the industry structure.

Early studies in the SCP tradition were criticized for using large cross-sectional datasets of unrelated industries with dissimilar cost and demand structures (Wen, 2001). Food retailing, a single industry with similar production technologies and distinctive spatially ordered markets, allows for cross-sectional analysis while reducing the concerns about misspecification of costs.

To our knowledge, the earliest price-concentration study in grocery retailing (Mori and Gorman, 1966) tested the relationships between various structural characteristics and market performance. Mori and Gorman (1966) used prices because they could be regarded as an approximation of such performance criteria as production efficiency, profit rates, and progressiveness.

Twenty-three cities from three Midwestern states were chosen due to divergent structural characteristics, namely the degree of market power (concentration) and the extent of chain dominance. A price index was created for each city and regressed against 1, 2, 3, and 4 firm concentration ratios, respectively.

Mori and Gorman (1966) concluded that market share held by the largest firms in a market was not an effective variable in explaining differing price levels among cities. Furthermore, it was concluded that the degree of price competition was found to be largely an individual city structural relationship dependent upon many possible factors such as the goals of management of independent firms, growth of the market area, and recent entry of new firms.

Due to concerns about increasing concentration in food retailing, a study was commissioned by the Joint Economic Commission. In the study, Marion et al. (1977, 1979a,b) focused on the organization and competitive performance of the food retailing industry from 1970-74, focusing particularly on the price and profit performance of large U.S. grocery chains and the impact on the competitive environment.

The price-performance section of the study performed an analysis of competitive forces on the grocery price level of three grocery chains located in 36 metropolitan areas. The level of prices in different markets was examined by computing the cost of consumers for a market basket containing 110 products. Exogenous structural variables included in the analysis were the four-firm concentration ratio (CR4) and the relative firm market share (the firm's market share divided by the market's four-firm concentration ratio). The concentration variable was included to serve as a proxy for market power and was expected to be positively related to prices, while the relative firm market share measures firm dominance vis-à-vis its leading rivals, and was hypothesized to be positively related to price levels. The relative firm market share was firm market share normalized by the concentration ratio. Firm market share and concentration were highly correlated while relative firm market share and concentration were not. Store size was included to adjust for differences in the importance of supermarkets compared to small stores in the various metropolitan areas. Additional variables included were market growth, market size, and a short-run market rivalry, which was intended to capture the effect of rivalry intensity

among leading chains in the short run on food prices. A nonlinear relationship was tested in some regressions by transforming the concentration variable to a curvilinear form to detect critical concentration ratios that would express the use of oligopoly power in food retailing.

The authors revealed that, *ceteris parabis*, the greater the market structure variables, CR4 and relative firm market share, the higher the firm's grocery prices. A negative relationship between store size and prices further reinforced the positive relationship between CR4 and prices. The negative relationship between market growth and price showed that chains tended to price lower in rapidly growing markets compared to slowly growing markets. Market rivalry was also negative, and highly significant, suggesting that prices are lowest in markets where firm rivalry is the most intense. In addition, the inclusion of private label products in the grocery basket of goods had little effect on the findings and did not introduce a bias in the results.

The authors stipulated that the estimates for the price comparison data may be misleading. Since the price data was only available for one month, this possibly revealed a short run phenomenon. Since the results were derived from only three chains from 32 different MSAs, it was urged to not over-generalize the results.

The findings of the structure-price section of the study suggested that higher observed profits, from results presented earlier in the profit-performance section of the study, were due, at least in part, to the higher prices that chains were able to charge in less competitively structured markets. However, the data series did not permit a direct comparison of price levels across MSAs. In the study, it was estimated that monopoly price overcharges, which were calculated over 263 Census MSAs in 1974, was roughly $662 million. The conclusion was that substantial market power exists in grocery retailing in many markets, which results in consumers paying considerably higher prices than if competition were more effective. They concluded that food prices and retail operating expenses would be significantly reduced by actions that lead to lower market concentration and lower market shares for firms that now hold dominant positions in some markets.

Hall et al. (1979) tested the relationship between wholesale-retail marketing margins and concentration for the U.S. retail beef industry across different retailing regions of the U.S. It was believed that using a panel data approach would reduce the problems of inter-industry analysis, such as omitting certain important structural variables while providing an opportunity to look at changes in the variables over time. Additionally, the use of panel data helps to eliminate the possibility that a short-run effect or economic disequilibrium is being observed. The wholesale and retail prices for beef were computed from data covering 19 MSAs during 1967-1973, obtained from the U.S. Bureau of Labor Statistics (BLS) and the U.S. Economic Research Service (ERS). Structural variables, such as price elasticity of demand, the rate of growth of demand over time, the rate of technical change, and the extent of product differentiation were assumed constant, since the analysis was for a single industry across regions.

Hall et al. (1979) regressed the wholesale-retail price spread against retail food store wage rate and four-firm concentration ratio. Estimation was conducted using OLS and GLS regression techniques, with similar results occurring for both estimations. The null hypothesis that higher retail concentration did not influence the beef wholesale-retail marketing margins was rejected. Using an elasticity interpretation, a 10 percent increase in the concentration level in a metropolitan area would increase the price margin by over four percent. It was concluded that "the degree of concentration existing in a market does appear to be an important factor affecting the price-cost marketing margin in a particular region."

Lamm (1981) looked at the nature of the price-structure relationship for the food retailing industry. By using individual firm market shares and one- through four-firm concentration ratios as structural measures, he was able to perform "a more detailed perspective of the food retailing industry structure than had been previously possible." The analysis used a time-series cross-sectional pooled data set consisting of 18 urban areas from 1974 to 1977. Lamm (1981) suggested that studying the relationship between price and structure would allow the price effects from concentration to be "disentangled" from the cost depressing effects attributable to scale economy realization.

In the model, the price of food was regressed against marginal costs, market concentration, barriers to entry, and operational scale. It was argued that the use of price as the dependent variable allowed the avoidance of some typical problems found in earlier inter-industry studies, such as the effects of technological change and differing capital requirements. Price was approximated by the food at home price index from the BLS. Marginal costs were represented by the price to retailers of finished consumer foods and by food store wage rates. Regional binary variables were included to represent the differential costs associated with operating in different regions of the U.S. Average store size served as a proxy of economy of scale measures, while demand controls and entry barrier measures were omitted from the analysis due to data limitation and variable definition problems.

The conclusion was the three-firm concentration ratio was probably the most appropriate market structure measure of the food retailing industry. Lamm (1981) insisted that including individual firm shares identifies the relative contributions of each firm to collusion. The analysis indicated that the choice of a market structure measure is important for determining the nature of the structure-price relationship in the food retailing industry. An equally important finding was the identification of a positive relationship between food prices and market concentration, providing further evidence that a higher degree of seller concentration is one cause of differences in intercity food prices.

While Lamm's results are usually recognized as evidence of a positive relationship between food prices and market concentration, he compared the CPI-Food at Home index across markets, which the BLS specifically states is not an acceptable procedure. The CPI series data are not meant to perform cross-sectional analysis; they are MSA specific and are not consistent with other MSA index numbers, which questions the validity of Lamm's results.

Under the request of the Arkansas attorney general, Cotterill (1983) studied price and service levels in Arkansas as well as neighboring cities from surrounding states. The data set consisted of 163 store observations that generated a market basket of 115 items from 75 different food product classes. The food price observations were then aggregated together to form an all items food price index.

The analysis was performed to measure and evaluate the importance of market structure, service, cost, and demand factors on food prices. Market structure variables included in the analysis were the Herfindahl-Hirschman Index, four-, three-, two-, and one-firm concentration ratios, relative firm market share, store affiliation (chain or independent), state of store residence, and whether a warehouse supermarket is operating in the market area. Service variables included store format binary variables (denoting whether a store was a traditional supermarket or a warehouse store) and average store selling space. It was hypothesized that smaller stores offered more personalized services. Cost variables included the distance from the firm's major supply warehouse, average wage, whether or not the firm was unionized, and weekly sales per square foot. Demand variables included were growth in food sales from 1977 to 1982, per capita income, the unemployment rate, and the value of food stamps issued as a percent of food sales. A firm was the level of observation, with price and store service indices averaged together when more than one store of a particular firm was present in a market.

Cotterill (1983) found that a firm's price level is positively related to HHI, in most cases at the 1% significance level. The warehouse supermarket binary variable was negative and significant, while warehouse store impact was negative and significant. Neither growth nor per capita income had a statistically significant impact on prices. Square feet of selling space was estimated in quadratic form as well, which was highly significant, suggesting that average store size is strongly related to price.

Cotterill (1983) ran many smaller subsample regressions as well, with similar results occurring for most of the regressions. However, the subsample of only Arkansas retailers revealed that prices were negatively and significantly related to income, which was a rather "astounding result." Implications of the results were not discussed since this was a presentation for the state attorney general, so there were no conclusions or opinions of the results presented.

Meyer et al. (1983) examined the extent to which a high degree of local concentration would raise prices and lower quality, while presenting a new geographic definition of the relevant retailing market. The study's purpose was to address the relationship between concentration, the conduct of retailers, and price.

By evaluating only the Santa Cruz-Capitola and Berkeley-Oakland Hills areas of California, Meyer et al. implied that they effectively controlled for labor, land, and building costs, meaning that price differences were not due to cost differences, but to differences in market structure and conduct. The data used consisted of 183 item prices collected from multiple stores in the two areas analyzed. Using paired t-tests, Meyer et al.

(1983) found a strong significant price difference between concentrated and unconcentrated markets. In the study, the neighborhood[5] was the market extension, not the entire metropolitan area as in other studies, so they assumed that neighborhoods with high concentration levels had significantly higher prices.

The results of Meyer et al. (1983) suggested that prices were higher in monopoly and concentrated oligopoly markets compared to unconcentrated markets; however, price differences were not so severe when generic goods were included in the comparison. Meyer (1983) also observed (but did not test empirically) that stores in monopoly locations offered the lowest level of services. It was duly noted by Meyer (1983) that in future studies, market power must be considered on a very local level, not on the larger defined metropolitan statistical areas (MSAs), which may understate the effects of concentration on price.

In a study of Vermont grocery retailers, Cotterill (1986) analyzed (1) how the price level of a firm in a market relates to measures of local market structure, (2) how prices of firms are related to firm-specific characteristics, and (3) which measures of market concentration are most strongly related to the price level and how they compare to firm market share.

In Cotterill's model, the market structure variables included were the one- and four-firm concentration ratios, the Herfindahl-Hirschman Index, and per capita income[6]. Firm structure variables included market share, relative firm market share (market share divided by either CR1 or CR4), whether a firm was an independent or chain, store capacity utilization, store size, population growth, and the distance from wholesale distribution centers. 18 different markets across Vermont were used in the analysis, which consisted of 35 supermarkets. Local concentration ratios were very high for Vermont during the time of the study, with average CR4 for rural Vermont at 96.1%, and 14 out of the 18 markets analyzed had a CR4 of 100%.

Cotterill (1986) found, after controlling for the variation in firm-specific characteristics, that market concentration, as measured by the HHI or concentration ratios, had a significant positive impact upon firm price levels. He concluded that Ravenscraft's 1980 study, which tried to isolate the independent effects of cost economies and market power on profitability, may not be generalized to markets with imperfect information and/or product heterogeneity. Cotterill (1986) concluded that profitability related to market share is due to share related market power, not cost economies.

Since Mori and Gorman (1966) first rejected the hypothesis of a positive relationship between concentration and price in food retailing, the studies following after determined that instead, there was a positive relationship. However, this relationship was questioned

---

[5] Neighborhoods were defined as an area where residents were likely to confine their shopping.

[6] Cotterill (1986) stated that "markets with high per capita income tend to have more inelastic demand curves for food because food represents a smaller portion of a high income person's expenditures. Therefore prices are hypothesized to be higher in high income markets."

again due to the findings of Kaufman and Handy (1989) in a report for the USDA Economic Research Service (ERS). The study objectives were to (1) address the shortcomings and criticisms of earlier food retailing price studies through study innovations which included refined sampling and price measurement procedures, (2) determine whether prices are higher in more concentrated markets, (3) determine whether firms with larger market shares charge higher prices, (4) determine the importance of other factors that have been hypothesized to affect food prices, such as wage rates, occupancy costs, and store services, and (5) estimate price differentials between integrated and nonintegrated firms.

Kaufman and Handy (1989) believed that previous concentration-price studies in grocery retailing were flawed, stemming from four different problems: (1) items selected were not representative of all food and nonfood supermarket products, (2) there was a nonrepresentative sample of cities, firms, and stores, (3) important price determinants were omitted from the statistical analysis, and (4) store- or firm-level data was not available.

In the analysis, 28 different MSAs were chosen from four different groups of four-firm concentration ranges. At least one store was selected from each of the six leading firms located in the MSA, and five additional randomly selected stores were chosen to account for all other supermarket firms operating in the market, bringing the total number of supermarkets involved to 616. The sample included food and grocery items from about 95 percent of all supermarket products, including produce and fresh meat.

The objectives of the sample design were that: (1) the products selected should represent the entire supermarket, to the extent possible, (2) items should be selected in proportion to their share of total supermarket sales, (3) price comparisons should be limited to like items, (4) the data should permit a comparison of prices between brand types, and (5) random selection should be used. In total, more than 300,000 food and nonfood prices were collected during three survey waves conducted approximately two months apart. Prices were collected Thursday through Saturday during each survey wave to capture end-of-week price promotions. Additionally, separate surveys of store characteristics and labor compensation were collected from the various stores where prices were collected.

A price-relative index was computed for each item by using a store's price for a particular product compared against the average price charged by all survey stores for that product. Item price-relative indexes were then aggregated into averages by brand type (national, private/store label, and generic), department, store, firm, and MSA. This method was deemed more appropriate by the authors than the market basket approach, primarily due to previous study problems relating to missing items or item quantity price-checks. Price indices constructed for each survey wave were then averaged together to form the final price indices.

Using an ANOVA test, Kaufman and Handy (1989) found that between-city price differences accounted for 22 percent of the total variation in the sample, leaving 78 percent of the variation due to within-city firm price differences. This result suggested that factors

specific to stores, firms, and cities are most likely to influence supermarket prices. A similar test was performed for labor compensation, which resulted in less than half the total variation due to between-city differences, and the remainder due to within-city differences.

The econometric analysis was performed with price regressed against firm market share, market concentration, a sales size variable, the degree of firm integration, firm occupancy costs, store services, labor compensation, a warehouse store binary variable, market rivalry, market turbulence, market growth, and market entry.

Kaufman and Handy (1989) found no relationship between market share and firm price differences. Market concentration was found to not be associated with firm prices, but they did suggest that the use of marketwide MSA definitions may mask otherwise positive concentration-price and market share-price relationships in cities large enough to have multiple submarkets. Increasing amounts of in-store services had a positive and significant effect on prices, likely capturing the higher costs of services, as well as some degree of market power due to firm differentiation. The warehouse store variable accounted for 6 percent lower average firm-level prices than non-warehouse store retailers, suggesting that considerable cost savings resulted from the reduced labor input requirements of warehouse store firms, leading to lower prices in warehouse stores.

Kaufman and Handy (1989) concluded that oligopolistic firm market power did not play a significant price-determining role in grocery retailing; however, market concentration may be associated with higher prices in a particular city or market area. They concluded that the price patterns of leading firms lend support that market share and market concentration are not the cause of price differences. Kaufman and Handy (1989) suggested that supermarket firms operate in an environment somewhere in between the extremes of pure competition and oligopoly.

Shortly after the publication of the Kaufman and Handy (1989) study, another publication questioned the legitimacy of the positive relationship between concentration and price in grocery retailing. Newmark (1990) presented what he called a “new test” of the concentration-price relationship by including consumer income and new geographical areas of data. Following the argument that services per unit of the item and the marginal cost of providing the services can cause price differences, Newmark (1989) suggested that, in cases where retail services are greater in concentrated markets, the positive correlation of prices and concentration might not indicate oligopolistic interdependence and welfare loss; rather, consumers may prefer higher-priced but higher-quality bundles of goods and services. Newmark (1989) asserted that unless empirical tests control for retail services, we cannot be sure whether a positive correlation implies oligopolistic interdependence, or, possibly, the competitive superiority of leading firms (see also Demsetz, 1973). By assuming that demand for services is normally distributed, Newmark (1989) held constant a number of unmeasured differences in the groceries-plus-services basket while including income in the analysis to back up his prior assertions.

Data was collected for 35 commonly purchased grocery items reported for 14 cities across the U.S. plus an additional 13 cities from Florida from two different newspaper surveys. Newmark (1989) assumed that, since the Florida food retailing industry had higher concentration levels, treating the two sets of prices as completely comparable should bias the empirical results in favor of a positive relationship between prices and concentration, but that this bias should not be large.

Newmark's model regressed his price index against four-firm concentration, income, market size, market growth, and average store size. After performing multiple regression analysis, he found no significant relationship between concentration and price. Newmark (1989) did, however, find a positive significant relationship between price and income, consistent with his hypothesis that demand for retail services is higher in high-income areas.

Serious debate ensued after the findings of Kaufman and Handy (1989) and Newmark (1990) were released. A critique by Geithman and Marion (1993) focused on whether the Kaufman and Handy (1989) study was "good science," attempted to explain the methodologies that Kaufman and Handy (1989) had employed, while identifying some of the "unusual characteristics and weaknesses" of the study. Geithman and Marion (1993) disagreed with Kaufman and Handy's use of average price for an item/good category as a measure of price, suggesting that, ideally, the prices of identical products should be compared across stores and across markets. Additionally, Geithman and Marion (1993) noted that the complexity of the data set, as well as a "subpar" survey return rate may have influenced the results. Geithman and Marion (1993) further revealed that firms that were to be price checked were notified in advance by the ERS researchers, meaning that there was no way of knowing whether the supermarket chains had adjusted prices in certain MSAs to remove possible evidence of market power.

Geithman and Marion (1993) found that the result of Kaufman and Handy (1989) compared to previous price-concentration studies, using reviews by Weiss (1989) and Schmalensee (1989), is an outlier, remarking that it was only consistent with a "methodologically questionable" study by Newmark (1990). Furthermore, there was an absence of statistical analysis performed on the actual drawn sample in the study, which suggested that Kaufman and Handy (1989) provide no statistical substantiation for the claim of superior data. Instead, Geithman and Marion (1993) believe that the sampling errors are larger and nonsampling errors are very pervasive. The nonsampling errors cited were missing data and missing data imputations. They further suggested that linear and polynomial regressions should have been presented, and corrections for heteroscedasticity should have been made.

In response to the critiques of Geithman and Marion (1993), Kaufman and Handy (1993) refuted the idea that the study was an outlier; rather, it was consistent with the findings of the National Commission on Food Marketing (1966), Gorman and Mori (1966), and Newmark (1990). Kaufman and Handy (1993) replied that the approach recommended by Geithman and Marion (1993), pricing only identical goods, would have severely restricted

the number of item-price comparisons between stores. By calculating the average price per unit of homogenous goods, along with random sampling procedures, it would allow for differences in the mixture of goods within a product category.

Kaufman and Handy (1993) stated that, with respect to the "missing" price data critique, a brand was "missing" only if the item was carried by the store, but not enumerated. Kaufman and Handy (1993) suggested that the lack of matching identical items between stores offered evidence that the market basket approach that Geithman and Marion (1993) advocate is "unworkable and constrained by serious practical and conceptual limitations."

Comparing price changes over time, Marion et al. (1993) took a closer look at a relatively new format in grocery retailing, the warehouse store. The article focused on the competitive impact of warehouse stores from 1977-1987. It was initially hypothesized that (1) in most markets in which warehouse stores had successfully entered, warehouse store presence would provide a downward pressure on market prices, while (2) change in market concentration would be positively related to change in food prices, and (3) de novo entry is negatively related to changes in food prices.

The study was framed on the assumption that warehouse stores hold the potential to increase the number of strategic groups in grocery retailing, adding a significant competitor in many metro areas. It was believed that a new strategic group may provide a means of circumventing entry barriers in a market, at least in the short run. In a sense, warehouse stores may enhance price rivalry due to the circumvention of these entry barriers, and since warehouse stores emphasize low prices, this may stimulate further price rivalry with at least some incumbent retailers within a market. Warehouse store entry was expected to reduce the prices paid by customers, first, as a direct benefit of the lower prices at the warehouse store, and, second, by price reductions by some incumbent retailers (indirect benefits). While the CPI obscures the direct effect by not specifying the firms included in the price index, it does capture the extent to which warehouse stores affect the prices charged by incumbent supermarkets; thus the indirect effect was the main focus of the study.

Marion et al. (1993) used a model which utilized a set of dummy variables that represented differing levels of warehouse store market share, in addition to several control variables suggested by economic theory. Since the BLS states that CPI-Food at Home (FAH) data is not appropriate for making cross-section comparisons of price indices, a pooled time-series cross-sectional data set was constructed that compared changes in the FAH index over the 11 year period, across 25 cities, which resulted in 249 observations.[7] The change in the FAH index was regressed against the warehouse store and entry binary variables plus the change in (1) concentration, (2) per capita income, (3) population, (4) operating costs, and (5) labor costs variables. An additional model was specified that examined the average changes over the entire study period. In this model, different dummy variables were used

[7] Miami had missing data for the first year of the study, 1977.

distinguish between three rates of warehouse store growth, while changes in population and operating costs were dropped from the regression due to collinearity problems and degree of freedom issues. The results were very similar for the average change model, and hence, were not discussed.

The Marion et al. (1993) results strongly supported the hypothesis that the introduction of warehouse stores and the increase in warehouse store market share affect food prices negatively. However, when the warehouse share exceeded 30%, the annual change in price became positive, indicating that the market's reaction to the warehouse store format had played out. A strong positive relationship was found between increasing concentration and food price increases. Entry was found to be negative and significant, suggesting that when warehouse stores were introduced into a market by de novo entry, the prices of the incumbent supermarkets were negatively affected even more than when the warehouse stores were introduced by an incumbent retailer.

The Marion et al. (1993) results were consistent with the hypothesis that warehouse stores constitute a strategic group that is sufficiently interdependent with other supermarket formats and is an important competitive force that increases rivalry and leads to substantial consumer benefits. Marion (1993) also suggested that entry of a "significant competitor" had a consistent negative influence on food price increases in the two years following entry. Furthermore, retail food prices were positively related to MSA concentration, consistent with the concentration-price relationship results of some previous studies of food retailing.

Marion (1998) updated the warehouse store study by extending the study period from 1977-1992. Similar methodology from the previous study was employed, with many of the similar results reoccurring. Once again, a warehouse market share of greater than 30 percent had a positive relationship with changing prices, reaffirming that the warehouse store format played itself out on the consumers in the market, over a longer time period.

To test the robustness of the regression results, Marion (1998) divided the data set into two time groups, 1977-1985 and 1985-1992, specifically to test whether the negative impact on prices from warehouse stores occurred primarily during the first half of the study period or during the entire period. Results of the first time period, in terms of an individual variable's statistical significance, were similar to previous findings. The second time period, however, yielded no significant warehouse market share variable. The change in concentration and entry variables were no longer significant as well, suggesting that there was a change in the response of the market to warehouse stores. Marion (1998) accredited this difference to strategic learning by incumbent retailers. By the late 1980s, the warehouse stores had lost their mystique, and incumbent retailers learned they could compete with a less aggressive price response to warehouse retailers. Marion (1998) further noted that warehouse stores gravitated toward large super stores in their product-service offerings during this time period, declining the emphasis on lower prices.

The new results did, however, still support the hypothesis that retail food prices are positively related to concentration. Both changes in cost variables were insignificant at even the 10 percent level, giving further evidence of a positive linkage between concentration and price.

In the "new competitive environment," Binkley and Connor (1998) examined the long-run supermarket pricing pattern across different U.S. markets. The "new competitive environment," as they called it, was the new food retailing market where warehouse stores and fast food restaurants compete with supermarkets for consumer food purchases. The intent was to study market characteristics that explained the long-run average retail prices of two broad classes of grocery goods: "wet," or fresh, perishable goods and "dry," or pre-packaged, branded foods. Additionally, they attempted to assess the impact of fast-food restaurants in the food retailing market.

The model employed in the analysis set price to be a function of variables that measured the competitive climate of the retail market,[8] factors categorizing the metropolitan area,[9] and supply-side or cost factors for the sellers.[10] The price data was obtained from ACCRA's Inner City Cost of Living Index (American Chamber of Commerce Researcher's Association, various years), where the authors used 26 food prices based on year averages for 95 cities from 1986 to 1988. The date range corresponded to the four-firm concentration numbers that were reported by the U.S. Census in 1987. Instead of making an ad-hoc market basket of goods, Binkley and Connor (1998) used principle components to determine the two groups of goods for supermarkets: the "dry" and "wet" goods categories. These components were then used to construct indices for each city to be used as the dependent variable in the separate regression equations.

Binkley and Connor (1998) found evidence that the nature of retail market competition affects different price groupings in different ways. The dry goods were less strongly affected by market competition, which reflects that branded goods are priced more uniformly across the U.S. than are produce and other non-branded items. A positive significant value was found on concentration with respect to dry goods, but a negative insignificant value was found for wet goods. Binkley and Connor (1998) also determined that supermarkets responded to warehouse store competition by lowering prices more for wet goods, which the warehouse stores typically do not stock. They believed that huge differences observed in the analysis reflected discriminatory pricing patterns. The use of

---

[8] This included concentration measures, the amount of chain ownership, the ratio of small store sales to total sales, the ratio of warehouse stores to total grocery stores, the average per person expenditure on low cost restaurants, the average store size, and the number of grocery items with large quarterly price changes.

[9] This included the average retail wage, the cost of rental housing, the electricity costs, and the number of supermarket employees per supermarket

[10] This included area grocery sales, the population density, the population growth rate, average market income, and regional binary variables.

selected prices from store advertisements generated an image of strength and low prices for supermarkets in goods of interest aimed at particular consumer segments. The results depicted a changing market, with serious competition arising from not only new formats of grocery retailing, such as the warehouse store, but also from the restaurant industry.

In a paper directly addressing the Demsetz critique, noted previously, Cotterill (1999) posited research questions of whether consumers in concentrated markets pay higher prices, and whether those higher prices are correlated with the provision of more costly services. Additionally, he evaluated whether unilateral or coordinated market power prevails in the differentiated markets. Cotterill (1998) stated that a supermarket's price level is expected to be positively related to market share if unilateral power over price is significant, or if large share firms offer more costly services. Alternatively, if a supermarket's price level is positively related to market concentration, then there is coordinated market power, or the provision of more costly services in more concentrated markets is effective.

The data used in the estimation was collected from 34 cities across Arkansas from May 6-8, 1982. Of the cities included in the analysis, only three had a population larger than 100,000. After aggregating multiple stores for a firm in a city, there were 107 total observations. 30 out of the 107 observations had a CR4 of 100, and 30 of the 34 cities had a HHI of over 2700[11].

The survey of Arkansas retailers also questioned whether the stores had any of a list of 27 services. Factor analysis was used to find the five factors that identified important service strategies for grocery retailers. The five strategies identified were (1) labor-intensive services, which included prices on packaging, bagging, loading of groceries, and no checkout scanners, (2) the breadth of supermarket product line, which included delicatessens, bakery, restaurants, service seafood, and pharmacy, (3) consumer services, which included unit pricing, handicap carts, express lanes, and no trading stamps, (4) old-time services, which included phone ordering, home delivery, no uniforms, and no nametags, and (5) promotions, which included contests, music, and trading stamps.

The structural equation system, used to test the Demsetz quality critique, was estimated using three-staged-least-squares. In the structural model, the service variables were regressed against variables that were possibly related to the choice of service level within each store. In the reduced form equation, the structural variables do not show up directly, but indirectly through the included exogenous variables.

In the reduced form model, the three-firm concentration ratio had a positive significant impact on price, while the presence of a warehouse store is negative and significant. The structure-price relationship is confirmed by the structural model, since controlling for the quality effects does not destroy the relationship between market concentration and price. Since three-firm concentration was positive and significant, it strengthened the

[11] The Department of Justice Merger Guidelines state that an HHI of 1800+ is highly concentrated

concentration-price relationship, contrary to the Demsetz critique, leading Cotterill (1999) to reject the Demsetz quality critique, concluding that supermarkets exploit oligopoly power to raise prices.

Subsequent regressions were performed using subsamples consisting of just chains, affiliates, and independent chains, which further confirmed the positive effect of concentration on price. By replacing concentration with individual market shares of the supermarkets, he found that individual market shares were also statistically significant and positively related to price.

The latest study to test the price-concentration relationship in food retailing was performed by Yu and Connor (2002). Because of (1) the brevity of the prices collected (one week), (2) the selection of the items, (3) the geographic location of most cities, (4) the method of calculating the price index, (5) the small set of independent variables, and (6) the restricted functional form used by Newmark (1990), Yu and Connor (2002) thought that it may be possible that Newmark's results may be sensitive to the model he employed. Yu and Connor (2002) examined the importance of sampling, measurement, variables, and formulating models when cross-sectionally testing for the statistical significance of the concentration-price relationship in the food retail industry.

Yu and Connor (2002) realized that Newmark's index of retail prices was the total dollar value of a constant list of items for the supermarkets; no weighting or conversions to a standard unit of weight or volume were pursued. Yu and Connor (2002) suggested four possible suggested sources of estimation error in Newmark's study: (1) measurement error in the independent variables, (2) measurement problems with the price variable, (3) handling the unusual composition of the sampled cities, and (4) model formulation. Utilizing new variables in the regression, Yu and Connor (2002) corrected for the use of data that contained wholesalers and convenience stores in the computation of four-firm concentration, while using government published data for income. They also calculated a new price index, since they believed the use of absolute dollar expenditures may have significantly overstated the effect of income. Using the ACCRA price index to examine the sensitivity of the price-reporting error, the new grocery basket index was computed by weighting the price of each grocery item by the expenditures on that item relative to the expenditures on all grocery items, as reported by the USDA. A state dummy variable was also included to indicate if the observation was a Florida city, since Florida cities were overrepresented in Newmark's analysis. Additionally, Yu and Connor (2002) believed that the unusual sociodemographic characteristics of Florida may have influenced the earlier results.

The inclusion of the state dummy variable reversed the sign of the concentration variable from negative to positive. The implementation of "methodological improvements" by Yu and Connor (2002) reaffirmed the existence of a positive significant relationship between concentration and price in food retailing. By excluding noncompeting retailers from the concentration figure, and controlling for Florida cities, the study by Newmark (1990) would have fallen in line with results of previous price-concentration studies.

## NEIO, Game Theory, and Recent Studies of Food Retailing

Due to the model identification problems associated with the SCP framework, researchers specified the new empirical industrial organization (NEIO) model, which explicitly uses the structure of the oligopoly model, to test economic theory. The NEIO econometric models utilize the first order conditions for profit maximization, a market demand function, and an endogenous relationship for the conjectural variation variable (Wen, 2001). These models then produce an estimate for the conjectural variation, which is the degree to which a firm takes into account its rivals' reactions to its own output choices.

To better understand the NEIO approach, we demonstrate the relationship between market share and prices, utilizing framework of Harris (1986, 1988), and later revisited by Cotterill (1993a), which used a dominant firm oligopoly model under product differentiation.

Cnsider the profit-maximizing pricing decision of a dominant firm engaged in competition with a few rival firms (i.e., a member of a dominant oligopoly group, such as in a supermarket submarket). We can define the dominant firm's demand as:

$$q_1 \equiv q(q_m(p_1,...), q_r(p_1,...)) \qquad (2\text{-}7)$$

where

$q_m$ = market demand

$q_r$ = rival's summed supply

$p_1$ = price received by firm 1

Differentiating (2-7) with respect to $p_1$ gives us:

$$\frac{\partial q_1}{\partial p_1} = \frac{\partial q_1}{\partial q_m}\frac{\partial q_m}{\partial p_1} + \frac{\partial q_1}{\partial q_r}\frac{\partial q_r}{\partial p_1} \qquad (2\text{-}8)$$

Then, noting that optimal inventory decisions are made at

$$q_r = q_m - q_1 \qquad (2\text{-}9)$$

in equilibrium. It then follows that:

$$\frac{\partial q_1}{\partial q_m} = 1 \quad \text{and} \quad \frac{\partial q_1}{\partial q_r} = -1 \qquad (2\text{-}10)$$

Multiplying and dividing through (2-8) with $q^m$ and $q^r$ yields the own-price elasticity of demand

$$\eta_1 \equiv \frac{\partial q_1}{\partial p_1}\frac{p_1}{q_1} = \frac{\partial q_m}{\partial p_1}\frac{p_1}{q_m}\frac{q_m}{q_1} - \frac{\partial q_r}{\partial p_1}\frac{p_1}{q_r}\frac{q_r}{q_1} \qquad (2\text{-}11a)$$

or

$$\eta_1 = \eta_m \frac{q_m}{q_1} - \theta_p^s \frac{q_r}{q_1} \qquad \text{(2-11b)}$$

where

$\eta_1$ is the own-price elasticity of demand for the dominant firm

$\eta_m < 0$ is the elasticity of market demand with respect to the dominant firm price.

$\theta_p^s \gtrless 0$ is the conjectural own-price elasticity of rival supply. It is the perceived percent change in rival supply for a one percent change in dominant firm price.

Now, recognizing that $\frac{q_m}{q_1}$ is the inverse market share of the dominant firm $\left(\frac{1}{s_1}\right)$, it follows that $\frac{q_r}{q_m}$ is equal to 1-$s_1$, the market share of the remaining firms, leading to the following result:

$$\eta_1 = (\eta_m - \theta_p^s(1 - s_1)) / s_1 \qquad \text{(2-12)}$$

We see that the dominant firm's own-price elasticity is a function of its market share, elasticity of market demand, and rival's supply conjecture.

The profits for the dominant firm are:

$$\pi_1 = p_1 q_1 - c(q_1) \qquad \text{(2-13)}$$

Therefore, the dominant firm would set its profit-maximizing price where

$$\frac{\partial \pi_1}{\partial p_1} = q_1 + \left( p_1 - \frac{\partial c}{\partial q_1} \right) \frac{\partial q_1}{\partial p_1} = 0 \qquad \text{(2-14)}$$

Then, from (2-9), it follows that $\frac{\partial q_1}{\partial p_1} = \frac{\partial q_m}{\partial p_1} - \frac{\partial q_r}{\partial p_1}$, then (2-14) becomes

$$q_1 + \left( p_1 - \frac{\partial c}{\partial q_1} \right) \left( \frac{\partial q_m}{\partial p_1} - \frac{\partial q_r}{\partial p_1} \right) = 0 \qquad \text{(2-15)}$$

Rearranging (2-15) and dividing by $q_1$ reveals

$$\left( p_1 - \frac{\partial c}{\partial q_1} \right) \left( \frac{\partial q_m}{\partial p_1} - \frac{\partial q_r}{\partial p_1} \right) \frac{1}{q_1} = -1 \qquad \text{(2-16)}$$

Then multiplying and dividing through by $q_m$ and $q_r$, and multiplying through by $p_1$ yields

$$\left(\frac{\partial q_m}{\partial p_1}\frac{1}{q_1}\frac{q_m}{q_m}\frac{q_r}{q_r}p_1-\frac{\partial q_r}{\partial p_1}\frac{1}{q_1}\frac{q_m}{q_m}\frac{q_r}{q_r}p_1\right)=-\frac{p_1}{\left(p_1-\frac{\partial c}{\partial q_1}\right)} \qquad (2\text{-}17)$$

Which, following from (2-11a) and (2-11b), reduces to

$$\eta_m\left(\frac{1}{s_1}\right)-\theta_p^s\left(\frac{1-s_1}{s_1}\right)=-\frac{p_1}{\left(p_1-\frac{\partial c}{\partial q_1}\right)} \qquad (2\text{-}18)$$

Then, inverting (2-18) and multiplying through by -1 yields

$$pcm_1=\left(\frac{p_1-MC_1}{p_1}\right)=\left(\frac{-\eta_m+\theta_p^s(1-s_1)}{s_1}\right)^{-1}$$

or (2-19)

$$pcm_1=\frac{1}{\eta_1}$$

where $pcm_1$ and $MC_1$ are the price-cost margin and marginal cost for the dominant firm, respectively. Assuming the simplest case of identical marginal costs across firms, the profit maximizing price-cost margin may be written as:

$$pcm_1=\frac{(p_1-MC)}{p_1}=\frac{1}{\eta_1}=\frac{s_1}{-\eta_m+\theta_p^s(1-s_1)} \qquad (2\text{-}20)$$

The firm price-cost margin equals the inverse of its own price-elasticity of demand.

Solving for $p_1$ from (2-20) gives us:

$$\frac{(p_1-MC)}{p_1}=\frac{1}{\eta_1}\ \Rightarrow\ 1-\frac{MC}{p_1}=\frac{1}{\eta_1}\ \Rightarrow\ 1-\frac{1}{\eta_1}=\frac{MC}{p_1}\ \Rightarrow\ p_1=\frac{MC}{1-\frac{1}{\eta_1}}$$

$$or\ \ p_1=\frac{MC}{1-\frac{s_1}{-\eta_m+\theta_p^s(1-s_1)}} \qquad (2\text{-}21)$$

In the special case where the firm's conjectural rival supply response elasticity, $\theta_p^s$, is zero, which implies no perceived change in the rival's supply responses due to the dominant firm's actions, then (2-21) reduces to:

$$p_1 = \frac{MC}{1 - \frac{s_1}{\eta_m}} \tag{2-22}$$

Even in a constant marginal cost case, a firm's price can vary, and is a positive function of market share. Cotterill (1993a) argued that the higher prices that large profit-maximizing firms charge are due to the market power that differentiation confers; not higher costs.

By taking the partial derivative of (2-20) with respect to market share, we get:

$$\frac{\partial pcm_1}{\partial s_1} = \frac{-\eta_m + \theta_p^s(1 - s_1) - s_1(-\theta_p^s)}{(-\eta_m + \theta_p^s(1 - s_1))^2} \tag{2-23}$$

which reduces to:

$$\frac{\partial pcm_1}{\partial s_1} = -\eta_1^{-2}(\eta_m - \theta_p^s)s_1^{-2} \tag{2-24}$$

which is $> 0$ if $\theta_p^s \geq 0$ or $\eta^m < \theta_p^s < 0$

Because costs are constant in (2-20), this implies that the partial derivative of price with respect to market share is positive. Harris (1988) also demonstrated that $pcm_1$ is positively related to market share when marginal costs are not constant. In retrospect, when market share is a function of costs, as hypothesized by Demsetz (1973), we have an ambiguous sign for the price share derivative. Demsetz (1973) hypothesized that higher market share firms have higher prices due to product differentiation and market power and/or higher costs, or they may have lower prices due to lower costs.

Concerns about the altered structure in the food retailing industry due to leveraged buyouts, mergers, acquisitions and financial restructuring during the 1980s, as well as increasing concentration levels as a result of the altered structure led Park and Weliwita (1999) to examine competitive conditions in the U.S. food retailing industry from 1967 to 1992. A model of firm conduct based on NEIO literature was used to measure the degree of competitive behavior in the food retailing industry, incorporated financial variables into the industry cost function to control for the effect of changes in industry financial structure on the costs.

The variables included to estimate the index of market power were the percentage of stores using scanner technology, because the information provided from scanners gives an advantage to retailers over wholesalers, the average weekly sales per checkout which measures the efficiency of the supermarket, and a binary variable denoting the intensified level of merger activity during 1983 to 1992. Percentage of stores using scanner

technology data was unavailable before 1981, and so the authors extrapolated the data series to approximate the missing data years.[12]

The cost function variables included price of food purchases, labor, energy, and capital indices, the output of food retailers, and the percentage of total current liabilities and long-term debt. The demand equation variables included the food at home and food away from home price indices, disposable per capita income, and the female to male earnings ratio. The model was estimated using three-stage least squares.

Park and Weliwita (1999) concluded that, because of merger activity and leveraged buyouts, financial leverage increased and shifted from short-term liabilities to long-term debt. Park and Weliwita's results indicated that markets in the food retailing industry became more concentrated and segmented, offering opportunities for firms to exert market power by charging prices above the average cost of production. The estimated index of market power was significantly different from zero during the 1983 to 1992 time period, but had a low coefficient value, revealing only a slight shift in competitive conditions associated with merger and acquisition activity.

Analyzing the wholesale beef market, Schroeter et al. (2000) addressed the problem of measuring market power without a hypothesis of price taking behavior on one side of the market or the other. The wholesale beef market is thought to be an example of a bilateral oligopoly: both buyer and seller markets are highly concentrated. Three equilibrium concepts were suggested: bilateral price-taking, manufacturer price-taking, or retailer-price taking. To determine the correct equilibrium concept, the authors used a conduct parameter, which indexes the degree of market power in an industry. To correct for the econometric identification problem associated with NEIO models, Schroeter et al. (2000) made a slight adjustment to the model suggested by Bresnahan (1982) by allowing sellers' marginal cost to rotate (not merely shift) with changes in the exogenous variables.

Monthly data was used from January 1990 to December 1994, with variables including the retail price of beef, the quantity of beef, the wholesale price of beef, the food at home component of the CPI, the real retail price of pork, average hourly earnings of grocery store workers, and a proxy for the price of cattle. The structural equations included retail demand, the grocery retailers' marginal cost, and meat packers' marginal cost.

The model was estimated using maximum likelihood estimation for the bilateral price-taking, manufacturer price-taking, retailer price-taking, and "hybrid" price-taking models. The authors found that manufacturer price-taking is favored over bilateral price-taking through the use of asymptotic t-tests; however, retail price-taking was found not to be an improvement over bilateral price-taking. Furthermore, the retailer price-taking model is rejected when tested against the "hybrid" model, whereas, the manufacturer price-taking model was not rejected.

---

[12] Scanner technology was introduced into supermarkets in 1974 (Mayo, 1993), and so data was extrapolated for 1974 to 1980.

The conclusion was that food retailers enjoy market power in the wholesale market, but the manufacturers do not enjoy market power, suggesting that retailers have acquired buying power in the wholesale market compared to its manufacturing counterparts.

The study by Kadiyali, Chintagunta, and Vilcassim (2000) measured the power of market channel members in an attempt to understand the reasons for market power in the refrigerated juice and canned tuna markets. The authors believed that power rests with the retailers and has increasingly shifted from manufacturer to retailer, due to intense competition among manufacturers, the introduction of private label brands, and increased concentration at the retail level.

Game theory methods were used to develop models of market channel conduct, but the framework differed from previous studies since the model allowed for a continuum of possible channel interactions between the retailer and manufactures, compared to just three possible channel interactions (like that hypothesized by Schroeter et al. (2000)). The model employed examined the vertical interaction between multiple food manufacturers of the product (either refrigerated juice or canned tuna) and one retailer. This approach allowed for manufacturers to consider the decisions of competing manufacturers, as well as the retailer's decision. A firm's market power, given by its conjectural variation parameter, and the firm's share of total channel profits were analytically synonymous, thereby providing the measure of a firm's total market power in the channel.

For refrigerated juice, three demand equations, two manufacturing pricing equations, and three retailer pricing equations were estimated (eight equations), while canned tuna required three equations estimated for each category (nine equations), using three stage least squares. The weekly data was from a major food retailer in Chicago, resulting in 215 total observations. Variables included retail price, manufacturer price, quantity, outside sales in the category, and a percentage of deals. Additional control variables were summer binary terms, wages, and the CPI for the Midwest region.

Kadiyali et al. (2000) concluded that the major retailer had substantial pricing power for both the refrigerated juice and canned tuna product categories. This provided evidence that manufacturing pricing power was less than retailer pricing power for each of the national brands. The authors also found that the three channel interactions of previous studies were rejected in favor of the channel interaction continuum.

### Price Dispersion Studies

Price dispersion studies focus on the distribution of prices across sellers of the same item. When price dispersion is present, it reflects market inefficiency, a direct violation of the Law of One Price (Stigler, 1961). The dispersion is attributed to search costs, market power, or attributes of the item sold or retailer involved in the selling process. Early studies presented mixed results on whether a price gap between sellers exists. Groom (1966) and Alcaly and Kevorick (1971) found no relationship between market prices and average incomes, while Kureuther (1973) found that poor neighborhoods had higher food prices.

In a study of the Irish grocery market, Walsh and Whelan (1999) modeled the price dispersion between related brands within product categories for independent Irish retailers. Since the shops in the study were small "corner grocer" stores, the shops did not carry the full range of available brands; subsequently, the presence of price dispersion between related brands in the market reflected different price patterns of averaged brand prices across different shops or consumer groups. The focus was to determine whether the dispersion in the market price of related brands within products in the Irish grocery market was an outcome of "monopoly type" or "competitive type" pricing over heterogeneous consumer segments.

Walsh and Whelan (1999) focused on the relationship between brand price dispersion within products and the competition structures of products, the structure of brand distribution across shops, and deterministic effects. Data was obtained from A.C. Nielsen of Ireland, providing bi-monthly data from October 1992 to October 1995, resulting in 524 individual brands from 124 firms and 18 product categories. The data included the brand retail sale price, the total sales of the brand, and the total sales of the brand as a proportion of the total product sales for shops that sell the brand. Indices that were made from the data included the degree of price dispersion, the extent of product category brand specialization, the degree of brand concentration, and the magnitude of inter-firm brand competition within each product category. In addition, time trend and product category or seasonal effects variables were added as control parameters.

The model was estimated as a random effects model in either GLS, AR(1) and instrumented AR(1) forms. Walsh and Whelan's results provided evidence that product category brand specialization leads to price dispersion within products of the market. However, price dispersion between related brands within products was estimated to increase with the level of brand choice and firm competition in the product, which was consistent with "competitive type" pricing across consumers. Additional evidence suggests that imperfect consumer switching abilities become more elastic in some consumer segments compared to others in response to competitive forces. They revealed that brand pricing across consumer groups induced different degrees of localized imperfect price competition rather than pricing across segments that extract consumer willingness to pay.

Hayes (2000) examined whether food prices are higher in poor, urban neighborhoods compared to more affluent locations. The data was raw price data from the BLS. To avoid comparison problems, the analysis was limited to five homogeneous goods surveyed in the majority of the sampling areas: milk, whole chicken, eggs, naval oranges, and iceberg lettuce. The data set consisted of 10,170 prices from 2,181 stores in 43 states over 12 months in 1998. Data from private sources were used to supplement the BLS data on service offerings, outlet size, and costs, in addition to deriving measures of competition from the number of stores in a zip code.

Hayes (2000) estimated the relationship between the market price and income level of the neighborhood using prices for homogeneous goods priced in almost every sampling area. Subsequent regressions added additional control variables, such as store features and

demographic information. The estimation results revealed that poorer neighborhoods faced discounted net prices as much as 6 percent lower than those faced by the more affluent neighborhoods. Price dispersion accounted for much of the variation in prices, but did not completely explain the price gap as significant discounts remained for various poor subgroups.

Hayes (2000) suggested that food stores offer discounts to consumers who have greater price elasticities of demand and not to inelastic consumers. Additionally, poor white and Hispanic neighborhoods had market prices considerably lower than those found in affluent white neighborhoods, while prices in poor black neighborhoods did not significantly differ from affluent white neighborhoods.

### Price Asymmetry Studies

Prices rigidity occurs in imperfectly competitive markets when product prices tend to change less frequently in response to various economic stimuli than is suggested by models of the competitive firm (Shonkwiler and Taylor, 1988). This price asymmetry or "stickiness" has been a focal point in the farm-retail price transmission process.

Kinnucan and Forker (1987) focused on the price transmission process in the dairy subsector from January 1971 to December 1981, testing for retail pricing asymmetry in four dairy products: fluid milk, butter, cheese, and ice cream. Kinnucan and Forker (1987) believed the stickiness of retail prices to changes in wholesale or farm-level prices is due to (1) inertia associated with storing, transporting, and processing the farm product, (2) the costliness of repricing items at the retail level, (3) market imperfections such as diversity in market structure or differences in information transmission, and (4) the nature of price reporting and collection methods. Asymmetry in farm-retail price transmission was hypothesized to exist due to (1) industry concentration beyond the farmgate, (2) government intervention, and/or (3) shifts in retail demand versus farm supply.

The model employed was a variation of the Heien (1980) markup pricing model. The model included retail price, marketing costs, and rising and falling phases of milk prices variables. The Houck (1977) procedure was used to compute the rising and falling phase variables.

Kinnucan and Forker's results indicated that increases in the farm price of milk were passed through the retail level more fully than price decreases. This was further illustrated by the small size of short-run elasticities relative to long-run elasticities for pricing responses. Still, the results showed that decreases in the farm price of milk were eventually passed along to consumers.

In a study of frozen concentrated orange juice, Shonkwiler and Taylor (1988) examined the price asymmetry issue through the use of Rosett's friction model. The friction model allows any change in an exogenous variable to induce an immediate and proportional change in the desired price, but only if certain thresholds are breached and costs of the change are covered. Additionally, the friction model can predict the magnitude of an upward or downward price change.

Monthly data was obtained from August 1976 to March 1985 for the retail and bulk price of frozen concentrate, an index of labor and packaging costs, and industry inventory holdings.

Shonkwiler and Taylor's results concluded that for a change in the retail price of frozen concentrate, the bulk price of concentrate, the labor and packaging costs, and inventory levels must pass certain thresholds before the retail prices are changed. Alternatively, price was symmetrically rigid with respect to price increases or decreases for frozen concentrate, contrary to previous observations.

Unlike previous studies that focused on specific markets or industries, Peltzman (2000) looked for evidence of asymmetric price transmission in 77 consumer and 165 producer goods categories in an attempt to generalize how prices respond to cost changes using monthly data from 1978 to 1996.

The results of the consumer and producer goods categories overwhelmingly point to positive asymmetry relationships in the respective markets, suggesting positive asymmetry is a fact of life in industrial markets. Only after long time lapses, eight months, was there evidence of the gap narrowing between input price increases and decreases.

In a second model, Peltzman (2000) estimated how quickly a change in the wholesale price of a typical brand was reflected in the retail price of that brand in a specific store, using 357 pairs of individual UPCs at 4 stores from a leading supermarket chain in the Chicago metropolitan area. The results indicated there was no evidence of asymmetric behavior; there was a complete absence of any systematic asymmetry when the response of a single decision maker to its own costs was studied.

Peltzman (2000) found that, with respect to producer goods, less input volatility was associated with more asymmetry, and the structure of the market "matters" but in a way that resists easy labeling. Fewer competitors (in numbers) were associated with more asymmetry but a more concentrated market (in HHI) was associated with less asymmetry. It also appeared that the more fragmented the supply chain to retailers, the more asymmetric the price changes realized.

Evaluating the fluid milk markets of New York City and upstate New York, Romain et al. (2002) employed a marketing margin model to test for constant returns to scale, as well as short- and long-run asymmetric marketing costs and farm-price transmissions. The analysis was partitioned into upstate New York and New York City due to regulatory changes that occurred during the study time frame, specifically, the deregulation of milk distribution in New York City in 1987, and the 200% law or price gouging law of 1991.

The models were estimated using monthly data from 1980 to 1997; variables included the marketing margin, quantity of milk used by processors, the marketing cost index, cumulative marketing cost increases and decreases, cumulative farm price increases and decreases, and binary variables indicating changing market conditions.

The hypothesis of constant returns to scale technology in the fluid milk market could not be rejected. In addition, prior to the price gouging law, there were significant long-run

asymmetric price transmissions, suggesting that an under allocation of milk occurred before 1991, primarily due to the permanent above-competitive price level of milk. After 1991, there was no evidence that farm price increases and decreases were not completely transmitted to retail price; therefore, the price gouging law was beneficial to consumers. Romain's results further indicated that the deregulation of the New York City milk market significantly reduced milk-marketing margins. Short-run asymmetry was important in New York City before and after the regulation changes, while it was less evident in upstate New York in the beginning, and almost disappeared during the latter time period. These findings suggested that middlemen in the fluid milk market were exercising market power in New York before the price gouging laws came in effect.

In the following chapter, the reduced-form model used to estimate the structure-price relationship is presented, as well as defining the variables that are included in the estimation. Included in the chapter is information about the data used in the analysis, plus restrictions that limit certain data applications.

**Table 2.1: Studies in Food Retailing**

| **Is there market power in food retailing?** | **Yes** | **No** |
|---|---|---|
| Structure-conduct-performance studies | Marion et al. (1977, 1979a,b)<br>Hall et al. (1979)<br>Lamm (1981)<br>Cotterill (1983)<br>Meyer, et al. (1983)<br>Cotterill (1986)<br>Marion et al. (1993)<br>Binkley and Connor (1998)<br>Marion (1998)<br>Cotterill (1999)<br>Yu and Connor (2002) | Mori and Gorman (1966)<br>Kaufman and Handy (1989)<br>Newmark (1990) |
| NEIO Studies | Schroeter et al. (2000)<br>Kadiyali et al. (2000) | Park and Weliwita (1999) |
| **Are there price disparities in food retailing?** | **Yes** | **No** |
| Price dispersion studies | Kunreuther (1973)<br>Walsh and Whelan (1999)<br>Hayes (2000) | Groom (1966)<br>Alcaly and Klevorick (1971) |
| **Is price transmission asymmetric from farm to retail?** | **Yes** | **No** |
| Price asymmetry studies | Kinnucan and Forker (1987)<br>Peltzman (2000)<br>Romain et al. (2002) | Shonkwiler and Taylor (1988) |

# Chapter 3: Model and Methodology

The theoretical results from the previous chapter are used as the foundation of the model developed. First, a discussion of this model and the Consumer Price Index (CPI) limitations are presented, followed by the definition of the variables used in the analysis. Then, the base model is presented with the hypothesized signs of the variables used in the estimation process.

## The Model and Methodology

The analysis focuses on annual food price changes across different markets in the U.S. The analysis is limited to 23 different MSAs where price indices for food consumed at home are available from the BLS.

The model used is of the form:

$$Y = \alpha + ß_i X + e \qquad (3\text{-}1)$$

where Y is the annual percentage point change in the CPI-Food at Home price index and X is a vector of market structure and exogenous control variables suggested by economic theory to explain food prices. The analysis is performed using a data set consisting of 23 different MSAs over the 1992-2003 time period, resulting in a total of 253 observations.

## A Note about the Use of BLS CPI for Cross-Sectional Analysis

As noted earlier with respect to the analysis by Lamm (1981), the BLS states that:

> "an individual area index measures how much prices have changed over a specific period in that particular area; it does not show whether prices or living costs are higher or lower in that area relative to another. In general, the composition of the market basket and relative prices of goods and services in the market basket during the expenditure base period varies substantially across areas." (Bureau of Labor Statistics, 2004)

This means that performing cross-sectional analysis using any CPI figures (Lamm used the CPI-FAH index) would be an incorrect use of the CPI data. A way around this data issue is to compare the percentage change in price indexes over years.

In addition to the differences in price indices across metropolitan areas, Marion et al. (1993) explained that the BLS "blends in" the price data from the various supermarkets. The price data is obtained from the Consumer Expenditure Survey (conducted once every year) and the Continuing Point of Purchase Survey (conducted at random time intervals for selected MSAs). The published CPI figure for the current month is based on the price relative for the previous month only, and the next month is based on the price relative for

the current month only. Figure 3.1 shows how this process effectively "blends in" the price data when a supercenter or other format enters into a new market.

**Figure 3.1: CPI Price-Blending Example**

| Sample | Market Basket Cost | March | April | May |
|---|---|---|---|---|
| **A** | **Old sample without supercenters** | $150.00 | $165.00 | — |
| **B** | **New sample with supercenters** | — | $136.40 | $150.00 |
| | **CPI-FAH** | 100.0 | 110.0 | 121.0 |

Following Figure 3.1, suppose that supercenters introduced a lower total market basket cost. The released CPI figure for April will be computed based on the stores that were present in March and the old market basket from sample A. The CPI released figures intentionally hide the lower level of prices, or the direct effect, and the introduction of a new food retailing format into the market. However, the data collection for April covers sample A plus the new supercenter as well. To maintain consistency, a new market basket will be computed for April that phases in the new supercenter from sample B, thereby allowing future comparison in the market. The figures released in May then reflect all stores in the market because the comparison is now based on sample B. Note that the CPI still reflects a monthly 10% increase in prices, so even though supercenters may be represented in the BLS sample, the CPI would conceal any effect on price levels due to the introduction and expansion of supercenters. However, the CPI still captures the extent to which supercenters affect the prices charged by incumbent supermarkets, or the indirect effect. Since supercenters may lower or raise the amount of price changes within a market, it reflects the importance of studying the indirect effect; therefore, the indirect effect is examined in the analysis.

The following section discusses the different variables used in the analysis. A formal presentation of the econometric model and data examples are presented thereafter.

## Variable Definitions and Descriptions[13]

*Change in the CPI Food-At-Home Index* ($\Delta$CPI-FAH) – $\Delta$CPI-FAH is the percentage point change in the CPI Food-At-Home price index for each market area.

[13] Certain MSA geographical definitions from the BLS had different market definitions than those found from the other trade sources. The alterations to data obtained from various trade sources are explained in detail in the appendix.

$$\Delta CPI - FAH_{i,t} = \frac{CPI - FAH_{i,t} - CPI - FAH_{i,t-1}}{CPI - FAH_{i,t-1}} \times 100 \qquad (3\text{-}2)$$

The data for ΔCPI-FAH was collected from the U.S. BLS website for 25 different locations, using the average annual figure for each MSA. Unfortunately, two MSAs (Washington-Baltimore and Phoenix-Mesa) were incomplete and subsequently dropped from the analysis to maintain a balanced data set, resulting in 23 MSAs representing many different geographic regions of the U.S. Table 3.1 contains a list of the MSAs included in the analysis. The FAH index includes smaller grocery stores (mom and pop stores) and convenience stores that would ideally be excluded for purposes of this analysis; however, the prices of these smaller stores receive relatively little weight in nearly all the MSAs (Marion et al., 1993).

*Supercenter Market Share* (SCMS) – The variable SCMS is the sum of the market shares for Wal-Mart, Target, and Kmart supercenters within a market. SCMS is used to measure the nontraditional food retailing seller's concentration within a market. This market share variable can be interpreted as a measure of market power for the supercenter retailers. The market share values were obtained from various issues of Trade Dimension's *Market Scope*. Since supercenters are the latest form of grocery retailing, their impact on price changes is still questionable with respect to market share, however, it is believed that supercenters have a cost advantage and sell at lower prices, much like warehouse stores. Therefore, it is expected that increasing market share is negatively related to change in food prices.

*Relative Supercenter Market Share* (RSMS) – RSMS is the relative market share for the supercenters within a market area. RSMS is calculated as

$$RSMS_{i,t} = \frac{SCMS_{i,t}}{CR4_{i,t}} \times 100 \qquad (3\text{-}3)$$

RSMS serves as an approximation for the relative market power of supercenters within a market. Marion et al. (1979a) point out that since relative market share measures the relative competitive position of a firm in a market, it is more appropriate than plain market share in cross-sectional analysis involving many markets. Due to the distribution and cost efficiencies of supercenter retailers, it is hypothesized that RSMS is negatively related to price changes. In addition to the RSMS variable, RSMS is specified in a squared form, suggesting that initially, low RSMS levels should have little influence on price changes, but as RSMS increases, one can expect a negative impact on price changes, due in part to price cutting practices by incumbent retailers who are losing market share. Following the results of Marion (1998), incumbent firms should experience forms of strategic learning after some higher level of supercenter concentration is reached, thereby constraining further price impacts. However, the supercenter is still a rather new retailing format, so it is unknown whether strategic learning has taken place at this point in time.

*Change in Four-Firm Concentration Ratio* (ΔCR4) – ΔCR4 is the percentage point change in the sum of the four largest firms' market share within a market.

$$\Delta CR4_{i,t} = \frac{CR4_{i,t} - CR4_{i,t-1}}{CR4_{i,t-1}} \times 100 \qquad (3\text{-}4)$$

ΔCR4 serves as an approximation for the market power of the major sellers within a market. As fewer sellers control more of the food sales within a market, the remaining sellers begin to act interdependently rather than as independent competitors. This interdependence tends to lead to implicit or explicit forms of collusion that maintains price above the competitive level (Marion et al., 1979a). While economic theory does not specify what the critical level of concentration is in grocery retailing, it does predict that, increases in concentration lead to more firm interdependence, and hence, higher prices. ΔCR4 is hypothesized to have a positive relationship with price changes. Market share data was collected from Trade Dimension's *Market Scope*.

*Change in Herfindahl-Hirschman Index* (ΔHHI) – ΔHHI is the percentage point change in the sum of the squared market shares.

$$\Delta HHI_{i,t} = \frac{HHI_{i,t} - HHI_{i,t-1}}{HHI_{i,t-1}} \times 100$$
$$\text{where } HHI_i = \sum_{j=1}^{n_i} s_{i,j} \qquad (3\text{-}5)$$

and s is the market share for firm j in market i. ΔHHI is another approximation of market power within a MSA. The ΔHHI is used in place of ΔCR4 as the concentration variable for different models. The latest Department of Justice Merger Guidelines stated that "an increase in the HHI of more than 100 points in moderately concentrated markets (1000 < HHI < 1800) post-merger potentially raise significant competitive concerns," while "an increase in the HHI of more than 100 points [in highly concentrated markets] (1800 < HHI) are likely to create or enhance market power or facilitate its exercise" (Department of Justice, 1997). Therefore, it is hypothesized that as ΔHHI increases, price changes will increase, ceteris paribus. The HHI was created from the market share data collected from Trade Dimension's *Market Scope*.

*Change In Income* (ΔINC) – ΔINC is the percentage point change in "effective buying income."

$$\Delta INC_{i,t} = \frac{INC_{i,t} - INC_{i,t-1}}{INC_{i,t}} \times 100 \qquad (3\text{-}6)$$

ΔINC is an approximation for average household after-tax disposable income. Data for "effective buying income" was collected from Sales and Marketing Management's *Annual*

*Survey of Buying Power* for each MSA. Demand becomes more inelastic as income rises, and so the monopoly price charged by firms is higher in more affluent markets compared to lower income markets. It has also been argued that as income increases, the demand for higher-quality products and higher levels of services increases as well. Therefore, we expect that as the change in income increases, the change in prices should follow increase as well.

*Change in Population* (ΔPOP) – ΔPOP is the percentage point change in a market's population.

$$\Delta POP_{i,t} = \frac{POP_{i,t} - POP_{i,t-1}}{POP_{i,t-1}} \times 100 \qquad (3\text{-}7)$$

ΔPOP serves as a proxy for the amount of growth that takes place within a market. It is expected that as a market experiences higher growth levels, the demand for items will increase, store capacity should be fully utilized, and thus, prices should be higher. Conversely, if market growth slows, one would expect store capacity to be underutilized, demand lowers, and so more competitive action will ensue in the market between retailers, culminating in lower prices. Therefore, we hypothesize the change in population to be positively related to the change in prices. Population data was obtained from Trade Dimension's *Market Scope*.

*Change in Electricity* (ΔELEC) – ΔELEC is the percentage point change in the CPI-Electricity index in a market.

$$\Delta ELEC_{i,t} = \frac{ELEC_{i,t} - ELEC_{i,t-1}}{ELEC_{i,t}} \times 100 \qquad (3\text{-}8)$$

ΔELEC serves as an approximation for the electricity costs for a supermarket. As the cost of electricity increases for a grocery retailer, one would expect prices to increase accordingly, reflecting the passing on of higher costs from the seller to the consumer. We hypothesize that ΔELEC is positively related to the change in prices. The CPI-Electricity data was obtained from the U.S. BLS.

*Change in Rent* (ΔRENT) – ΔRENT is the percentage point change in the CPI-Residential Rent index in a market.

$$\Delta RENT_{i,t} = \frac{RENT_{i,t} - RENT_{i,t-1}}{RENT_{i,t-1}} \times 100 \qquad (3\text{-}9)$$

ΔRENT approximates the change in the rents charged to grocery retailers within a market. The residential rent index was used because the CPI does not calculate a commercial rent index. As the cost of rent increases for a grocery retailer, we can expect that prices would increase accordingly, reflecting the higher rents charged to the seller being passed on to the

consumer. We hypothesize that ΔRENT is positively related to the change in prices. CPI-Residential Rent data was obtained from the U.S. BLS.

*Change in Labor Costs* (ΔLABOR) – ΔLABOR is the percentage point change in the ratio of payroll per dollar of sales. The change in labor costs, following from Marion (1993), is expressed as:

$$\Delta LABOR_{i,t} = \left( \left( \frac{payroll_t / sales_t}{payroll_{t-1} / sales_{t-1}} \right) - 1 \right) \times 100 \qquad (3\text{-}10)$$

ΔLABOR it approximates the change in labor costs and productivity. Labor costs account for nearly 60 percent of total supermarket costs (Marion, 1998). There are many different wage levels, number of full- and part-time employees, and productivity across the different markets in the analysis. The change in payroll per dollar of sales is a ratio of productivity. It facilitates the comparison of labor costs across various markets and different forms of employment. Since labor costs are such a large percentage of costs for food retailers, we hypothesize that ΔLABOR is positively related to changes in prices. Payroll data was obtained from the BLS (NAICS 4451) for each MSA. Sales data was obtained from Sales and Marketing Management's *Annual Survey of Buying Power*, which estimates the sales of all stores selling food primarily for consumption at home for each MSA.

*Entry* (E) – E is a binary variable denoting when de novo entry by a supercenter occurs within a market.

$$E_{i,t} = \begin{cases} 1 \text{ if de novo entry in a market by a non-traditional food retailing supercenter} \\ 0 \text{ otherwise} \end{cases}$$

The variable takes a value of one when there is de novo entry by a nontraditional supercenter retailer and a zero value otherwise. The entry variable is included to account for the price change effects from the introduction of the first supercenter within a market. Entry acts as the one time pricing shock response of incumbent retailers to a supercenter. It is hypothesized that de novo entry by a supercenter will lead to a downward adjustment in prices by incumbent food retailers. However, entry by a supercenter may have a smaller impact within a larger metropolitan area, since there may be multiple submarkets located within the larger market.

The base econometric model used is of the form:

$$\Delta CPI\text{-}FAH_{it} = \alpha + \underset{(<0)}{\beta_1 RSMS_{it}} + \underset{(>0)}{\beta_2 \Delta CONC_{it}} + \underset{(>0)}{\beta_3 \Delta INC_{it}} + \underset{(>0)}{\beta_4 \Delta POP_{it}} + \underset{(>0)}{\beta_5 \Delta ELEC_{it}} + \underset{(>0)}{\beta_6 \Delta RENT_{it}}$$
$$+ \underset{(>0)}{\beta_7 \Delta LABOR_{it}} + \underset{(<0)}{\beta_8 E_{it}} + e_{it}$$

(3-11) where i,t are area, year subscripts, respectively and $e \sim N(0, \sigma^2)$

Hypothesized signs are expressed in parentheses.

| | | |
|---|---|---|
| ΔCPI-FAH | = | the percentage change in CPI Food-at-Home price index for area i at time t |
| RSMS | = | the relative market share of supercenters for area i at time t |
| ΔCONC | = | the percentage change in concentration (either ΔCR4 or ΔHHI) for area i at time t |
| ΔINC | = | the percentage change in income for area i at time t |
| ΔPOP | = | the percentage change in population for area i at time t |
| ΔELEC | = | the percentage change in CPI-Electricity price index for area i at time t |
| ΔRENT | = | the percentage change in CPI-Residential Rent price index for area i at time t |
| ΔLABOR | = | the percentage change in the payroll/sales ratio for area i at time t |
| E | = | 1 if de novo entry by a supercenter for area i at time t, 0 otherwise |

## Data

The data for the analysis covered the 1992-2003 time period. By analyzing annual price changes, one year of observation was lost. The resultant data set consisted of annual price changes from 1993 to 2003. This time frame was chosen to coincide with the first entry of a supercenter into any of the included MSAs. A list of the MSAs included in the analysis is presented in Table 3.1.

The data was collected from three primary sources: Trade Dimension's *Market Scope*, Sales and Marketing Management's *Annual Survey of Buying Power*, and the BLS. MSA definitions varied with each data source. In Table 3.1, MSAs denoted with an asterisk underwent corrections to maintain consistency across data sources. An explanation of the corrections is provided in the appendix.

Summary statistics for the base model are presented in Table 3.2. The average for all variables ranged from 0.083 to 3.26 units. Considerable variation was present in the two concentration variables. The large negative CR4 and HHI changes were present in Milwaukee in 1998 when Pick N Save divested 25 stores, resulting in a drop from the largest food retailer to the 5$^{th}$ largest retailer in the MSA. Likewise, Milwaukee observed the largest positive change in HHI in 2002, while Pittsburg experience the largest positive change in CR4 in 1993. The electricity and labor variables also had considerable variation, in terms of maximum and minimum values observed. Electricity rate changes were especially volatile in Los Angeles where the minimum and maximum percentage change values were observed in 2002 and 2003, respectively. The average value for the entry variable suggests that de novo entry occurred in 8.3% of the observations.

**Table 3.1: MSAs Included in the Study**

| |
|---|
| Atlanta, GA |
| Boston-Brockton-Nashua, MA-NH-ME-CT |
| Chicago-Gary-Kenosha, IL-IN-WI * |
| Cincinnati-Hamilton, OH-KY-IN |
| Cleveland-Akron, OH * |
| Dallas-Ft. Worth, TX * |
| Denver-Boulder-Greeley, CO |
| Detroit-Ann Arbor-Flint, MI * |
| Houston-Galveston-Brazoria, TX |
| Kansas City, MO-KS |
| Los Angeles-Riverside-Orange County, CA * |
| Miami-Ft. Lauderdale, FL * |
| Milwaukee-Racine, WI |
| Minneapolis-St. Paul, MN-WI |
| New York-Northern New Jersey-Long Island, NY-NJ-CT-PA * |
| Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD * |
| Pittsburg, PA |
| Portland-Salem, OR-WA |
| St. Louis, MO-IL |
| San Diego, CA |
| San Francisco-Oakland-San Jose, CA * |
| Seattle-Tacoma-Bremerton, WA * |
| Tampa-St. Petersburg-Clearwater, FL |

**Table 3.2: Summary Statistics for the Base Model (1993-2003)**

| Variable | ΔCPI-FAH | SCMS | RSMS | ΔCR4 | ΔHHI | ΔINC | ΔPOP | ΔELEC | ΔRENT | ΔLABOR | E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average** | 2.60 | 2.45 | 3.46 | 1.06 | 2.80 | 1.48 | 1.50 | 1.44 | 3.26 | 0.38 | 0.083 |
| **Minimum** | -0.87 | 0.00 | 0.00 | -28.45 | -49.61 | -18.87 | -11.09 | -34.81 | -1.07 | -21.98 | 0.00 |
| **Maximum** | 8.23 | 26.00 | 38.58 | 57.85 | 88.51 | 15.53 | 19.68 | 60.89 | 10.63 | 25.31 | 1.00 |
| **Median** | 2.54 | 1.00 | 1.40 | 0.00 | 0.57 | 3.60 | 1.04 | 0.44 | 3.13 | 1.05 | 0.00 |
| **St. Dev.** | 1.45 | 4.01 | 5.71 | 7.34 | 15.25 | 6.18 | 2.53 | 7.79 | 1.69 | 7.08 | 0.28 |

# Chapter 4: Analysis and Results

The base model was estimated using OLS regression techniques. Subsequent tests were performed to determine whether fixed and/or random effects are present in the data. Additional tests were performed to determine if autocorrelation and/or heteroscedasticity were present in the data. After the identification of possible sources of error in the estimation, changes were made to correct for autocorrelation by assuming an AR(1) error structure and additional changes were made to correct for heteroscedasticity by employing panel corrected standard errors (PCSE). An in-depth discussion of these procedures is presented below, followed by a presentation of the results of the analysis.

## Estimation

The first step in the estimation process was to perform OLS regression analysis on the base model presented in (3-11). Results were very similar for the various regressions performed[14]. The next step in the analysis was to determine whether fixed or random effects are present in the time-series cross-sectional data set.

A model with random effects refers to a regression with a random constant term (Greene, 2003).

$$\begin{aligned}\Delta CPI\text{-}FAH_{it} = {} & \alpha + \beta_1 RSMS_{it} + \beta_2 \Delta CONC_{it} + \beta_3 \Delta INC_{it} + \beta_4 \Delta POP_{it} + \beta_5 \Delta ELEC_{it} + \beta_6 \Delta RENT_{it} \\ & + \beta_7 \Delta LABOR_{it} + \beta_8 E_{it} + u_i + e_{it}\end{aligned} \quad (4\text{-}1)$$

The intercept is a random outcome variable, which is a function of the mean value plus a random error; the random error, $u_i$, is specific to each city, and is constant over time. To test for random effects, Breusch and Pagan (1980) devised a Lagrange multiplier test statistic to signify the presence of random effects in the model. The test statistic is as follows:

$$LM = \frac{NT}{2(T-1)}\left[\frac{T^2\bar{e}'\bar{e}}{SSE} - 1\right]^2 = \frac{253}{2(11-1)}\left[\frac{11^2 \times 3.5547}{490.6325} - 1\right]^2 = 0.1924 \quad (4\text{-}2)$$

where $\bar{e}$ is a $n \times 1$ vector of average residuals for each MSA from the base models, N is the number of MSAs in the analysis, T is the number of time periods, and SSE is the sum of squared errors. The test statistic is distributed chi-squared with one degree of freedom, where the critical value is 3.8414 for a 5 percent level of significance. Since this value is greater than our test statistic, we cannot reject the null hypothesis of no random effects

[14] Test results presented below are based on model 1.a where the concentration variable and supercenter market share variable were ΔHHI and RSMS respectively.

within the data. That is, the data provides evidence that the constant term is not a random variable.

After finding no random effects, the models were expanded to test for fixed group and/or time effects. This process was accomplished by adding binary variables that represented either a selected MSA or time period. The different fixed effects models were of the form

$$\Delta CPI\text{-}FAH_{it} = \alpha + \beta_1 RSMS_{it} + \beta_2 \Delta CONC_{it} + \beta_3 \Delta INC_{it} + \beta_4 \Delta POP_{it} + \beta_5 \Delta ELEC_{it} + \beta_6 \Delta RENT_{it} + \beta_7 \Delta LABOR_{it} + \beta_8 E_{it} + \sum_{j=1}^{N-1} \beta_{j+8} Dj_t + e_{it} \quad (4\text{-}3)$$

or

$$\Delta CPI\text{-}FAH_{it} = \alpha + \beta_1 RSMS_{it} + \beta_2 \Delta CONC_{it} + \beta_3 \Delta INC_{it} + \beta_4 \Delta POP_{it} + \beta_5 \Delta ELEC_{it} + \beta_6 \Delta RENT_{it} + \beta_7 \Delta LABOR_{it} + \beta_8 E_{it} + \sum_{j=1}^{T-1} \beta_{j+8} Dj_i + e_{it} \quad (4\text{-}4)$$

Estimates were obtained using OLS, where Dj takes the form of either MSA (4-3) or time (4-4) binary variables. Joint significance tests were performed to assess the significance of MSA group or time effects within models.

The F statistic testing for the significance of MSA group effects from (4-3) was

$$F[22,222] = \frac{\left(R^2_{MSA} - R^2_{BASE}\right)/\left(N-1\right)}{\left(1-R^2_{MSA}\right)/(NT-N-k)} = \frac{\left(0.1229-0.0501\right)/22}{\left(1-0.1229\right)/222} = 0.8344 \quad (4\text{-}5)$$

where k is the number of regressors (not including binary variables), BASE refers to the base regression model 1.a from Table 4.1, and MSA refers to the group effects model. At a 5 percent level of significance, the critical value for $F_{22,222} = 1.5904$. Therefore, we cannot reject the null hypothesis of no group effects.

Using the same test, the F statistic testing for time effects in (4-4) was

$$F[10,234] = \frac{\left(R^2_{TIME} - R^2_{BASE}\right)/\left(T-1\right)}{\left(1-R^2_{TIME}\right)/(NT-T-k)} = \frac{\left(0.2591-0.0501\right)/10}{\left(1-0.2591\right)/234} = 6.5744 \quad (4\text{-}6)$$

where TIME refers to the time effects model. At a 5 percent level of significance, the critical value for $F_{10,234}$ is 1.8713. Therefore, we reject the null hypothesis of no time effects. Because of this result, the remaining models to be evaluated are fixed time effects models. The results for the fixed effects OLS model and subsequent test statistics are shown in table 4.2.

Using the fixed effects model, tests were performed to determine if the presence of autocorrelation and/or heteroscedasticity exists within the data set. Bhargava et al. (1982) modified the Durbin-Watson test for autocorrelation to extend into the fixed effects model. The new statistic arises from

$$d = \frac{\sum_{i=1}^{n}\sum_{t=2}^{T}\left(e_{i,t} - e_{i,t-1}\right)^2}{\sum_{i=1}^{n}\sum_{t=1}^{T} e_{i,t}{}^2} \qquad (4\text{-}7)$$

Autocorrelation was present in each model tested. In addition, a Breusch-Pagan test was performed to test for the presence of heteroscedasticity. The test statistic from the Breusch-Pagan test was 168.1853, and with the chi-squared critical value of 34.8053, this indicates the presence of heteroscedasticity in the model.

Beck and Katz (1995) suggest that the most efficient way to correct for both autocorrelation and heteroscedasticity in a time-series cross-sectional data set is to attain PCSE. They argue that the standard errors attained from feasible GLS estimates of the time-series cross-sectional data will overestimate the significance of the independent variables, whereas PCSE are closer to the true values. PCSE is similar to White's

robust standard errors, but adjusts for the time-series cross-sectional arrangement of the data as well.

Following Beck and Katz (1995), we assume that

$$COV(\hat{\beta}) = \sigma^2 (X'X)^{-1}(X'\Omega X)(X'X)^{-1} \qquad (4\text{-}8)$$

when we have autocorrelated and heteroscedastic errors. First, corrections are made for autocorrelation. It was assumed that an AR(1) structure is present in error term, $e_{i,t} = \rho_i e_{i,t-1}$, and

that ρ varies across MSAs. N different ρ values are present, and were subsequently estimated. The values for ρ are presented in Table 4.3.

The coefficient estimates were then obtained using

$$\hat{\beta} = (X'\Psi^{-1}X)^{-1}X'\Psi^{-1}Y \qquad (4\text{-}9)$$

where $\Psi^{-1}{}_i = \begin{bmatrix} 1 & -\rho_i & 0 & . & 0 & 0 \\ -\rho_i & 1+\rho_i^2 & -\rho_i & . & 0 & 0 \\ 0 & -\rho_i & 1+\rho_i^2 & . & 0 & 0 \\ . & . & . & . & . & . \\ 0 & 0 & 0 & . & 1+\rho_i^2 & -\rho_i \\ 0 & 0 & 0 & . & -\rho_i & 1 \end{bmatrix}$ along the diagonal, $\begin{bmatrix} 0 & 0 & . & 0 \\ 0 & 0 & . & 0 \\ . & . & . & . \\ 0 & 0 & . & 0 \end{bmatrix}$ on the off-diagonal, and i = (1, … , N). $\Psi^{-1}{}_i$ is dimension T×T , therefore, $\Psi^{-1}$ is dimension NT×NT. The AR(1) OLS coefficient values produced are incorrect unless we attain correct estimates for the variance of the OLS estimator. To obtain correct estimates of the variance, we use the residuals from (4-9) to form $\hat{E}$, which is a T×N matrix of residuals. $\hat{\Sigma}$ is estimated by

$$\hat{\Sigma} = \frac{(\hat{E}'\hat{E})}{T} \tag{4-10}$$

where $\hat{\Sigma}$ is dimension N×N, and we can then estimate $\Omega$ by

$$\hat{\Gamma} = \hat{\Sigma} \otimes I_T \tag{4-11}$$

where $\otimes$ is the Kronecker product and $I_t$ is an identity matrix of dimension T. Finally, the panel-corrected standard errors are computed by taking the square root of the diagonal elements of

$$COV_{PC}(\hat{\beta}) = \sigma^2 (X'X)^{-1} X'(\hat{\Gamma}) X (X'X)^{-1} \tag{4-12}$$

This correction accounts for "the contemporaneous correlation of the errors (and perforce heteroscedasticity)" (Beck and Katz, 1995). Since we now have correct estimates of the variance, the coefficient values obtained from (4-8) are efficient estimators. The results of the PCSE transformation are provided in Table 4.4 and are discussed in the following section.

## Results

Based upon either the adjusted $R^2$ value or the Akaike Information Criterion (AIC)[15], the model that had the best overall fit was model 3.c. The results did not supported the hypothesis that the increasing relative market share of supercenters has a negative effect on food prices; the coefficients were not statistically different from zero. There is evidence, however, that $RSMS^2$ is marginally significant,[16] suggesting that there are price impacts when significant market share has been acquired in a market area. Joint significance tests of $RSMS + RSMS^2$, evaluated at the data means, further established the insignificant impact of supercenters on MSA food price changes.

Market concentration, expressed as ΔHHI, was statistically significant and positive, insisting that as the concentration within a market increases, one can expect an increase in food prices, ceteris paribus. From the coefficients, we can expect that a ten percentage point increase in HHI would lead to an increase in food prices of .12%. ΔCR4 was not statistically different from zero. It is possible that CR4 is too limited to describe overall market concentration since it focuses on the largest four firms only, whereas many markets within the study had more than 10 supermarket chains represented in the respective markets.

The coefficient for ΔINC was not statistically different from zero. Because the data for income was collected from a different trade publication than the market share data and CPI figures, this result may be due to data collection differences. All coefficients for the ΔINC were very small, suggesting income has very little impact on food prices.

The coefficients for ΔPOP, ΔELEC, and ΔLABOR were not statistically significant. This means that market growth, change in electricity costs, and change in labor costs do not have significant impacts on food prices. This is interesting because changes in labor or electricity costs are not directly passed onto the consumer, but appear to be absorbed by the food retailer. Furthermore, it appears that market growth does not affect the pricing decisions of supermarkets.

ΔRENT was positive and statistically significant in every model estimated, suggesting that when the rental rate for supermarkets increases, supermarkets tend to pass on this cost to consumers in the form of price increases. ΔRENT also had the largest coefficient value of all percentage change variables. Using the coefficient from model 3.c, we see that a 10 percentage point increase in rental rates results in a 1.69% increase in food prices.

The entry variables were not statistically different from zero. The coefficient values varied due, apparently, to the supercenter market share variable used in the model. It appears that the impact of entry is understated due to the selection of the markets analyzed. The markets

---

[15] AIC= $NT \times \ln(RSS) + 2K$ where K is the number of regressors (including binary variables) and RSS is the residual sum of squares.

[16] Marginally significant refers to being statistically significant at the 10 percent, one tail level. It is a weak result and should be viewed with skepticism.

used in the analysis are some of the largest metropolitan areas in the U.S. It could be possible, if not probable, that within some of these markets, there are many different submarkets that better represent the relevant market area for consumers. For instance, a person living in the Long Island area of the New York City MSA would probably not be in interested in doing their grocery shopping in the Bergen-Passaic region of New Jersey, which is also part of the New York City MSA. Therefore, if a supercenter is opened in an MSA, its impact may be felt in the local area surrounding the supercenter, but not across the entire MSA.

Since the late 1990s, supercenters, mostly Wal-Mart, have experienced huge growth in the total number of stores and markets penetrated. It is possible that the impacts of supercenters are different in the last half of the study period compared to the first half. Also, the later half of the study period experienced many different mergers and acquisitions between some of the largest grocers in the U.S. To account for these changing market conditions, the data set was partitioned into two different groups, one comprising of 1993-1997 (NT=115), and the other 1998-2003 (NT=138). A Chow test (Chow, 1960) was used to determine if the structural break was present. The resultant Chow test statistic was

$$F_{10,233} = \frac{(SSE_{Full} - SSE_{First} - SSE_{Second})/K}{(SSE_{First} + SSE_{Second})/(NT_{First} + NT_{Second} - 2K)} = \frac{(504.1838 - 242.7799 - 213.7777)/10}{(242.7799+213.7777)/(115+138-20)} = 2.4305 \quad (4\text{-}13)$$

where first refers to the 1993-1997 time period, second refers to 1998-2003, and full is the entire study period (1993-2003). The F critical value is 1.8715 at the 5% level of significance, and so we reject the hypothesis that the coefficients in the two time periods are the same. The summary statistics for the first and second half are presented in Tables 4.5 and 4.7, respectively. The models were estimated in the PCSE time-effects form.

Results from the first half of the data (shown in Table 4.6) implied that all market structure variables were insignificant with respect to the change in food prices. Supercenter impact and ΔCR4 were again insignificant, following the results of the full model, but ΔHHI is now insignificant as well. This implies that from 1993 to 1997, introduction of supercenters and the small changes to HHI did not influence the market. The market variables, ΔINC and ΔPOP, were insignificant. Supermarket cost variables followed the results of the full model, with ΔRENT the only variable statistically different from zero.

The peculiar result was regarding the entry variable. In all forms of the model, it was insignificant. This may again be due to submarkets within an MSA. If a MSA has multiple submarkets, incumbent firms may engage in price competition with a supercenter in that submarket, but may be subsidized by higher prices charged by another store of that particular firm located in a different submarket of the MSA. It is also possible that the entrance into a market by a supercenter may have not received the same attention in this earlier time period compared to the later.

The second half (Table 4.8) yielded some different results compared to the first half, while some remained the same. The supercenter market share variables did not have a significant impact on food prices, further solidifying the result that supercenters have not made significant price impacts in metropolitan areas; however, $RSMS^2$ was marginally significant, as in the full model, which may suggest that supercenters are beginning to have price impacts on traditional supermarkets. The joint test again revealed an insignificant impact of supercenters on food price changes. Both concentration variables were positive and significant implying that as market concentration increases, we can expect higher food prices. This result is very relevant because the late 1990s had so many large mergers and acquisitions in food retailing. It appears that if this merger activity ended in more highly concentrated markets, consumers in these markets should have also experienced higher food prices.

ΔINC and ΔPOP were again insignificant. Supermarket cost variables were also insignificant for the most part. ΔRENT was only significant in two out of six models, and even then at only the 10 percent level; however, ΔRENT still had the largest coefficient values of the non-binary variables. ΔLABOR and ΔELEC were both insignificant. This result is peculiar since there has been much made about rising electricity costs and labor disputes over the past few years, whereas the results indicate that these costs have been mainly absorbed by the food retailers.

The entry variable was once again insignificant. Again, we believe this depends mostly on the availability of data representing the relevant market being analyzed. If smaller market areas were used in the analysis, it is quite possible that de novo entry by a supercenter would have a significant impact on food prices.

**Table 4.1: Base Model OLS Results**

| | model 1.a | | model 1.b | | model 1.c | | model 1.d | |
|---|---|---|---|---|---|---|---|---|
| Intercept | 2.3319 *** | (10.7023) | 2.3578 *** | (10.8178) | 2.2910 *** | (10.3341) | 2.3121 *** | (10.4113) |
| RSMS | -0.0321 * | (-1.9199) | -0.0321 * | (-1.9134) | 0.0006 | (-0.0168) | 0.0029 | (-0.0780) |
| $RSMS^2$ | | | | | -0.0013 | (-1.0013) | -0.0014 | (-1.0652) |
| CRSMS | | | | | | | | |
| ΔHHI | 0.0105 * | (1.7485) | | | 0.0105 * | (1.7564) | | |
| ΔCR4 | | | 0.0147 | (1.1597) | | | 0.0156 | (1.2294) |
| ΔINC | -0.0120 | (-0.7744) | -0.0123 | (-0.7867) | -0.0122 | (-0.7840) | -0.0126 | (-0.8024) |
| ΔPOP | 0.0369 | (0.9569) | 0.0303 | (0.7816) | 0.0406 | (1.0476) | 0.034 | (0.8743) |
| ΔELEC | 0.0162 | (1.3733) | 0.0158 | (1.3311) | 0.0175 | (1.4724) | 0.0119 | (1.4416) |
| ΔRENT | 0.0818 | (1.5090) | 0.0813 | (1.4890) | 0.0762 | (1.3984) | 0.0548 | (1.3812) |
| ΔLABOR | 0.0085 | (0.6312) | 0.007 | (0.5160) | 0.008 | (0.5931) | 0.0136 | (0.4690) |
| ENTRY | 0.192 | (0.5741) | 0.2064 | (0.6138) | 0.1527 | (0.4535) | 0.3383 | (0.4905) |
| $R^2$ | 0.0501 | | 0.0434 | | 0.054 | | 0.0479 | |
| Adj. $R^2$ | 0.0189 | | 0.0121 | | 0.0189 | | 0.0126 | |
| AIC | 848.3614 | | 812.4186 | | 869.3573 | | 839.0744 | |
| F | 1.6073 | | 1.3848 | | 1.5402 | | 1.3577 | |

Significance (Two-Tailed Test)

*** = 1 Percent

** = 5 Percent

* =10 Percent

t-ratios are in parenthesis

Dependent variable = ΔCPI-FAH

## Table 4.2: Fixed Effects OLS Model Results

| | model 2.a | | model 2.b | | model 2.c | | model 2.d | |
|---|---|---|---|---|---|---|---|---|
| Intercept | 2.1658 *** | (6.0412) | 2.1605 *** | (5.9949) | 2.1248 *** | (5.9164) | 2.1161 *** | (5.8629) |
| RSMS | -0.0175 | (-1.0328) | -0.017 | (-1.0015) | 0.0246 | (0.6976) | 0.0275 | (0.7751) |
| $RSMS^2$ | | | | | -0.0016 | (-1.3570) | -0.0017 | (-1.4293) |
| CRSMS | | | | | | | | |
| ΔHHI | 0.0116 ** | (2.0644) | | | 0.0115 ** | (2.0561) | | |
| ΔCR4 | | | 0.0171 | (1.4443) | | | 0.0178 | (1.5042) |
| ΔINC | 0.0042 | (0.1314) | 0.0048 | (0.1486) | -0.0003 | (0.0007) | 0.0003 | (0.0085) |
| ΔPOP | 0.0282 | (0.7707) | 0.0212 | (0.5775) | 0.033 | (0.8977) | 0.0262 | (0.7112) |
| ΔELEC | 0.001 | (0.0839) | 0.0008 | (0.0723) | 0.0028 | (0.2420) | 0.0029 | (0.2445) |
| ΔRENT | 0.1350 ** | (2.4446) | 0.1350 ** | (2.4321) | 0.1372 ** | (2.4877) | 0.1375 ** | (2.4810) |
| ΔLABOR | 0.0071 | (0.5378) | 0.0051 | (0.3792) | 0.0067 | (0.5071) | 0.0046 | (0.3417) |
| ENTRY | 0.0074 | (0.0235) | 0.0095 | (0.0302) | -0.0498 | (-0.1581) | -0.0489 | (-0.1544) |
| T1993 | -0.4786 | (-1.0228) | -0.47 | (-0.9976) | -0.4522 | (-0.9672) | -0.4454 | (-0.9468) |
| T1994 | 0.3298 | (0.6988) | 0.3943 | (0.8349) | 0.3333 | (0.7075) | 0.3957 | (0.8397) |
| T1995 | 0.6643 | (1.1635) | 0.7323 | (1.2801) | 0.5871 | (1.0250) | 0.6488 | (1.1308) |
| T1996 | 1.2610 *** | (2.8639) | 1.2705 *** | (2.8677) | 1.2442 *** | (2.8298) | 1.2547 *** | (2.8375) |
| T1997 | -0.0199 | (-0.0448) | 0.011 | (0.0246) | -0.0363 | (-0.0816) | -0.0068 | (-0.0152) |
| T1998 | -0.5841 | (-1.3682) | -0.5885 | (-1.3706) | -0.6212 | (-1.4546) | -0.6256 | (-1.4576) |
| T1999 | -0.5465 | (-1.2046) | -0.5 | (-1.0987) | -0.5722 | (-1.2624) | -0.5278 | (-1.1613) |
| T2000 | -0.28 | (-0.6093) | -0.2508 | (-0.5433) | -0.3284 | (-0.7138) | -0.3016 | (-0.6527) |
| T2001 | 0.6279 | (1.4792) | 0.6454 | (1.5130) | 0.5074 | (1.1718) | 0.5181 | (1.1917) |
| T2002 | -1.3485 *** | (-3.0797) | -1.3048 *** | (-2.9658) | -1.4449 *** | (-3.2631) | -1.4062 *** | (-3.1624) |
| | | | | | | | | |
| D.W. | 0.0657 | | 0.0635 | | 0.0658 | | 0.0636 | |
| B.P. | 168.1853 *** | | 169.6744 *** | | 171.5894 *** | | 173.7257 *** | |
| $R^2$ | 0.2591 | | 0.2523 | | 0.2649 | | 0.2588 | |
| Adj. $R^2$ | 0.2021 | | 0.1948 | | 0.205 | | 0.1984 | |
| AIC | 1281.3158 | | 1277.5408 | | 1291.9074 | | 1285.9756 | |
| F | 4.5465 *** | | 4.3863 *** | | 4.4196 *** | | 4.2828 *** | |

Significance (Two-Tailed Test)

*** = 1 Percent

** = 5 Percent

* =10 Percent

t-ratios are in parenthesis

Dependent variable = ΔCPI-FAH

**Table 4.3: MSA specific ρ estimates**[17]

| Metropolitan Statistical Area | ρ Values |
|---|---|
| Atlanta, GA | 0.0379 |
| Boston-Brockton-Nashua, MA-NH-ME-CT | 0.3332 |
| Chicago-Gary-Kenosha, IL-IN-WI | 0.3594 |
| Cincinnati-Hamilton, OH-KY-IN | 0.2801 |
| Cleveland-Akron, OH | 0.0508 |
| Dallas-Ft. Worth, TX | -0.1332 |
| Denver-Boulder-Greeley, CO | -0.3991 |
| Detroit-Ann Arbor-Flint, MI | -0.0562 |
| Houston-Galveston-Brazoria, TX | -0.3192 |
| Kansas City, MO-KS | 0.1228 |
| Los Angeles-Riverside-Orange County, CA | 0.3038 |
| Miami-Ft. Lauderdale, FL | 0.3540 |
| Milwaukee-Racine, WI | 0.2797 |
| Minneapolis-St. Paul, MN-WI | 0.1833 |
| New York-Northern New Jersey-Long Island, NY-NJ-CT-PA | 0.3849 |
| Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD | -0.2633 |
| Pittsburg, PA | -0.0407 |
| Portland-Salem, OR-WA | 0.1334 |
| St. Louis, MO-IL | 0.2434 |
| San Diego, CA | -0.2111 |
| San Francisco-Oakland-San Jose, CA | 0.1667 |
| Seattle-Tacoma-Bremerton, WA | 0.1008 |
| Tampa-St. Petersburg-Clearwater, FL | 0.1498 |

[17] Similar values were attained for ρ estimates for each model. The values presented were estimates used in model 3.c.

**Table 4.4: PCSE Model Results**

| | model 3.a | | model 3.b | | model 3.c | | model 3.d | |
|---|---|---|---|---|---|---|---|---|
| Intercept | 2.2242 *** | (8.8264) | 2.2141 *** | (8.6611) | 2.1369 *** | (8.9268) | 2.1211 *** | (8.7796) |
| RSMS | -0.0255 | (-1.1614) | -0.0256 | (-1.1614) | 0.023 | (0.6967) | 0.0247 | (0.7392) |
| $RSMS^2$ | | | | | -0.0017 | (-1.3451) | -0.0018 | (-1.3630) |
| CRSMS | | | | | | | | |
| ΔHHI | 0.0118 * | (1.9597) | | | 0.012 ** | (2.0020) | | |
| ΔCR4 | | | 0.0186 | (1.5296) | | | 0.0192 | (1.5988) |
| ΔINC | -0.0016 | (-0.0527) | -0.0005 | (-0.0156) | -0.0073 | (-0.2515) | -0.0061 | (-0.2114) |
| ΔPOP | 0.0265 | (0.7811) | 0.021 | (0.6095) | 0.0265 | (0.7706) | 0.0206 | (0.5896) |
| ΔELEC | 0.0023 | (0.2176) | 0.0026 | (0.2417) | 0.0039 | (0.3604) | 0.0044 | (0.3984) |
| ΔRENT | 0.1632 *** | (3.2376) | 0.1601 *** | (3.1389) | 0.1687 *** | (3.4222) | 0.1656 *** | (3.3230) |
| ΔLABOR | 0.0075 | (0.5229) | 0.0058 | (0.3965) | 0.0063 | (0.4440) | 0.0044 | (0.3045) |
| ENTRY | -0.0232 | (-0.0768) | -0.0206 | (-0.0678) | -0.063 | (-0.2121) | -0.0635 | (-0.2129) |
| T1993 | -0.5250 * | (-1.7846) | -0.5203 * | (-1.7841) | -0.4538 | (-1.6026) | -0.4452 | (-1.5850) |
| T1994 | 0.2179 | (0.7502) | 0.2919 | (1.0288) | 0.2726 | (0.9578) | 0.3496 | (1.2567) |
| T1995 | 0.5005 | (1.2438) | 0.5876 | (1.4692) | 0.4082 | (1.0189) | 0.5017 | (1.2556) |
| T1996 | 1.2150 *** | (4.9720) | 1.2430 *** | (5.0460) | 1.2282 *** | (5.0850) | 1.2582 *** | (8.1739) |
| T1997 | -0.1766 | (-0.6998) | -0.1319 | (-0.5262) | -0.1721 | (-0.6873) | -0.1245 | (-0.5008) |
| T1998 | -0.6789 *** | (-3.1427) | -0.6716 *** | (-3.0880) | -0.6754 ** | (-3.0754) | -0.6635 ** | (-3.0005) |
| T1999 | -0.6110 ** | (-2.3933) | -0.5591 ** | (-2.2252) | -0.6270 ** | (-2.4601) | -0.5740 ** | (-2.2870) |
| T2000 | -0.3619 | (-1.3914) | -0.326 | (-1.2595) | -0.3802 | (-1.4410) | -0.3396 | (-1.2914) |
| T2001 | 0.5505 *** | (2.6895) | 0.5573 *** | (2.7329) | 0.4333 * | (1.9128) | 0.4409 * | (-1.941) |
| T2002 | -1.4401 *** | (-7.0147) | -1.3694 *** | (-6.6257) | -1.5311 *** | (-6.9314) | -1.4553 *** | (-6.5322) |
| | | | | | | | | |
| $R^2$ | 0.2561 | | 0.2495 | | 0.2624 | | 0.2567 | |
| Adj. $R^2$ | 0.1989 | | 0.1918 | | 0.2023 | | 0.1961 | |
| AIC | 1281.3158 | | 1274.7424 | | 1289.5026 | | 1283.904 | |
| F | 4.4749 *** | | 4.3220 *** | | 4.3629 *** | | 4.2345 *** | |

Significance (Two-Tailed Test)

*** = 1 Percent

** = 5 Percent

* =10 Percent

t-ratios are in parenthesis

Dependent variable = ΔCPI-FAH

**Table 4.5: Summary Statistics for the First Half (1993-1997)**

| Variable | ΔCPI-FAH | SCMS | RSMS | ΔCR4 | ΔHHI | ΔINC | ΔPOP | ΔELEC | ΔRENT | ΔLABOR | E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average** | 2.97 | 1.18 | 1.71 | 2.18 | 4.86 | 1.35 | 1.34 | 1.10 | 2.73 | 2.02 | 0.13 |
| **Minimum** | -0.76 | 0.00 | 0.00 | -10.87 | -24.07 | -18.87 | -3.39 | -21.63 | -0.84 | -13.64 | 0.00 |
| **Maximum** | 8.23 | 8.70 | 10.93 | 57.85 | 78.17 | 10.12 | 19.68 | 35.59 | 7.24 | 21.49 | 1.00 |
| **Median** | 2.88 | 0.00 | 0.00 | 0.34 | 1.12 | 4.28 | 0.71 | 0.79 | 2.65 | 2.57 | 0.00 |
| **St. Dev.** | 1.50 | 1.72 | 2.49 | 8.74 | 15.88 | 7.36 | 2.48 | 4.99 | 1.35 | 5.89 | 0.34 |

**Table 4.6: PCSE First Half Model Results**

| | model 4.a | | model 4.b | | model 4.c | | model 4.d | |
|---|---|---|---|---|---|---|---|---|
| Intercept | 1.8819 *** | (5.2696) | 1.9012 *** | (5.3296) | 1.9268 *** | (5.0966) | 1.9547 *** | (5.1788) |
| RSMS | -0.0456 | (-1.0442) | -0.0434 | (-1.0167) | -0.1191 | (-0.7990) | -0.1282 | (-0.8613) |
| $RSMS^2$ | | | | | 0.0098 | (0.5041) | 0.0113 | (0.6012) |
| CRSMS | | | | | | | | |
| ΔHHI | 0.0059 | (0.5023) | | | 0.0051 | (0.4222) | | |
| ΔCR4 | | | 0.0054 | (0.3049) | | | 0.0051 | (0.2872) |
| ΔINC | 0.0069 | (0.1109) | 0.0107 | (0.1724) | 0.0019 | (0.0322) | 0.0045 | (0.0779) |
| ΔPOP | 0.0384 | (0.6150) | 0.0364 | (0.5904) | 0.0357 | (0.5680) | 0.0341 | (0.5527) |
| ΔELEC | -0.0096 | (-0.4242) | -0.0110 | (-0.4825) | -0.0121 | (-0.5152) | -0.0133 | (-0.5695) |
| ΔRENT | 0.2463 *** | (3.7978) | 0.2398 *** | (3.7819) | 0.2544 *** | (3.8861) | 0.2489 *** | (3.8694) |
| ΔLABOR | 0.0179 | (0.6245) | 0.0173 | (0.3879) | 0.0212 | (0.7269) | 0.0206 | (0.6877) |
| ENTRY | 0.1421 | (0.4265) | 0.1257 | (0.3758) | 0.2117 | (0.5899) | 0.2088 | (0.5754) |
| T1993 | -0.3891 | (-1.3923) | -0.3893 | (-1.3420) | -0.3789 | (-1.3248) | -0.3849 | (-1.2927) |
| T1994 | 0.3198 * | (1.7190) | 0.3349 * | (1.8699) | 0.3179 * | (1.6787) | 0.3288 * | (1.7988) |
| T1995 | 0.8053 | (0.7684) | 0.8845 | (0.8438) | 0.6859 | (0.7038) | 0.7352 | (0.7504) |
| T1996 | 1.2369 *** | (8.2243) | 1.2162 *** | (8.2803) | 1.2500 *** | (7.7333) | 1.2351 *** | (7.6063) |
| $R^2$ | 0.1780 | | 0.1760 | | 0.1735 | | 0.1711 | |
| Adj. $R^2$ | 0.0813 | | 0.0790 | | 0.0671 | | 0.0644 | |
| AIC | 465.9643 | | 464.6706 | | 465.0160 | | 463.4325 | |
| F | 1.8403 ** | | 1.8153 * | | 1.6306 * | | 1.6037 * | |

Significance (Two-Tailed Test)

*** = 1 Percent

** = 5 Percent

* =10 Percent

t-ratios are in parenthesis

Dependent variable = ΔCPI-FAH

**Table 4.7: Summary Statistics for Second Half (1998-2003)**

| Variable | ΔCPI-FAH | SCMS | RSMS | ΔCR4 | ΔHHI | ΔINC | ΔPOP | ΔELEC | ΔRENT | ΔLABOR | E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average** | 2.28 | 3.50 | 4.92 | 0.13 | 1.08 | 1.59 | 1.62 | 1.72 | 3.69 | -0.99 | 0.04 |
| **Minimum** | -0.87 | 0.00 | 0.00 | -28.45 | -49.61 | -11.53 | -11.09 | -34.81 | -1.07 | -21.98 | 0.00 |
| **Maximum** | 5.72 | 26.00 | 38.58 | 25.81 | 88.51 | 15.53 | 15.24 | 60.89 | 10.63 | 25.31 | 1.00 |
| **Median** | 2.19 | 2.25 | 2.92 | 0.00 | 0.22 | 1.96 | 1.27 | 0.00 | 3.60 | -0.43 | 0.00 |
| **St. Dev.** | 1.34 | 4.97 | 7.08 | 5.80 | 14.54 | 5.00 | 2.56 | 9.52 | 1.82 | 7.69 | 0.20 |

**Table 4.8: PCSE Second Half Model Results**

| | model 5.a | | model 5.b | | model 5.c | | model 5.d | |
|---|---|---|---|---|---|---|---|---|
| Intercept | 2.2590 *** | (5.9591) | 2.2398 *** | (5.7485) | 2.1145 *** | (5.7841) | 2.0851 *** | (5.5274) |
| RSMS | -0.0208 | (-0.7388) | -0.0218 | (-0.7648) | 0.0388 | (0.8084) | 0.0413 | (0.8288) |
| $RSMS^2$ | | | | | -0.0021 | (-1.4653) | -0.0022 | (-1.4890) |
| CRSMS | | | | | | | | |
| ΔHHI | 0.0181 ** | (2.5809) | | | 0.0183 *** | (2.6744) | | |
| ΔCR4 | | | 0.0388 ** | (2.3621) | | | 0.0405 ** | (2.6071) |
| ΔINC | 0.0246 | (1.0166) | 0.0226 | (0.9299) | 0.0159 | (0.6862) | 0.0132 | (0.5697) |
| ΔPOP | 0.0040 | (0.0827) | -0.0076 | (-0.1517) | 0.0012 | (0.0248) | -0.0106 | (-0.2162) |
| ΔELEC | 0.0032 | -0.3209 | 0.0051 | (0.4924) | 0.0058 | -0.5602 | 0.0077 | -0.7455 |
| ΔRENT | 0.1035 | (1.4610) | 0.1050 | (1.4624) | 0.1229 * | (1.8544) | 0.1254 * | (1.8658) |
| ΔLABOR | -0.0023 | (-0.1272) | -0.0038 | (-0.2103) | -0.0029 | (-0.1631) | -0.0043 | (-0.2449) |
| ENTRY | -0.1849 | (-0.4248) | -0.0931 | (-0.2132) | -0.2240 | (-0.5145) | -0.1226 | (-0.2822) |
| T1998 | -0.5075 ** | (-2.1980) | -0.4987 ** | (-2.1634) | -0.5208 ** | (-2.2899) | -0.5072 ** | (-2.2215) |
| T1999 | -0.6079 ** | (-2.3284) | -0.5276 ** | (-2.0553) | -0.6161 ** | (-2.4059) | -0.5349 ** | (-2.1099) |
| T2000 | -0.338 | (-1.4449) | -0.2727 | (-1.1938) | -0.3655 | (-1.5699) | -0.2911 | (-1.2661) |
| T2001 | 0.9037 *** | (3.7845) | 0.8893 *** | (3.8121) | 0.7388 *** | (3.4856) | 0.7156 *** | (3.4146) |
| T2002 | -1.1547 *** | (-4.4682) | -1.0841 *** | (-4.3118) | -1.3010 *** | (-4.9796) | -1.2333 *** | (-4.7952) |
| $R^2$ | 0.2753 | | 0.2639 | | 0.2863 | | 0.2757 | |
| Adj. $R^2$ | 0.1993 | | 0.1867 | | 0.2050 | | 0.1933 | |
| AIC | 608.8480 | | 603.0146 | | 616.2486 | | 611.0557 | |
| F | 3.6234 *** | | 3.4196 *** | | 3.5241 *** | | 3.3444 *** | |

Significance (Two-Tailed Test)

*** = 1 Percent

** = 5 Percent

* =10 Percent

t-ratios are in parenthesis

Dependent variable = ΔCPI-FAH

# Chapter 5: Policy Implications

## Summary

The nation's food retailing climate has changed dramatically over the past 15 years. The rapid expansion of supercenters, combined with numerous mergers and acquisitions have changed the efficiency requirements of all food retailers, while putting additional competitive pressure on incumbent stores. In response to this evolution in the food retailing industry and its impact on consumers, this study examined the relationship between market structure variables and price across 23 MSAs from 1993 to 2003. The PCSE model allowed for correction of heteroscedasticity and autocorrelation within the model, providing robust results for interpretation.

Growing expansion and subsequent market share of supercenters was found to be statistically insignificant in explaining food price changes in metropolitan markets both at the mean of the supercenter market share data and across the range of supercenter market shares. Thus, no evidence could be found that supercenters exert structural changes leading to increased competition that induces rivalry among its competitors or that they lead to substantial consumer benefits. It is worth noting that noting that the squared supercenter market share term ($RSMS^2$) was negative and marginally significant in the full and second half models. This result may suggest that if the current rate of supercenter development continues, it would be advisable to retest the hypothesis that supercenters are causing downward pressure on prices in the U.S. food retailing industry.

We also tested the impacts of the initial entry of supercenters into each MSA. Like the market share results, entry did not exhibit significance in any of the models. This result is peculiar since much focus of grocery trade magazines in the past few years has been on supercenters opening locations near other long established supermarkets and how supercenters impact the stores, even leading to store closure.

Our findings on the role of supercenters market share and entry stands in contrast to the role of warehouse stores found in earlier studies from Marion (1993) (years studied 1977-1987) and from Marion (1998) (years studied 1977-1992). In those studies, which used the same independent variable, the downward price effects were evident in the market *while* warehouse market share was emerging and continued until they stabilized in the 30% market share range. Marion also found that *entry* of warehouses was statistically significant in reducing price.

Why supercenter market share impacts on price were not present from 1992 forward is probably due to a combination of factors. First, perhaps much of the strategic restructuring from the influence of warehouses may have limited the need for additional changes to the market. Indeed, when Marion (1998) partitioned his data, he found that warehouse effects in the latter years of his study (1985-1992) were not significant. Therefore, it is certainly possible that incumbent retailers simply had continued to emphasize non-price strengths of individual stores that compete directly with a supercenter, thus lowering the necessity to

compete on a price basis. Second, perhaps supermarkets pay less attention to supercenters if time has become a more valuable commodity in the consumer's utility function, leading to more spatially defined markets. Another plausible explanation is that supercenters restructure the market by encouraging merger and acquisition activity, which in turn mitigates the downward price effects. This is consistent with the merger wave that began in 1997 (see chapter 1) and, as we discuss next, this explanation is supported by the results that increased concentration had upward effects on prices.

The results from the analysis did reveal a positive relationship between changes in concentration and price changes, which is consistent with the results of ten food retailing studies (Marion et al., 1979; Hall et al., 1979; Lamm, 1981; Cotterill, 1983; Meyer et al., 1983; Cotterill, 1986; Marion et al., 1993; Marion, 1998; Binkley and Connor, 1998; and Yu and Connor, 2002). This result is also consistent with the conclusion of the reviewed findings in Weiss (1989). The variable ΔHHI (percent changes in the Herfindahl-Hirschman index) was significant during the full and second half results. ΔCR4 was only marginally significant but may have been a poor representation of market concentration within the large urban market areas studied.

Interesting, and contrary to Newmark (1990), the changes in income were found statistically insignificant in all versions of the model estimated. Of the store cost variables, only changes in rental rates were found to be highly significant in explaining food price changes. This suggests that food retailers pay close attention to fixed capital costs, which may be viewed as more permanent shocks than in-store operating costs such as electricity and labor. The variable ΔPOP (population changes) was also insignificant in every model.

## Policy Implications

The study period examined was one of exceptional merger activity in the U.S. While the results do not provide evidence whether there is a significant positive or negative relationship between supercenter market share and prices, they do suggest that there is a direct positive relationship between concentration and prices. The U.S. Consumer Expenditure Survey (2003) stated that the average household food at home expenditure was $3,129. Using the results from model 3.c, if merger activity resulted in the average increase in the HHI of 2.8 percent from Table 3.2, we would expect, on average, an increase in food at home expenditures of $1.05, ceteris paribus. If an average change in HHI occurred during each year of the study, the consumer would pay $11.55 more in food in 2003 versus 1992. Additionally, if merger activity generated scale economies for supermarkets (which is often the argument to support a merger), it does not appear these benefits are being passed to consumers and additional rents are accruing to the retail grocery sector. Finally, in some markets, we observed significant merger activity leading to HHI changes of 30 percent or more. Those markets appear quite vulnerable to significant price increases in short periods of time.

## Limitations

The data for food prices in the analysis was the CPI Food-At-Home price index, thereby limiting the scope of the study to 23 of the largest markets in the U.S. Two limitations are evident with these data. First, it is quite common for smaller market areas to have relatively fewer supermarkets providing goods and services. When merger activity takes place, it can result in even higher concentration changes, and, on average, higher food expenditures (see Cotterill [1986] for insights on concentration in the non-urban Vermont food markets).

Second, within the markets we studied, it is quite possible that many different submarkets exist that could better describe the consumer's shopping radius. The submarkets may contain fewer shopping alternatives, resulting in more concentrated markets. Because of this, it is quite possible that the concentration and supercenter variables are understated in a subset of the spatial areas we covered. It would be beneficial if future studies could break out the MSAs into smaller micropolitan areas and include some of the smaller markets across the U.S. in future studies.

A third limitation is the aggregate nature of the data. By using the CPI data, we may be losing the direct effect of supercenters entering a market, thereby having to rely on the indirect effect as our only means of comparison. However, one could use price data from other sources where the researcher could create a "market basket" of goods that reflects the purchases made by an individual. This procedure may better reflect the true costs to consumers, revealing more accurate results and generalizations, but, again, the stores in which the prices are collected are not distinguishable.

Finally, it is imperative that future studies look at the impact of supercenters. In 2004, the first Wal-Mart Supercenter opened in California, with plans to open another 30 supercenters in California by the end of 2005, and Wal-Mart plans to open its first supercenter in New York City in the near future. It is also important to consider whether Kmart will continue to be a player in the supercenter trade since their merger with Sears. Taking these concerns into consideration, as more markets are penetrated, it becomes increasingly important to study the effects of supercenters on the food retailing landscape.

# Appendix

## Changes Made to the Data

Some metropolitan area definitions for the U.S. CPI indices did not match up with metropolitan area definitions from Market Scope. Metropolitan areas that did not match up that were included in the study are denoted with an asterisk in Table 3.1. [18]

Corrections were made to make the data definitions consistent across all samples. In MSAs where combinations were made, a weighted average based on total population, as reported for each market from the Market Scope data, was used to compute Effective Buying Income.

$$EBI_{it} = \frac{\sum_{i=1}^{n} POP_{it} * EBI_{it}}{\sum_{i=1}^{n} POP_{it}}$$

Likewise, a weighted average based on total food sales, as reported for each market from the Sales and Marketing Management's *Annual Survey of Buying Power*, was conducted for market shares of supercenters, CR4, and HHI.

$$SCMS_{it}, CR4_{it}, \text{or } HHI_{it} = \frac{\sum_{i=1}^{n} FS_{it} * CONC_{it}}{\sum_{i=1}^{n} FS_{it}}$$

where CONC is a placeholder for SCMS, CR4, or HHI, and FS is food sales.

---

[18] Combinations were made as follows (MSA Definition on left, Market Scope MSAs combined on the right):

| | |
|---|---|
| Chicago-Gary-Kenosha | = Chicago and Gary-Hamilton |
| Cleveland-Akron | = Cleveland and Akron |
| Dallas-Ft. Worth | = Dallas and Ft. Worth |
| Detroit-Ann Arbor-Flint | = Detroit and Ann Arbor |
| Los Angeles-Riverside-Orange County | = Los Angeles, Riverside-San Bernardino, and Orange County |
| Miami-Ft. Lauderdale | = Miami and Ft. Lauderdale |
| New York-Northern New Jersey-Long Island | = New York City, Bergen-Passaic, Monmouth-Ocean, Nassau-Suffolk, Jersey City, Middlesex-Somerset-Hunterdon, and Newark |
| Philadelphia-Wilmington-Atlantic City | = Philadelphia and Wilmington-Newark |
| San Francisco-Oakland-San Jose | = San Francisco, Oakland, San Jose, and Vallejo-Fairfield-Napa |
| Seattle-Tacoma-Bremerton | = Seattle and Tacoma |

## Data Examples

The data collected covers 23 of the largest MSAs from 1992 to 2003, as defined by the U.S. government[19]. The supermarket market share data and demographic data were collected from Trade Dimension's *Market Scope*, an annual publication.

Data was also collected from the BLS website. The data collected was the CPI of Food at Home, Electricity, and Rent for the 23 MSAs across the United States. Additional data was collected for the MSAs Total Employment, Total Number of Stores, Total Wages, and Average Wages.

### Example A.1: CPI Data for Milwaukee MSA (collected from BLS website)

Series ID : CUUSA212SAF11
Not Seasonally Adjusted
Area : Milwaukee-Racine, WI
Item : Food at home
Base Period : 1982-84=100

| | |
|---|---|
| 1992 | 137.5 |
| 1993 | 140.1 |
| 1994 | 144.3 |
| 1995 | 148.9 |
| 1996 | 153.8 |
| 1997 | 156.1 |
| 1998 | 156.1 |
| 1999 | 160.6 |
| 2000 | 166.3 |
| 2001 | 170.7 |
| 2002 | 172.9 |
| 2003 | 177.3 |

[19] As of February 18, 2004, MSAs have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties (Office of Management and Budget bulletin No. 04-03).

## Example A.2: Market Scope data for Milwaukee MSA (Collected from Market Scope)

| | | % U.S. | | |
|---|---|---|---|---|
| Population | 1512416 | 0.52 | % under $25M income | 27.9 |
| Households | 599676 | 0.55 | % over $75M income | 14.4 |
| Supermarkets | 107 | 0.4 | % Black | 15.8 |
| Convenience Stores | 292 | 0.4 | % Asian | 2.2 |
| Drug Stores | 207 | 0.5 | % Hispanic | 6.7 |
| Mass Merchandisers | 73 | 0.3 | Average Household Size | 2.5 |
| Wholesale Clubs | 4 | 0.4 | Average Household EBI | 48860 |
| | | | Supermarket Sales | 77 |
| | | % ACV | as a % of Food Store Sales | |
| Chains | | 62 | | |
| Independents | | 38 | | |

| SUPERMARKET | | | | |
|---|---|---|---|---|
| Buying Offices | Supermarkets In Area | % Market Share | CR4 | |
| Roundys | 31 | 41.3 | | 74.2 |
| Albertsons | 14 | 14.2 | | |
| Sentry Foods | 21 | 11.8 | HHI | |
| Pick N Save Stores | 7 | 6.9 | | 2140.25 |
| Piggly Wiggly | 9 | 3.8 | | |
| Aldi Inc | 12 | 3 | | |
| Festival Foods | 4 | 2.8 | | |
| Wal-Mart Supercenter | 1 | 2.3 | | |
| Jacob L Hanson Foods | 4 | 2.1 | | |
| Jerrys Enterprises Inc | 3 | 1.6 | | |
| El Rey Mexican Products | 4 | 1.3 | | |
| County Market | 2 | 0.8 | | |
| Town & Country Super Markets | 1 | 0.4 | | |
| Brennans | 1 | 0.2 | | |
| | | | | |
| Independents | 23 | 7.5 | | |
| Totals | 137 | 100 | | |

# References


Adelman, M. A. (1959). *A & P: A Study in Price-Cost Behavior and Public Policy*. Cambridge, Massachusetts: Harvard University Press

Ahold (2004). "About Ahold: History." (http://www.ahold.com/aboutahold/history)

Albertson's Inc. (2003). *2003 Annual Report*.

Alcaly, R. and A. Klevorick. (1971). "Food Prices in Relation to Income Levels in New York City." *Journal of Business*. V. 44, pp. 380-397.

American Chamber of Commerce Researcher's Association. *Inner-City Cost of Living Index*. Indianapolis, Indiana: ACCRA. Various years.

Anderson, K.B. (1993). "Structure Performance Studies of Grocery Retailing: A Review." In *Competitive Strategy Analysis in the Food System*. Ronald W. Cotterill, ed., Westview Press, pp. 201-219.

Balto, D. A. (2001). "Supermarket Merger Enforcement." *Journal of Public Policy & Marketing*, V. 20(1), p. 38-50

Beck N. and J.N. Katz. (1995). "What to do (and not to do) with Time-Series Cross-Section Data." *The American Political Science Review*. V. 89(3), pp. 634-647.

Bergmann, J. (1999). "Food for Thought: Going into the Grocery Business." *Discount Merchandiser*. V. 39(5), pp. 36-40

Bhargava, A., L. Franzini, and W. Narendranathan (1982). "Serial Correlation and the Fixed Effects Model." *Review of Economic Studies*. V. 49, pp. 533-549.

Binkley, J.K. and J.M. Connor. (1998). "Grocery Market Pricing and the New Competitive Environment." *Journal of Retailing*. V. 11, pp. 473-492.

Blalock, C. (1999). "How Big Is Too Big? The Role of the FTC in Supermarket Industry Mergers." *Grocery Headquarters*. V. 65(2), pp. 24-25.

Bresnahan, T.F. (1982). "The Oligopoly Solution Concept Is Identified." *Economic Letters*. V. 10, pp. 87-92.

Breusch, T.S. and A.R. Pagan. (1980). "The Lagrange Multiplier Test and its Application to Model Specification in Econometrics." *Review of Economic Studies*. V. 47, pp. 239-254.

Bureau of Labor Statistics. (2004). "Addendum to Frequently Asked Questions." www.bls.gov

*California v. American Stores Co.*, 495 U.S. 271 (1990).

Carrefour (2004). "Carrefour: History." (http://www.carrefour.com/english/groupecarrefour /annees60.jsp)

Chow, G. "Tests of Equality Between Sets of Coefficients in Two Linear Regressions." *Econometrica*. V. 28(3), pp. 591-605.

Church, J. and R. Ware. (2000). "Identifying and Measuring Market Power." In *Industrial Organization: A Strategic Approach*. Irwin-McGraw-Hill, pp. 423-456.

Cotterill, R.W. (1983). *The Food Retailing Industry in Arkansas: A Study of Price and Service Levels*. Submitted to the Honorable Steve Clark, Attorney General, State of Arkansas, January, 10, 1983.

Cotterill, R.W. (1986). "Market Power in the Retail Food Industry: Evidence from Vermont." *Review of Economics and Statistics*. V. 68(3), pp. 379-386

Cotterill, R.W. (1993a). "Introduction and Methodological Overview." In *Competitive Strategy Analysis in the Food System*. Ronald W. Cotterill, ed., Westview Press, pp. 3-22.

Cotterill, R.W. (1993b). "A Response to the Federal Trade Commission/Anderson Critique of Structure-Performance Studies in Grocery Retailing." In *Competitive Strategy Analysis in the Food System*. Ronald W. Cotterill, ed., Westview Press, pp. 221-252.

Cotterill, R.W. (1999). "Market Power and the Demsetz Quality Critique: An Evaluation for Food Retailing." *Agribusiness*. V. 15(1), pp. 101-118.

Coupe, K. (1994). "How Big A Threat?" *Progressive Grocer*, v. 73(4).

Cowling, K. and M. Waterson. (1976). "Price-Cost Margins and Market Structure." *Economica*. V. 43(171), pp. 267-274.

Demsetz, H. (1973). "Industrial Structure, Market Rivalry, and Public Policy." *Journal of Law and Economics.* V. 16(1), pp. 1-10.

Department of Justice. (1997). *Horizontal Merger Guidelines*. U.S. Government Printing Office: 1997.

Foer, Albert A. (1999). "Food Retailing: The Two Faces of Supermarket Mergers." Publication for the American Antitrust Institute. 8-26-1999.

The Food Institute (2003). *Food Industry Review 2003*.

Garry, M. (1993). "Showdown! Standing Up to Supercenters." *Progressive Grocer*, V. 72(2).

Geithman, F.E., and B.W. Marion. (1993). "Testing for Market Power in Supermarket Prices: A Review of the Kaufman-Handy/ERS Study." In *Competitive Strategy Analysis in the Food System*. Ronald W. Cotterill, ed., Westview Press, pp. 253-291.

Great Atlantic and Pacific Tea Company (2004). "A&P's History." (http://www.aptea.com/history.asp)

Greene, W.H. (2003). *Econometric Analysis*. 5th ed. Upper Saddle River: Prentice Hall, pp. 293.

Groom, P. (1966). "Prices in Poor Neighborhoods." *Monthly Labor Review*. V. 89, pp. 1085-1090.

Hall, L., A. Schmitz, and J. Cothern. (1979). "Beef Wholesale-Retail Marketing Margins and Concentration." *Economica*. V. 46(183), pp. 295-300.

Harris, F. (1986). "Market Structure and Price-Cost Performance under Endogenous Profit Risk." *Journal of Industrial Economics*. V. 35(1), pp. 35-59.

Harris, F. (1988). "Testable Competing Hypotheses from Structure-Performance Theory: Efficient Structure versus Market Power." *Journal of Industrial Economics*. V. 36(3), pp. 267-280.

Hayes, L.R. (2000). "Do the Poor Pay More? An Empirical Investigation of Price Dispersion in Food Retailing." September 12, 2000.

Heien, D.M. (1980). "Markup Pricing in a Dynamic Model of the Food Industry." *American Journal of Agricultural Economics*. V. 62, pp. 10-18.

Heller, W., et al. (2004), "The Search for Growth." (In the 71st Annual Report of the Grocery Industry). Progressive Grocer, V. 83(6), pp. 31-2, 34, 36, 38, 40-1

Hisey, P. (2003). "A Glimpse of Target's Food Strategy." *Progressive Grocer*, V. 82(1), pp. 19

Houck, J.P. (1977). "An Approach to Specifying the Estimating Nonreversible Functions." *American Journal of Agricultural Economics*. V. 59, pp. 570-572.

Janoff, B. (2000). "Target: Hitting the Bullseye." *Progressive Grocer*. V. 79(4), pp. 40-44

Kadiyali, V., P. Chintagunta, and N. Vilcassim (2000). "Manufacturer-Retailer Channel Interaction and Implications for Channel Power: An Empirical Investigation of Pricing in a Local Market." *Marketing Science*. V. 19(2), pp. 127-148.

Kaufman, P.R. and C.R. Handy. (1989). *Supermarket Prices and Price Differnces: City, Firm, and Store-Level Determinants*. Economic Research Service, U.S. Department of Agriculture, Technical Bulletin No. 1776.

Kaufman, P.R. and C.R. Handy. (1993). "The Geithman-Marion Review of the ERS Supermarket Pricing Study: A Response." In *Competitive Strategy Analysis in the Food System*. Ronald W. Cotterill, ed., Westview Press, pp. 293-310.

Kunreuther, H. (1973). "Why the Poor Pay More for Food: Theoretical and Empirical Evidence." *Journal of Business*. V. 46, pp. 368-383.

Kinnucan, H.W. and O.D. Forker. (1987). "Asymmetry in Farm-Retail Price Transmission for Major Dairy Products." *American Journal of Agricultural Economics*. V. 69, pp. 285-292.

Kmart Corporation. (2004). *2003 Kmart Annual Report*.

Kroger Co. (2002). *Kroger 2002 Factbook*.

Lamm, R.M. (1981). "Prices and Concentration in the Food Retailing Industry." *Journal of Industrial Economics*. V. 30(1), pp. 67-78.

Lande, R. H. (2001). "Resurrecting Incipiency: From Von's Grocery to Consumer Choice." *Antitrust Law Journal*. V. 68(3), pp. 875-898.

Lewis, L. (2000). "Mass Monsters? Are They Nibbling Away the Supermarket Pie." *Progressive Grocer*, V. 79(1), pp. 24-26

Marion, B.W., W.F. Mueller, R.W. Cotterill, F.E. Geithman, and J.R. Schmelzer. (1977). The *Profit and Price Performance of Leading Food Chains, 1970-1974*. A study prepared for the use of the Joint Economic Committee. Congress of the United States. April 12, 1977 (Revised May 6, 1977).

Marion, B.W., W.F. Mueller, R.W. Cotterill, F.E. Geithman, and J.R. Schmelzer. (1979). *The Food Retailing Industy: Market Structure, Profits, and Prices*. Praeger Publishers, New York.

Marion, B.W., W.F. Mueller, R.W. Cotterill, F.E. Geithman, and J.R. Schmelzer. (1979). "The Price and Profit Performance of Leading Food Chains." *American Journal of Agricultural Economics*. V. 61, pp. 420-433.

Marion, B.W., K. Heimforth, and W. Bailey. (1993). "Strategic Groups, Competition, and Retail Food Prices." In *Competitive Strategy Analysis in the Food System*. Ronald W. Cotterill, ed., Westview Press, pp. 179-199.

Marion, B.W. (1998). "Competition in Grocery Retailing: The Impact of a New Strategic Group on BLS Price Increases." *Review of Industrial Organization*, V. 13, pp. 381-399.

Mathews, R. (1996). "Background of a Revolution and the Birth of an Institution." *Progressive Grocer*, V. 75(12), pp. 29-30

Mayo, J.M. (1993), *The American Grocery Store: The Business Evolution of an Architectural Space*, Westport, CT: Greenwood Publishing Group, Inc. 1993 pp. 77-233.

McTaggart, J. (2003). "Wal-Mart Vs. The World." *Progressive Grocer*, V. 82(15), pp. 20-21, 24, 26, 28, 30

Meijer. (2004) "About Meijer: Meijer History." (http://www.meijer.com/70th/timeline.asp)

Meyer, P.J., K.M. Garber, and B.A. Pino (1983). "Concentration and Performance in Local Retail Markets." In *Industrial Organization, Antitrust, and Public Policy*. John V. Craven, ed., Kluwer-Nijhoff, pp. 145-161.

Mori, H., and Wm.D. Gorman. (1966). "An Empirical Investigation into the Relationship between Market Structure and Performance as Measured by Prices." *Journal of Farm Economics*. V. 48(3) pt. 2, pp. 162-171.

*National Tea.* (1966). FTC Docket no. 7453, Final Decision and Order (Washington D.C.; U.S. Government Printing Office, 1966).

Newmark, C.M. (1990). "A New Test of the Price-Concentration Relationship in Grocery Retailing." *Economic Letters*. V. 33, pp. 369-373.

Newmark, C.M. (2004). "Price-Concentration Studies: There You Go Again." Prepared for the DOJ/FTC Workshop Concentration and Market Shares Panel, 2-14-2004.

Park, T. and A. Weliwita. (1999). "Competitive Behavior in the U.S. Food Retailing Industry." *Canadian Journal of Agricultural Economics*. V.47, pp. 45-55.

Peltzman, S. (2000). "Prices Rise Faster than They Fall." *Journal of Political Economy*. V. 108(3), pp. 466-502.

Progressive Grocer. (1992-2004). *The Annual Report of the Grocery Industry*, Stamford, CT: Progressive Grocer Associates.

Romain R., M. Doyon, and M. Frigon. (2002). "Effects of State Regulations on Marketing Margins and Price Transmission Asymmetry: Evidence From the New York City and Upstate New York Fluid Milk Markets." *Agribusiness*. V. 18(3) pp. 301-315.

Safeway, Inc. (2003). *Safeway 2003 Factbook*.

Sales and Marketing Management. *Annual Survey of Buying Power*. various years 1993-2004.

Schmalensee, R. (1989). "Inter-Industry Studies of Structure and Performance." In *The Handbook of Industrial Organization: Volume II*. Richard Schmalensee and Robert D. Willig, eds., Elsevier Science, pp. 951-1009.

Schroeter, J.R., A.M. Azzam, and M. Zhang. (2000). "Measuring Market Power in Bilateral Oligopoly: The Wholesale Market for Beef." *Southern Economic Journal*. V. 66(3), pp. 526-547.

Shonkwiler, J.S. and T.G. Taylor. (1988). "Food Processor Price Behavior: Firm-Level Evidence of Sticky Prices." *American Journal of Agricultural Economics*. V. 70, pp. 239-244.

Stigler, G. (1961). "The Economics of Information." *Journal of Political Economy*. V. 69(3), pp. 213-225.

Stigler, G. (1964). "The Theory of Oligopoly." *Journal of Industrial Economics*. V. 72(1), pp. 44-61.

Supermarket News. (2002-04). *SN's Top 75*.

Target Corporation. (2004). *2003 Target Annual Report.*

Tarnowski, J., et al. (2004). "The Super 50." *Progressive Grocer*, V. 83(7), p. 59-60, 62, 64, 66.

Tortola, J.O. (2003). "Picking up the pieces." *Progressive Grocer*, V. 82(14), pp. 18-20, 22-24.

Trade Dimensions. *Market Scope*. various years 1993-2004.

Turock, A. (2004). “Driving Wal-Mart’s Growth Engine.” *Progressive Grocer*, V. 83(2), pp. 29.

*U.S. v. Von’s Grocery Co.*, 384 U.S. 270 (1966).

Vance, S. and R. V. Scott. (1992). “Sam Walton and Wal-Mart Stores, Inc.: A Study in Modern Southern Entrepreneurship.” *The Journal of Southern History*, V. 58(2), pp. 231-252.

Wal-Mart Stores, Inc. (2004). *2004 Wal-Mart Annual Report*.

Walsh, P.P. and C. Whelan. (1999). “Modelling Price Dispersion as an Outcome of Competition in the Irish Grocery Market.” *Journal of Industrial Economics*. V. 47(3), pp. 325-343.

Weinstein, S. (1995). “The Two Faces of Supercenters.” *Progressive Grocer*, V. 74(5), pp. 45-46.

Weinstein, S. (1998). “The Ultimate Weapon?” *Progressive Grocer*, V. 77(9), pp. 25-26.

Weir, T. (2003). “Wal-Mart's the 1 (America's 50 largest supermarket chains).” *Progressive Grocer*, V. 82(7), pp. 35-6, 40, 44, 46, 48.

Weiss, L.W. (1989). “Conclusion.” In *Concentration and Price*. Leonard W. Weiss, ed., MIT Press.

Wen, J. (2001). “Market Power in Retailing: Assessing the Evidence for Canada.” Prepared for the Competition Bureau. 9-25-2001.

Yu, C. and J.M. Connor (2002). “The Price-Concentration Relationship in Grocery Retailing: Retesting Newmark.” *Agribusiness*. V. 18(4), pp. 413-426.