



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

The Effects of Warehouse and Super Warehouse
Grocery Stores on Metropolitan Area
Food Prices

by
Keith Heimforth and Bruce Marion

WP-93

December, 1988

Note: Bruce Marion is a professor of Agricultural Economics and Director of the Food Systems Research Group, University of Wisconsin-Madison. Keith Heimforth was formally a project assistant in the Department of Agricultural Economics at the University of Wisconsin-Madison. The helpful contributions of Frederick E. Geithman, University of Wisconsin-Madison and William Weber, Bureau of Labor Statistics, are gratefully acknowledged.

Contents

	<u>Page</u>
I. Background.	1
II. Framework for Analysis	2
III. Strategic Groups in Retail Food Markets	7
IV. Assessing the Impact of Warehouse and Super Warehouse Stores on Retail Food Markets	16
A. The Food At Home Component of the CPI	17
B. The Model	22
1. The Variables and Their Measurement in the Pooled Data Set	22
2. Variables in Cross-Sectional Analysis of Average Price Changes for 1977-1983 Period	28
V. Empirical Results	29
A. Descriptive Statistics	29
B. Regression Results -- Pooled Data Set	30
C. Regression Results -- Cross-Section Analysis	33
VI. Summary and Conclusions	38
Endnotes	42
References	45
Appendices	48

Warehouse and super warehouse food stores account for about 12% of grocery store sales in the U.S. (Grocer's Spotlight 1985b). Yet, since the late 1970's there are few topics which have received as much attention in the food retailing industry as the success and growth of these "depot" store formats.* Issues involving such stores have included charges of predatory pricing (both made by and made against depot store operators), the constraints of item-pricing laws, and various labor issues, among others. Each topic could itself provide fertile ground for analysis of these stores' economic impact, but each of them can also be considered an aspect of one overriding theme: the impact of warehouse and super warehouse food stores on competition in the retail grocery industry.

I. Background

The concept of minimal service, low-price grocery retailing dates back to the advent of the supermarket in the 1930's. Independent grocers in selected areas have successfully operated warehouse stores for decades. However, it was not until the economically turbulent 1970s that the warehouse store began making significant inroads in a number of urban grocery markets. Early warehouse efforts by chains such as Penn Fruit, Thriftmart, Acme and A&P were primarily last-ditch attempts to save failing stores (Progressive Grocer 1972). Although many of those conversions ultimately failed, increasing experimentation with the format throughout the 1970s and 1980s resulted in depot stores capturing 30% or more of sales in some markets. In other

* Throughout this paper, warehouse and super warehouse stores will be considered as different store formats and will be referred to separately by those names, and collectively under the rubric "depot stores".

1981; Caves and Porter 1977). Since we draw heavily on Porter's theory of strategic groups, some elaboration is in order.

Porter's theory of strategic group contends that within an industry, firms often differ from one another in the technologies and strategies employed (e.g., the degree of vertical integration, level of fixed costs, breadth of product line, level of advertising, R&D expenditures, nature of distribution channels and intermediaries used, extent of branded vs. private label or generic products, geographic areas served, emphasis on price vs. service, etc.). Porter (1979) comments: "An industry can...be viewed as composed of clusters or groups of firms, where each group consists of firms following similar strategies in terms of key decision variables....I define such groups as strategic groups" (p. 215).

Porter emphasizes that strategic groups are not merely properly defined industries, but reflect differences in strategy to operate in the same competitive arena. Firms within the same strategic group resemble each other closely and are most cognizant of their mutual dependence. Firms in different strategic groups are competitors in a less direct sense and may occasionally fall into different relevant submarkets.

The products of different strategic groups may be viewed as close substitutes in some instances and more distant substitutes in other cases. For example, regional and local food processors sometimes produce branded products that for consumers are close substitutes for national brands (potato chips and pourable salad dressings are examples). However, the regional brand manufacturers are often specialty companies that rely much less on media advertising than national brand manufacturers, may sell their products for slightly lower prices, and concentrate on limited geographic areas. The

strategies and entry barriers of these two strategic groups differ even though consumers consider their products as close substitutes.

In other cases, different strategic groups appeal to different market segments; their products may or may not be sufficiently close substitutes to place them in the same product market. For example, some food processors cater primarily to the food service industry while others sell mainly through supermarkets. This is the case with frozen potatoes where J.R. Simplot sells primarily to food service accounts while H.J. Heinz concentrates mainly on supplying food retailers. Another illustration is that low priced standardized products often appeal to a distinct market segment from high quality, high priced products. Although different market segments are usually served by different strategic groups, this is not always the case.

Variations in marketing strategy tend to be associated with variations in other elements of strategy. For example, the manufacturers of advertised brands in an industry are also likely to commit significant resources to product R&D to develop new differentiable products. In contrast, private label and generic product manufacturers devote few funds to R&D but tend to be alert to opportunities to reduce costs. Thus, differences in marketing strategies usually reflect differences in a broader set of strategy elements.

How does the theory of strategic groups affect our understanding of the competitive behavior of industries? Because different strategies result in differences in product differentiation, the minimum efficient size firm and absolute cost requirements, strategic groups vary in their barriers to entry. For example, entry barriers into advertised brand manufacturing are generally substantially higher than barriers into private label manufacturing. As Caves and Porter point out, entry barriers not only insulate firms from entrants new

to the industry but also from entry by firms in another strategic group (intergroup mobility). Thus, entry barriers can be framed more generally as "mobility barriers". This is particularly important in understanding variations in the profits and market power of firms within the same industry. Since strategic groups vary in the number of constituent firms and mobility barriers, they vary in the extent to which they can charge supra-competitive prices and realize non-competitive profits.

Porter (1979) also contends that the presence of strategic groups affects interfirm rivalry in an industry. Where there are multiple strategic groups, divergent strategies reduce the ability of oligopolists to tacitly coordinate their actions. The influence on rivalry, however, depends upon the characteristics of the strategic groups. Porter identifies three factors that affect the degree of rivalry:

1. The number and size distribution of strategic groups--all else the same, the more numerous and more equal in size the strategic groups, the more rivalry is enhanced. If one strategic group dominates an industry, the remaining small strategic groups may have little influence on industry rivalry. In ready-to-eat breakfast cereals, for example, the private label/generic strategic group only accounts for about 5% of industry sales and has had little influence on the rivalry of the dominant advertised brand group.
2. The strategic distance between groups--the more dimensions of difference between group strategies, the more difficult is inter-firm coordination and the greater the rivalry. For example, groups that differ only in the degree of vertical integration or breadth of product line face fewer problems in coordination than those where there are differences across

several elements of strategy (e.g., advertising, channels of distribution, new product innovations, and product quality). Industry rivalry tends to increase as the "distance" between strategies increases.

3. The market interdependence among groups--the presence of market segments within industries affects the degree of interdependence of strategic groups. If two groups use different approaches to sell to the same customer segment, group interdependence will be high. Rivalry will be stimulated. On the other hand, if one group sells primarily to price conscious buyers while the second group sells primarily to quality sensitive buyers, conduct changes in one group may have little effect on sellers in the second group. In this instance, the two groups may be in separate submarkets. Rivalry is reduced in such a market setting.

The last two factors must be considered together. Greater strategic distance between groups enhances industry rivalry only if the groups are competing for the same market segment and hence recognize their mutual dependence. Where the strategic distance between groups is large because they are appealing to distinct market segments, distance may not affect rivalry.

Several studies have found empirical support for the existence of strategic groups. Newman (1978) found that price-cost margins in chemical process industries were inversely related to the degree of heterogeneity of strategic groups in the industries (strategic distance in Porter's terms). He concluded that "...heterogeneity of strategic groups both frustrates communication and agreement on short run goals for the industry and increases the difficulties of enforcing any consensus that is reached" (p. 425). Porter (1979) divided firms in 42 consumer goods industries into "leader" and "follower" groups. His analysis showed that structural characteristics had markedly different

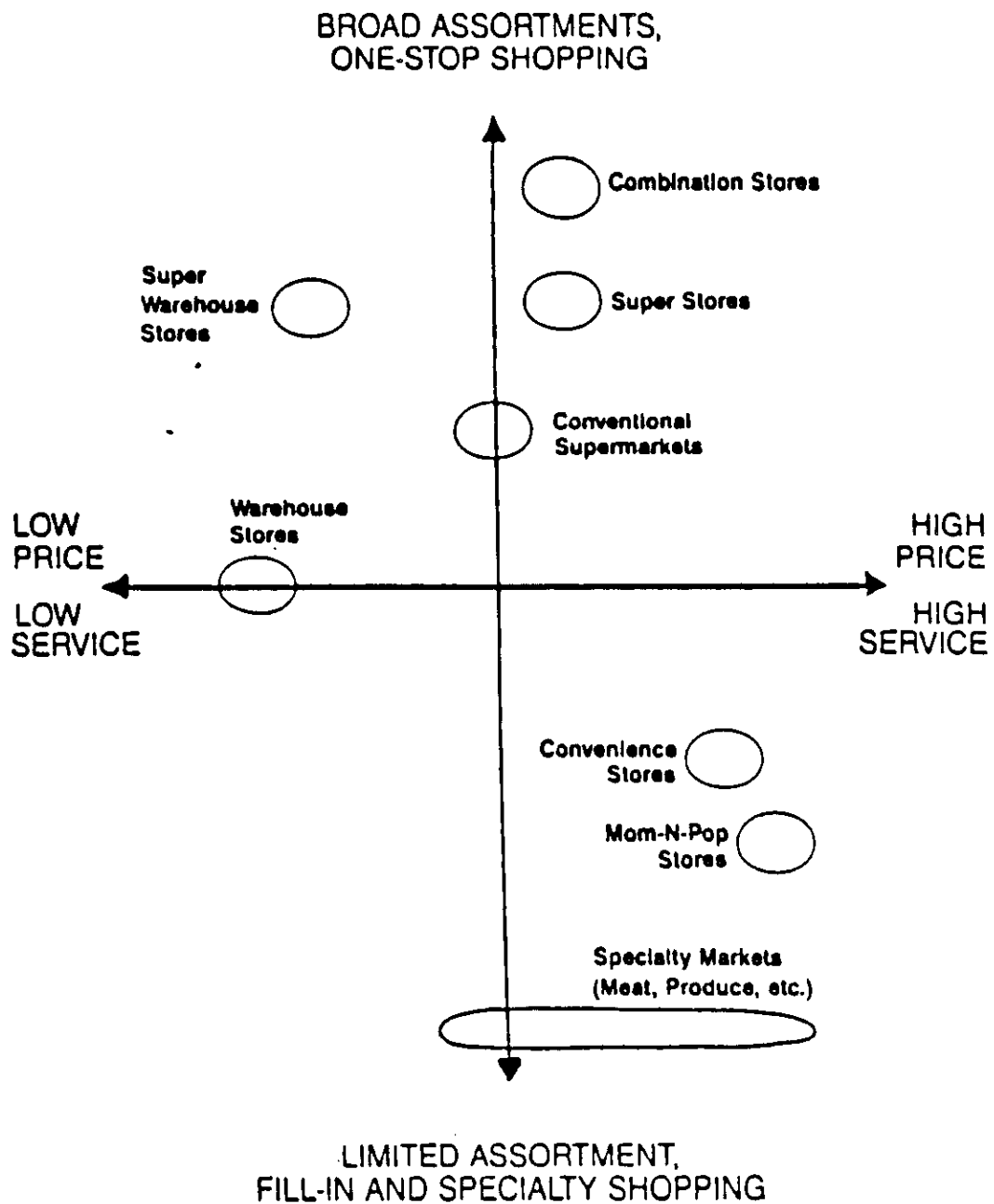
effects on the rates of return in the different strategic groups. Tremblay (1985) hypothesized national and regional strategic groups in the beer brewing industry. He found that such groups face different demand functions, and that rivalry between firms within a group is stronger than rivalry between firms in different groups. Each of these studies supports the idea that analysis of strategic groups is an important element in the application of the S-C-P model.

III. Strategic Groups in the Retail Food Markets

The concept of strategic groups can be applied to local markets for retail food purchases. Marion (1984) suggested that each of the various food store formats is a strategic group. Such formats include specialty markets, convenience stores, Mom-n-Pop stores, conventional supermarkets, super stores, combination stores, warehouse and super warehouse stores.¹ The reason for considering each to be a separate strategic group is that each offers a unique mix of price, service, and product assortment. The combination of all three elements constitutes the "product" offered by food stores of a particular format. An impressionistic illustration of the configuration of these groups is shown in Figure 1.

The eight strategic groups in Figure 1 fall into at least two relevant product markets: those on or above the horizontal axis compete with each other for the major shopping trips of consumers; the remaining three groups largely compete for fill-in shopping. The major shopping market can be labelled the "supermarket market". Since the stores in this market account for about 75% of food store sales and have the greatest effect on prices

Figure 1. Retail Food Store Formats



charged to consumers, factors that may increase or decrease supermarket rivalry are of considerable interest.

Since depot stores are newcomers to food retailing, this study examined their impact on supermarket rivalry. Based upon Porter's theory re strategic group, what impacts would be expected?

1. Number and size distribution of strategic groups--depot stores increase the number of strategic groups. To have a positive effect on supermarket rivalry, however, depot stores must capture or be expected to capture a significant market share. If they never capture more than 1 or 2 percent of a market's sales, depot stores would be part of the fringe that the major competitors can ignore. Some observers have estimated the market share potential of depot stores at 15-20% (Supermarket News 1983b, 1984). Depot stores have already far exceeded this share in a few markets. Thus, these stores hold the potential of increasing the number of strategic groups and adding a significant competition in many metropolitan areas. This is not always the case, however. In some metropolitan areas, depot stores never achieve a significant market share either because of the counter actions of incumbents or because depot store owners are content to remain in the fringe of the market and avoid challenging the market leaders.
2. Market interdependence--the addition of a depot store strategic group will affect rivalry within the supermarket "market" only if there is considerable overlap in the customers being appealed to by the various strategic groups. The evidence on this issue is compelling. Non-depot store competitors have often responded aggressively to the opening of depot stores in a market. Non-depot store operators apparently perceive a

significant pool of consumers who are potential customers of all supermarket formats.

One authority on warehouse stores contends they represent a relatively narrow niche in the retail food market (Competitive Edge 1982, p.2). This is consistent with the limited effects of depot stores on the business of high service - quality - price firms such as Byerlys in Minneapolis. However, the latter type of store is at the opposite extreme from depot stores. The majority of supermarkets are closer strategically to depot stores than a Byerlys; depot stores are perceived as a direct competitive threat.

Because depot stores represent new strategic groups, the vast majority of their sales must be taken from other groups; the aggregate demand for food consumed at home is likely to expand little as a result of depot stores. We expect that depot store entry will have the greatest competitive impact on supermarkets that are strategically closest to depot stores in their appeal to price oriented consumers.

There has been no formal research to identify the stores that lose sales to new depot store entrants. A new Cub super warehouse store in Milwaukee took more than 50% of its sales from existing warehouse stores although such stores accounted for much less than half of area sales (Grocer's Spotlight, June 1984). This evidence is consistent with both the proposition that stores compete most directly with other stores in their strategic group and with the notion that there is a significant degree of interdependence between depot and non-depot stores. In the Milwaukee example, a sizeable percentage of Cub customers were drawn from non-depot stores even though other depot stores were the most directly affected.

3. Strategic distance--depot stores provide a product-service-price mix that is significantly different from the other strategic groups (conventional supermarkets, superstores and combination stores). For this reason, they expand the strategic distance between the groups in the supermarket market. According to Porter, increasing the strategic distance between strategic groups tends to increase rivalry.

The above discussion points clearly toward increased rivalry where depot stores are present. Porter's hypotheses focus on factors affecting firms ability to coordinate their behavior. Porter does not deal specifically with the competitive impact of a new strategic group. Rather, he focuses on the rivalry impacts of various strategic group configurations.

The development of a new strategic group in a market requires denovo entry and capacity expansion in many cases. This has been true with depot stores in some MSA's although in the majority of MSA's examined, depot stores were first introduced by established supermarket firms.

The competitive impact of a new strategic group may differ some from Porter's proposed scenario and may also differ in the short-run vs. the long-run. A new strategic group, such as depot stores, is expected to increase rivalry during the entry and market penetration period as it takes sales from incumbent strategic groups. As indicated above, those incumbent strategic groups that are strategically closest to the new group are expected to be affected the most and to respond most to the new entrant.

If the new strategic group appeals to a distinct market segment, there may be a tendency towards increased market segmentation over time. That is, when depot stores have attracted most of the customers who are highly price oriented, intergroup rivalry may decline. At this point, the internal

structure of strategic groups may have an important bearing on market rivalry. In food retailing geographic markets in which depot stores are well established, the warehouse store and superwarehouse store strategic groups are usually made up of only 2 or 3 firms. Intra group coordination of competitive actions appears likely once these stores have achieved most of their perceived market potential. Thus, the competitive consequences in the long-run of depot stores may be quite different from the consequences during the market penetration period. If Porter is correct, however, rivalry would still be somewhat higher even in the long-run than would have been true absent the depot store strategic groups (all else the same).

Porter says relatively little about the rivalry effects of concentrated vs. atomistic intra-group structure. Are there trade-offs for example between the number and size distribution of strategic groups in an industry and the number and market shares of firms within each group? For example, what would be the likely competitive differences between an industry that had only one strategic group in which there were 8 firms and an industry with four equal sized strategic groups, each of which contained two firms? Oligopoly theory and empirical evidence suggest that intra-group coordination would be easier in the latter than the former. But intergroup coordination would be more difficult in the latter. The trade-offs involved have not been adequately examined either theoretically or empirically.

Strategic groups may vary considerably in entry or mobility barriers. New strategic groups may also provide a means of circumventing entry barriers, at least in the short-run. This is particularly true where the new strategic group appeals to a particular market segment, employs new technology or possesses other advantages over incumbent groups. Because depot stores

represent a significant innovation in the retailing of food with particular appeal to price-oriented customers, they provide a means of overcoming the significant barriers to entry into the supermarket sub-market of many metropolitan areas. The first depot stores into a metropolitan area are likely to attract those customers whose preferences are not met by existing stores. In addition, as the CEO of Safeway Stores indicated, entering a market with one or two super warehouse stores is much less capital intensive than opening a larger number of conventional supermarkets or superstores in order to achieve the desired market share (Grocer's Spotlight 1985a). Thus, capital requirements barriers to significant scale entry are easier to surmount with super warehouse stores.

Because the potential market share of depot stores in most metropolitan areas is thought to be limited (estimates range from 15 to 30 percent) and because super warehouse stores usually are very high volume stores, the number of suitable locations for these stores has been estimated as low as 200-300 nationwide (Supermarket News 1983a).² Under these circumstances, first-movers into a metropolitan area can enjoy significantly easier entry than late-comers. Several firms have opened super warehouse stores in markets in order to preempt other firms' entry into that strategic group (Supermarket News 1984, 1985; Grocer's Spotlight 1985a).

Thus, depot stores may enhance rivalry in the supermarket sub-market for several reasons: 1) they represent a means of circumventing entry barriers so that denovo entry by depot stores is more likely than denovo entry by conventional supermarkets or superstores, and 2) they represent new strategic groups which are likely to reduce the ability of incumbent supermarkets to coordinate their competitive actions. Because depot stores emphasize low

prices, their presence is likely to stimulate price rivalry rather than non-price rivalry.

The first factor--lower entry barriers for depot stores--will affect market rivalry primarily during the period of entry and market penetration. Although the existence of warehouse store companies "waiting in the wings" could also affect competition in markets they have not yet entered, we believe potential entrants are more likely to affect the competitive behavior of incumbent firms in the same strategic groups (i.e., other depot stores), than stores in other strategic groups. Thus, we hypothesize that the prices of incumbent supermarkets and superstores will mainly be affected by actual entry of depot stores as compared to potential entry.

Significant denovo entry is normally expected to affect market rivalry simply because of the addition of capacity and the resulting displacement effect of the new entrant. Rivalry is enhanced as firms battle for a relatively fixed sized pie. The entry of depot stores is expected to have an additional impact on market prices because of the substantially lower prices of these firms.

Whether depot stores have a negative influence on market prices beyond the entry and market penetration period remains to be seen. If Porter is correct, oligopolistic coordination will be more difficult where depot store strategic groups exist; rivalry will be greater and prices lower. However, this is a hypothesis that remains to be tested. In addition, depot stores are likely to reduce average market prices vis a vis markets in which there are no depot stores because of the lower prices in depot stores. Even if market segmentation in a new equilibrium results in conventional supermarket and superstore prices returning to levels similar to markets in which depot stores

are not present, depot stores are expected to continue to charge lower prices. Their effect on average market prices would depend upon their market share.

There are few markets (if any) where depot stores have achieved their market share potential and a new equilibrium has emerged. Thus, for the period examined in this study, we will primarily be examining the price effects of depot store introduction and expansion. We will be unable to directly test Porter's hypotheses absent the influence of depot store entry/introduction.

One factor affecting the nature of responses to depot store entry/introduction is the degree of pre-entry rivalry. In markets where a low level of rivalry has allowed supracompetitive prices, downward pressure on market prices might be expected as at least some incumbents act to protect their market share and to limit the market penetration of the depot stores. Also, to the extent that such markets are characterized by x-inefficiency, cost reduction measures may be taken to permit lower prices without eroding profits. Mueller (1984) indicates that, in some markets, incumbents may respond to significant depot store entry by reducing prices below costs and absorbing short run losses to prevent or limit the success of warehouse stores; he also cites convincing evidence that such pricing conduct has occurred.

Even in "effectively competitive" markets there is likely to be some response by incumbent firms. Costs might be reduced by eliminating services, installing new technology, or re-negotiating labor contracts, permitting a reduction in price. Also, firms may attempt to protect their market niche by increased advertising and promotions.

A survey of grocery prices in Washington, D.C. (Handy and Stafford 1980) provides some evidence of competitors' short run response to the opening of warehouse and box stores. In that market, the two largest competitors (with 60% of the market) reduced prices as the new stores opened, especially at outlets near the new stores and on items carried by those stores.

IV. Assessing the Impact of Warehouse and Super Warehouse Stores on Retail Food Markets

When warehouse or super warehouse stores enter a market, we expect them to reduce the prices paid by consumers in two ways. First, since these stores carry significantly lower prices than conventional supermarkets, consumers who shop at depot stores receive directly the benefits of their lower prices. In addition, we expect the entry of warehouse and super warehouse stores to trigger price reductions by some incumbent supermarkets. Consumers shopping at the latter stores receive the "indirect" benefits of depot stores. Both sources of price reduction must be considered to understand the full impact of depot stores on market prices.

Unfortunately, data appropriate to assess both effects are unavailable. First, the most accurate and readily available price data, the Consumer Price Index (CPI) published by the U.S. Department of Labor, Bureau of Labor Statistics (BLS), do not allow meaningful comparisons of price levels across metropolitan areas (U.S. Department of Labor, 1984, p. 6). Thus, it is necessary to restrict interarea analyses to comparisons of price changes over time. Second, the CPI does not capture the full effects of depot stores on area prices because BLS methodology intentionally obscures the "direct effect" of new outlets. Since BLS procedures are not widely understood and have a

major influence on the meaning of the CPI for food consumed at home, we digress briefly to examine BLS methodology.³

A. The Food At Home Component of the CPI

The primary objective of BLS in calculating the CPI is to measure changes in price for a fixed basket of goods and services, not to measure the prices consumers actually pay in the market. Stated differently, the intent is to create a price index, not a cost of living index. Thus, to maintain comparability of the CPI over time, BLS attempts to "filter out" what it perceives as qualitative changes in the goods and services being priced.

To obtain a representative sample of food and other items with which to monitor price changes in an area, BLS combines information from two surveys, the Consumer Expenditure survey (CE) and the Continuing Point of Purchase Survey (CPOPS). The CE has been conducted approximately once every ten years, and provides information on the absolute and relative amounts spent by consumers on various categories of goods and services in different BLS regions. The CPOPS has been conducted since 1977, and is intended to provide data for periodically updating the sample of outlets at which CPI items are priced; each year, one-fifth of the 87 metropolitan areas regularly surveyed by BLS are updated. (Beginning in 1987, the CE information also will be provided and used on an on-going basis.)

CPOPS spending categories include, inter alia, eleven categories of food and non-alcoholic beverages purchased for consumption at home (See Appendix A). When a CPOPS is conducted in an area, information is obtained regarding consumers' current pattern of spending in these categories at outlets in the area. From this information a probability weight is assigned to each outlet

markets, depot stores have been largely unsuccessful in establishing a presence.

Warehouse and superwarehouse stores are able to offer consumers lower prices by making heavy use of manufacturer "deals", maintaining lower operating costs, and achieving high sales volume. Whereas conventional supermarkets and super stores operate on average gross margins $(\frac{\text{sales} - \text{cost of goods sold}}{\text{sales}})$ of 21-24%, depot store margins average 13-16%

(Progressive Grocer 1985; Grocer's Spotlight 1985b; Supermarket News 1986). Operating costs are lowered by reduced labor costs (fewer in-store services, pallet/cut case shelf stocking), lower advertising expenditures per dollar of sales, lower initial investment costs per square foot due to spartan physical store features, use of electronic scanning with no item-pricing where permitted, and other cost-reducing measures. The greater use of manufacturer deals reduces these store's cost of merchandise and is an additional source of lower prices not reflected in gross margin differences. Depot stores generally depend upon large sales volume in order to achieve a sufficient return on investment.

II. Framework for Analysis

The analytical framework used to study the impact of depot stores on competition in grocery retailing markets is the structure-conduct- performance paradigm developed by Edward Mason, Joe Bain and others. This basic framework has been extended and refined by Porter and Caves to include the concepts of strategic groups, mobility barriers and strategic behavior (Porter 1976, 1979,

in the survey area and a probability sample consisting of approximately ten (not necessarily unique) outlets (retail stores) for each CPOPS spending category is chosen for price recording. Individual stores are selected using this procedure, not companies. Thus, a major food chain in an MSA might have several stores selected for price checking.

Selection of the specific items to be priced in the chosen stores is the result of a two-step probability sampling procedure. The CE provides information on consumer spending in eighteen food-at-home "expenditure categories", which are subdivided into a total of 73 "item strata", each of which consists of one or more "entry level items" (ELIs) (See Appendix A). For each BLS pricing area, a probability sample of the 88 food-at-home ELIs, representing all item strata, is selected for pricing. The probability assigned to each ELI is related directly to the magnitude of consumer expenditures on that ELI in a BLS region. This probability distribution changes every time a new CE survey is conducted. Every ELI is contained in one and only one CPOPS spending category, and all ELIs selected within a given CPOPS category are priced at each outlet in the sample of stores chosen for that category. There is some variation in the sample of stores priced for each of the 11 CPOPS categories. For example, a retail bakery might be included in the sample of outlets for category 105, "bakery products", but would not be in the sample for other categories.

Since each ELI (e.g., "flour", "frozen prepared dinners") encompasses a range of specific store items, another probability sampling procedure is used to select the specific item within an ELI that will be priced in a given store. The selection is based on the proportion of sales within an ELI accounted for by the items at the outlet being priced. Once a specific item

is selected for pricing in a store, that item is continuously priced in succeeding months, unless its unavailability requires the substitution of a comparable item. The combined results of these sampling procedures are illustrated in Figure 2.

With the prices of specific items, BLS can calculate the CPI. First, the one period ($t-1$ to t) price change, or "price relative", is calculated for related groups of items, referred to as "item strata". Essentially, this involves (for food items) converting price quotes to a per ounce basis, calculating (as a ratio) the one period price change for each item priced, weighing each price change by factors reflecting the relative importance of the item in consumer purchases, and summing the weighted price changes first across all stores and then across item strata. Note that this results in a measure of price change, not price level, for each group of items and for "Food At Home" as a whole. (See Appendix B for more detailed illustration.)

When the CPOPS updates the sample of outlets (and, hence, the specific items priced), it is necessary for BLS to "blend in" the price data obtained based upon a new CPOPS sample. To do so, in one month the BLS obtains prices for both the old and the new samples of outlets and items for the area being updated. Published CPI figures for that month are based on the price relative from the preceding to the current month in the old sample only; in the following month the CPI is based on the price relative in the new sample only. Using this procedure, BLS is able to blend in the price data from the new sample without directly comparing the price levels of the two different samples. A stylized example is:

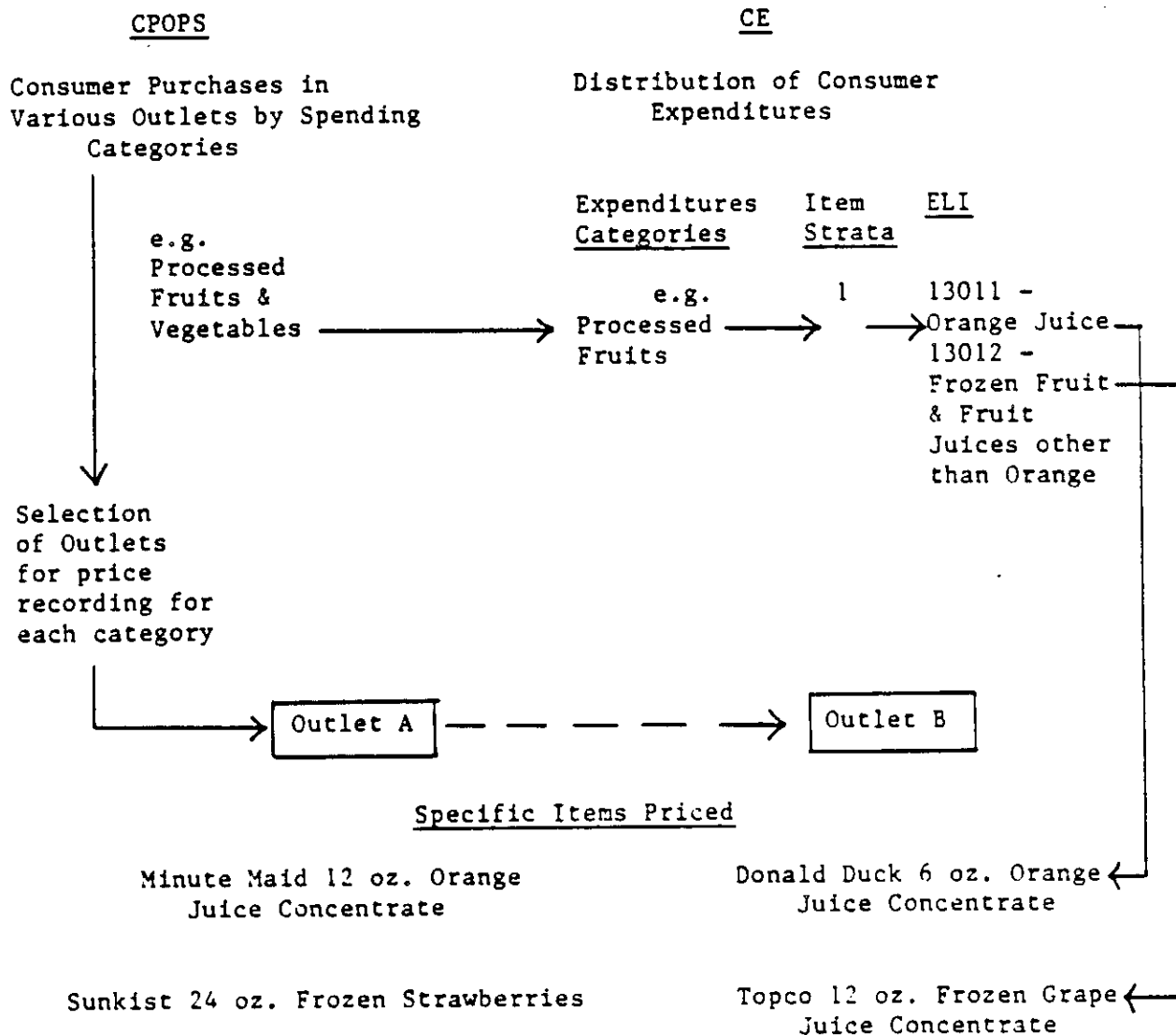


Figure 2: Selection of Outlets and Items and Pricing,
Bureau of Labor Statistics CPI for Food Consumed at Home

	<u>April</u>	<u>May</u>	<u>June</u>
Old Sample Cost	\$110	\$121	----
<u>New Sample Cost</u>	----	\$100	\$110
CPI	100	110	121

Continuity of the CPI is maintained since BLS computes the CPI by a "chaining process" using price relatives, not price levels. In this process, the price relatives from the new sample are multiplied by the estimates (based on the old sample) of the previous month's expenditures in the stratum. Thus, in the above example, the CPI change from April to June is 21 percent.

In general, then, published CPI figures conceal reductions in area price levels that result directly from depot store entry. In the above example the published CPI figures would accurately reflect the monthly 10% increase in prices, from May to June, but would hide the lower level of prices in the new sample. Furthermore, the BLS holds weights assigned to different outlets constant between CPOPS surveys. So, even though depot stores might be represented in the BLS sample, the CPI would conceal any effect on area price levels due to increases in the market share of depot stores. The CPI, however, does capture the impact of warehouse stores on the prices charged by non-warehouse store incumbents.⁴

Our intention in this discussion is not to criticize BLS. Their methodology, in general, accomplishes their objectives. We are aware that BLS continues to struggle with the considerable difficulties of creating a price index in a dynamic economy. Nevertheless, it is important in any empirical study to be fully aware of the data limitations, which in the present case includes the fact that the "direct effect" of low-price depot stores are not

reflected in the Food-at-Home CPI data; only the "indirect effect" of such stores -- the response of competitors -- is measured.

B. The Model

Our analysis focuses on changes in food prices across markets. We limit our attention to large, urban metropolitan areas for which BLS data are available.

The model empirically tested is of the form:

$$Y = \alpha + \beta X + \gamma Z + m$$

where the dependent variable is the percentage change in the BLS Food-at-Home Price Index, X represents a set of binary variables reflecting depot store activity, and Z are control variables suggested by economic theory that affect changes in retail food prices. The analyses are performed on two data sets. One is a set that pools annual percentage price change observations from 1977-1983 across 25 metropolitan areas (n = 149). The second set contains the percentage price change during the six year period, 1977-1983, for 24 MSAs (n = 24).

1. The Variables and Their Measurement in the Pooled Data Set

Change In Food Prices: The annual percentage change in the BLS CPI for Food-at-Home was calculated from the average annual price index published for each of 25 MSAs in the CPI detailed reports.⁵ These data are based on a sample of all food stores, and thus include a number of store types (e.g., convenience stores, meat markets, produce markets) that ideally would be excluded for purposes of this analysis. Also, since BLS incorporated new samples and methodology beginning in 1978, the 1977 base from which the 1978

change in price was calculated is not strictly comparable to data for subsequent years. However, discussions with BLS personnel, as well as the 1978-1983 comparison analyses reported below, suggest that the problem does not significantly affect our results.

Depot Share Variables: Our hypothesis is that the emergence of a strong depot store strategic group(s) in a market results in lower food prices in that market. Since the direct effect of such stores' low prices is not reflected in BLS data, and since we are restricted to analyzing food price changes (not levels), our testable hypothesis is that markets with strong depot groups experience a reduction in food prices or a smaller increase in food prices compared to markets without a significant depot store presence due to the "indirect effect" such competition has on the prices of non-depot rivals.

To test this hypothesis, binary "dummy" variables were constructed to reflect whether the depot share in a market in year t was 5-20%, or greater than 20%.⁶ Both variables took on a zero value if the depot share was less than 5%, on the assumption that such a share would be too small to elicit a detectable response in a market. Depot shares were estimated using a variety of trade sources, including Metro Market Studies, Supermarket News, Market Scope, and others. The imprecise nature of the estimates obtained from such sources prevented us from constructing a reliable continuous measure of depot store shares.

Change in Concentration: A wide variety of market models conclude that once a market can better be characterized as oligopolistic rather than competitive, there will be a positive relationship between market concentration and market price. Although there remains some dispute over both

the theory and empirical evidence supporting such a relationship⁷, this issue is rapidly being resolved by the growing number of empirical concentration-price studies. To date well over 50 such studies have been conducted in a wide range of industries (banking, securities, life insurance, gasoline retailing, food retailing, prescription drugs, cement, airlines, newspaper and television advertising). The results are impressively consistent. In nearly all cases, a significant positive relationship has been found between concentration and prices (Weiss 1985; Mueller 1986).

With respect to relationships between concentration and changes in price the evidence is less clear (Connor, et al. 1985, p. 310-311). However, at least one study has found evidence of a long run positive relationship between changes in concentration and changes in prices in the food and tobacco manufacturing industries (Kelton 1982). That evidence, plus the logical extension of the concentration level-price level relationship, suggests that a change in concentration variable should be tested in this model.

The measure of concentration used is the sum of the shares for the largest four firms (CR4) in each MSA, as reported by Metro Market Studies (Metro). Generally, this included the four largest chains in an area, but occasionally it included the corporate-store shares of wholesale groups. Since publication of Metro data lags collection of that data by one to two years, $CR4_t$ was first calculated as the average of Metro $CR4_{t+1}$ + Metro $CR4_{t+2}$. The resulting figure was then adjusted by the ratio: (1977 Census CR4)/(1977 Metro CR4), on the assumption that the divergence of Metro data from (the presumably more accurate) census data remained constant over the period examined. Finally, the annual change in this adjusted CR4 was calculated for use in the analysis.

Metro periodically updates its definitions of MSAs to correspond to those defined by the Bureau of the Census. Since BLS does not make such frequent periodic revisions for the CPI, some disparity occurs between Metro and BLS MSAs beginning with the 1984 Metro (used here to calculate the 1982 and 1983 CR4). However, the change in definition involved more than 8% of area sales in only 2 of the 11 areas where there were different definitions, and only one of these areas (Portland) contained depot stores.⁸

Change in Per Capita Income: As income in an MSA increases, consumers are expected to shift their purchases towards higher priced products and towards stores with higher levels of service. The long-run effects of these shifts would be an increase in food store sales that stem in-part from higher prices and in-part from changes in products sold.

Given BLS methodology and the relatively short period of this empirical study, it may not be possible to detect the expected positive relationship between price change and income change. For the five year periods between CPOPS surveys, the products and outlets on which BLS collects prices and the weights used are held constant. If consumers shift towards higher service stores as incomes increase, that will only be detected by BLS when a new CPOPS survey is conducted. Then because of the bridging procedure followed, the shift in consumer patronage to high service-high priced stores (or low price stores) is not allowed to influence the change in CPI. Thus the nature of the BLS data set conceals certain effects of changes in income. Change in per capita income is included in the model on theoretical grounds, recognizing that the data set may not allow adequately testing its effects on MSA prices.

The percentage change in personal disposable income was calculated using Sales and Marketing Management's (S&MM) estimate of "Effective Buying Income,"

as reported in the Annual Survey of Buying Power. This measure is available by county, so we could construct measures for areas directly comparable to those defined by BLS. The income data were put on a per capita basis using the population data described below.

Change in Population: The effect of an increase or decrease in population on area prices depends, in part, on concurrent changes in retail capacity and the retail strategies adopted. If population increases slower than capacity, the addition of capacity to the market would be expected to stimulate rivalry and depress prices. If population increases faster than capacity, the resulting excess demand may lead to a decline in rivalry and greater price increases than would otherwise occur. However, firms may also adopt strategies to maintain or expand their market share in growth markets. If population increases faster than capacity, increased utilization of existing capacity would lower average costs and allow share maximizing firms to lower prices. The expected relationship between change in population and change in prices is therefore ambiguous.

We measure this variable by calculating the percentage change in population as estimated in S&MM's survey of buying power. Again, the measure covered areas identical to BLS-defined areas.

Change in Operating Costs: The combination of utility and rental costs account for 10-12% of grocery store operating costs and roughly 2% of grocery stores sales. Regional differences in energy sources and uses, and differing rates of growth across areas, could result in variations in the rate of change of these operating costs.

As a proxy for the cost of these inputs to store owners, CPI data for fuels and for residential rent were combined to form an "energy plus rent" price

index. The annual percentage change in this index was then calculated. The "energy plus rent" index was calculated as a simple average of the two price indices since grocery industry data show that utilities (excluding telephone service) accounted for roughly the same percentage of operating costs as did rent payments during 1978-1982 (Progressive Grocer, April 1983 p. 96). We recognize that consumer utility and rental prices are an imperfect measure of the cost of those inputs to retailers. However, we expect that price changes for these inputs are similar for consumers and commercial purchasers.

Labor Costs: By far the largest single operating expense for food stores is their payroll, accounting for nearly 60% of operating expenses (Progressive Grocer 1985). Lamm and Wescott (1981) found changes in wages of food and grocery store employees to be a large and significant factor contributing to national changes in grocery prices over time. Such wage changes differ considerably across markets due to, inter alia, differing levels of unionization and union success in affecting wages (Lamm 1982; Harp 1979), and differing levels of unemployment.

The effects of changing wage rates on prices depends upon the extent to which productivity also changes. Thus, payroll per dollar of sales is preferred to wage rates as a measure of labor costs since it incorporates changes in wages, productivity and the mix of employees (part-time v. full-time) used. Changes in labor costs were measured as the annual change in payroll as a percent of deflated sales. Sales were deflated to eliminate changes in prices--the variable we are trying to explain--from the denominator in these calculations.

Payroll data were calculated from Bureau of Census County Business Pattern data which reports gross wages and other compensation for civilian employees

of food stores. The geographic areas for these data were generally identical to BLS areas.⁹ Sales data for each MSA and year were from S&MM Survey of Buying Power, which estimates sales of stores selling food primarily for home consumption. The sales figures were deflated by the BLS CPI consumed-at-home for each MSA and year.

2. Variables in Cross-Sectional Analysis of Average Price Changes for 1977-1983 Period

Whereas the previous data set was used in pooled time series-cross sectional analysis in which the dependent variable was year to year percentage changes in prices, the cross sectional analysis examined price changes over the period 1977-1983. The dependent variable was the six-year percentage change in the Food at Home CPI based upon BLS data.

The market share of depot stores changed considerably in some MSAs over the six years studied. Thus, the presence of depot stores was measured by the average annual change in depot store shares over the six year period. MSAs were categorized by their average annual percentage point increase in depot shares: 1) zero, 2) more than zero but less than one, 3) one to two, or 4) over two. Binary variables were used to designate the last three rates of growth.¹⁰

The average annual change in concentration used the data discussed above and was calculated as:

$$\frac{(Z_{1983} - Z_{1977})}{6}$$

The percentage changes in per capita income and labor costs were calculated for the entire six year period in a similar manner as the dependent variable:

$$\frac{(Z_{1983} - Z_{1977})}{Z_{1977}}$$

Variables analogous to the population change and energy plus rent cost change for the six year period were constructed and included in preliminary analysis. However, collinearity problems and the limited degrees of freedom in this data set resulted in our omitting these variables from subsequent analyses.

V. Empirical Results

A. Descriptive Statistics

The pooled data set consisted of 149 observations: six annual observations for 24 geographic markets for the years 1977-1983, plus five annual observations for the Miami MSA (data for 1977 were unavailable). A list of the areas is in Appendix C. The average annual percentage changes in the Food-at-Home CPI for observations grouped by depot market share were as follows:

	<u>Depot Store Market Share</u>		
	<u>0 ≤ 5%</u>	<u>> 5 ≤ 20%</u>	<u>> 20% share</u>
Average Annual % ΔCPI	7.4%	6.4%	1.7%
# Observations	105	38	6
# Different Areas	21	10	3

The cross-section data set consisted of 24 observations. The percentage changes in the Food-at-Home CPI for areas grouped by average annual depot share growth were:

	<u>Change in Depot Share</u>			
	<u>$\Delta\text{share}=0$</u>	<u>$0 < \Delta\text{share} \leq 1$</u>	<u>$1 < \Delta\text{share} \leq 2$</u>	<u>$2 \leq \Delta\text{share}$</u>
% ΔCPI , 1977-1983	51.2%	50.5%	44.3%	43.9%
% ΔCPI , 1978-1983	36.6%	36.3%	31.4%	30.1%
# Observations	8	10	2	4

Appendix D contains summary descriptive statistics for the dependent and control variables used in the study.

B. Regression Results - Pooled Data Set

The empirical model was:

$$P_{it} = \beta_1 + \beta_2 D1_{it} + \beta_3 D2_{it} + \beta_4 CR_{it} + \beta_5 I_{it} + \beta_6 P_{it} + \beta_7 ER_{it} + \beta_8 L_{it} + \sum_{t=1}^5 \beta_t T_t + e_{it}$$

where:

Hypotheses

i, t - area, year subscripts;

P - percentage change in retail food prices from one year to the next, expressed in decimals;

$D1$ - binary variable, value=1 if area depot share is $> 5 \leq 20\%$, otherwise = 0;

$$\beta_2 < 0$$

$D2$ - binary variable, value=1 if area depot share $> 20\%$, otherwise = 0;

$$\beta_3 < 0$$

CR - change in CR4 expressed in percentage points;

$$\beta_4 > 0$$

I - percentage change in per capita disposable income;

$$\beta_5 > 0$$

- P = percentage change in population; $\beta_6 \neq 0$
- ER = percentage change in price index of energy plus rent; $\beta_7 > 0$
- L = percentage change in payroll/deflated sales; $\beta_8 > 0$
- T = set of binary variables, value=1 when the year of observation = t, otherwise = 0 $\beta_t \neq 0$

The set of time-related binary variables was included because the observations for which D2=1 (and, to a lesser extent, for which D1=1) occur in the latter years of the time period analyzed. Since those years were characterized by significantly lower rates of inflation than the preceding years, failure to control for such time-related factors would result in D2 reflecting those lower inflation rates as well as any effects of depot stores on price changes. Regressions estimated without the time variables resulted in unrealistically large coefficients on D2.

Preliminary analysis using ordinary least squares indicated that the squared residuals were positively correlated with the level of CR4 in the markets. Subsequent tests indicated that we might assume that $\text{Var}(e_i) = \text{BCR4}^2$, and so to correct for the heteroskedasticity we deflated all variables by CR4 (Pindyck and Rubinfeld 1981, p. 151). Table 1 shows the results of this correction process, as well as results from the OLS regression. A test for first-order autocorrelation (regressing residuals against lagged residuals) did not indicate the presence of that problem.

As equation 1b in Table 1 shows, areas in which a substantial share of the market was held by depot stores experienced smaller increases in food prices than did areas where such stores had little or no market share. Prices rose about 1% per year less in MSAs in which depot stores held over 20% of the market. Areas in which depot stores held 5-20% of the market experienced a

TABLE 1. Effect of Depot Market Share on Area Food Prices¹
(Pooled Time Series and Cross Section Data)

Dependent Variable: Annual % Change, Food at Home CPI

Sample	N	Constant	Depot Share		Δ CR4	Δ Per Capita Inc	Δ Population	Δ Rent & Energy Prices	Δ Payroll/Sales	Time Dummies	R^2	\bar{R}^2
			5-202	>202								
1a 1977-1983 25 areas	149	.019 ^C (4.66)	-.004 ^b (-1.73)	-.012 ^b (-2.06)	.0005 (1.13)	.007 (.20)	.040 (.86)	-.007 (-.26)	-.008 (-.62)	Yes ^C (All Sig. at 1% Level)	.88	.87
1b 1977-1983 25 areas	149	.017 ^C (4.72)	-.005 ^b (-1.88)	-.010 ^b (-1.93)	.0002 (.47)	.021 (.62)	.060 (1.23)	-.011 (-.44)	-.009 (-.84)	Yes ^C (All Sig. at 1% Level)		
2a 1978-1983 25 areas	125	.017 ^C (3.99)	-.004 ^a (-1.25)	-.012 ^b (-2.02)	.0008 ^a (1.41)	.023 (.59)	.067 (1.15)	-.005 (-.16)	-.012 (-.90)	Yes ^C (All Sig. at 1% Level)	.87	.85
2b 1978-1983	125	.016 ^C (4.07)	-.004 ^a (-1.44)	-.010 ^b (-1.97)	.0003 (.56)	.037 (1.01)	.065 ^A (1.18)	-.010 (-.37)	-.016 (-1.26)	Yes ^C (All Sig. at 1% Level)		

(t - statistics in parentheses)

Significance levels: one-tailed tests: 10%-a; 5%-b
two-tailed tests: 10%-A; 5%-B; 1%-C

¹ Equations 1a and 2a are OLS; equations 1b and 2b have been corrected for heteroskedasticity by deflating all variables by area CR6s

² Except Miami, which is 1978-1983

.5% lower price increase. The differences were statistically significant at the 5% level. These results weakened slightly, but still generally held, when the 1977-78 price data were omitted (equations 2a, 2b).

The results provide considerable support for the hypothesis that depot stores exert a significant price-moderating effect in markets where they establish a sizable presence. Had the price data also reflected the lower prices of depot stores themselves (i.e., the "direct effect"), the observed impact on consumer prices would have been even greater. Other than the depot share and time-related binary variables, only the population growth variable had a coefficient significantly different from zero in the GLS models (for 1978-83 only).

C. Regression Results - Cross-Section Analysis

The empirical model estimated was:

$$P_i = \beta_1 + \beta_2 D_{i1} + \beta_3 D_{i2} + \beta_4 D_{i3} + \beta_5 CR + \beta_6 I + \beta_7 L + e_i$$

where:

Hypotheses

i - area subscript

P - percentage change in retail food prices, 1978-1983, expressed in decimals.

D1 - binary variable, value = 1 if average annual change in depot share is greater than 0 and less than or equal to 1, otherwise = 0; $\beta_2 < 0$

D2 - binary variable, value = 1 if average annual change in depot share is greater than 1 and less than or equal to 2, otherwise = 0; $\beta_3 < 0$

D3 - binary variable, value = 1 if average annual change in depot share is greater than 2, otherwise = 0; $\beta_4 < 0$

CR - average annual change in CR4 from 1977 to 1983. $\beta_5 > 0$

I = percentage change in per capita disposable
income from 1977 to 1983.

$\beta_6 > 0$

L = percentage change in payroll/sales from 1977 to 1983. $\beta_7 > 0$

As in the pooled data set, we corrected for error terms that were heteroskedastic with respect to CR4; the uncorrected and the corrected results appear in Table 2. The results of equation 1b show that depot store shares had to increase by over 1% per year to have a significant effect on changes in prices. Areas in which the depot share increased by 6-12 points over the period ($D2 = 1$) experienced food price increases that were 7.6% less than in areas where there was no change in depot shares; areas in which the depot share increased more than 12 points had price increases that were 6.8% less. These results were statistically significant at the 5% and 1% level, respectively. The results were similar for the 1978-83 time period (equations 2a, 2b). Although we would have expected the coefficient on D3 to be larger than that on D2 (if either were to be larger), the difference is neither statistically significant nor remarkable considering the small size of the sample. These results provide evidence that significant growth in depot store shares was related to lower food price increases in the metropolitan areas included in this analysis. Because of BLS procedures, these results are not due to depot store prices receiving more weight as depot share increases. The weight given different firms is held constant by BLS over five years periods.

The remaining variables in the cross section models are insignificant except for change in CR4 for the 1978-83 data set. Metropolitan areas that increased most in four-firm concentration from 1978 to 1983 tended to experience larger increases in BLS prices.

TABLE 2. Effect of Changes in Depot Store Market Share on Change in Area Food Prices¹
(Cross Section Data Set)

Dependent Variable: % Change, Food at Home CPI

Sample	N	Binary Variables Representing Average Annual % in Depot Market Share				Ave. Annual Δ in CR4	% Δ Per Capita Disposable Income	% Δ Payroll/Sales	R ²	F ²
		Constant	D ₁ 0-6 Pts. Δ	D ₂ 7-9 Pts. Δ	D ₃ 10-12 Pts. Δ					
1a 1977-83 24 areas	24	.532 ^c (6.91)	-.011 (-.47)	-.081 ^b (-1.91)	-.066 ^b (-2.14)	.011 (1.11)	-.010 (-.09)	.054 (.69)	.42	.22
1b 1977-83 24 areas	24	.514 ^c (7.20)	-.018 (-.96)	-.076 ^b (-1.95)	-.068 ^c (-2.65)	.005 (.60)	.005 (.05)	.058 (.84)		
2a 1978-83 24 areas	24	.367 ^c (5.84)	-.004 (-.23)	-.079 ^b (-2.14)	-.072 ^c (-2.66)	.013 ^b (1.86)	.024 (.22)	-.021 (-.34)	.44	.25
2b 1978-83 24 areas	24	.355 ^c (5.73)	-.007 (-.36)	-.078 ^b (-2.16)	-.074 ^c (-3.18)	.011 ^d (1.50)	.046 (.40)	-.025 (-.40)		

(t-statistics in parentheses)

Significance Levels (one-tailed tests): 10%-a; 5%-b; 1%-c

¹ Equations 1a and 2a are OLS; equations 1b and 2b have been corrected for heteroscedasticity by deflating all variables by the 6-year or 5-year average area CR4.

The results in Table 1 indicate that once depot stores have captured 5% or more of a market, they have a negative influence on the rate of price increases. Further, as the share held by depot stores becomes larger, that influence becomes greater. The results in Table 2 indicate that the rate of growth in depot share is also important. In markets in which the growth in depot store share was positive but less than or equal to 1 percentage point per year, there was no significant effect on the rate of price increases.

The results raise the question of whether both a threshold level of depot share and rate of growth in depot share are necessary for these stores to negatively affect price increases. Different samples are examined in Table 3 in an attempt to answer this question. Four of the MSAs in which depot share growth was 1% or less (D1 in Table 2 which was insignificant) had depot store shares of 5 to 20% (D1 in Table 1 which was significant). Those four areas accounted for 15 of the 38 observations in the pooled data set in which depot share was 5-20%, and 4 of the 10 observations in the cross section data set in which share growth was positive but $\leq 1\%$.

Equations 1a and 1b in Table 3 analyze the cross section data set after dropping the six areas in which share growth was positive but less than 1% annually and in which depot share was less than 5%. Thus, the relationship of D1 to the dependent variable is based upon the four area observations discussed above. D1 (average annual change in depot store share) remains insignificant in Equations 1a and 1b, suggesting that even though the four areas had depot shares of 5 to 20%, the lack of growth in depot shares led to no significant effect on price changes.

TABLE 3a Regression Results Explaining Changes in Food at Home CPI, Using Different Samples, 1977-1983¹
(Pooled and Cross Section Data Sets)

Sample	N	Binary Variables Representing Ave. Annual t in Depot Share										Time Dummies? R^2	R
		Constant	D1 0-0P1a1	D2 1-0P1a2	D3 2-0P1a	Depot Share Binary Variables 5-202 >202		Δ CR4 Per Cap Income	Δ Energy + Rent Prices	Δ Payroll /Sales			
1a Cross Section 18 areas 1977-1983	18	.493 ^C (5.87)	-.007 (-.78)	-.056 ^a (-1.37)	-.046 ^b (-2.46)		-.004 (-.36)	.027 (.21)		.067 (.82)	--	.59	.37
1b Cross Section 18 areas 1977-1983	18	.522 ^C (6.32)	-.024 (-1.00)	-.059 ^a (-1.46)	-.065 ^b (-2.55)		-.002 (-.23)	-.009 (-.07)		.086 (1.16)	--		
2a Pooled 23 areas 1977-1983	176	.018 ^C (4.77)				.001 (.31)	-.013 ^b (-2.12)	.0008 ^a (1.48)	.014 (.37)	-.011 (-.41)	Yes	.89	.87
2b Pooled 23 areas 1977-1983	176	.016 ^C (4.23)				.002 (.52)	-.016 ^b (-1.97)	.0004 (.71)	.023 (.65)	-.015 (-.55)	Yes		
3a Pooled 23 areas 1977-1983	134	.018 ^C (4.36)				-.008 ^C (-2.64)	-.009 ^a (-1.54)	.0004 (.80)	-.020 (-.55)	.010 (.37)	Yes	.90	.89
3b Pooled 23 areas 1977-1983	134	.015 ^C (4.37)				-.008 ^C (-3.05)	-.007 ^a (-1.44)	.0003 (.06)	-.008 (-.24)	.008 (.33)	Yes		

(t-statistics in parentheses)

Significance levels: one-tailed tests: 10%-a; 5%-b; 1%-c
two-tailed tests: 1%-c

¹ Equations 1a, 2a, 3a are OLS; equations 1b, 2b, 3b have been corrected for heteroscedasticity by deflating all variables by CR4 (2b, 3b) or the 6-year average CR4 (1b) for each area.

Equations 2a and 2b analyze the pooled data set after eliminating the 23 observations with a 5-20% depot share and a depot share growth greater than 1% annually. The fact that the 5-20% share variable becomes insignificant indicates that areas with a 5-20% depot share and a depot share growth of less than or equal to 1% did not experience significantly lower price increases. Equations 3a and 3b result from including the 23 areas omitted in equations 2a and 2b, and omitting the 15 areas for which the depot share was 5-20% with depot share growth less than 1% annually. Consistent with the interpretation above, the 5-20% share returns to significance. The results in Table 3 offer support for concluding that the response by competitors to depot stores depends on both: 1) depot stores attaining some threshold level of market share, perhaps 5%, and 2) depot stores increasing their market share by roughly one percentage point or more annually. This conclusion suggests that in areas such as Portland, where depot stores had 7-10% of the market throughout most of this period but did not experience much growth in that share, the market "settles" into less aggressive competitive behavior.

VI. Summary and Conclusions

The analyses in this paper indicate that metropolitan areas with substantial depot store activity experienced lower retail food price increases during the period studied than did areas without such depot activity. The results were consistent for both the pooled and the cross-section data despite imprecise data on depot store market shares and limitations in the CPI data.

The results are consistent with the hypothesis that depot stores constitute a strategic group that is sufficiently interdependent with other supermarket formats to be an important competitive force that increases rivalry and leads

to substantial consumer benefits. However, the results fall short of testing the hypothesis that depot stores are in fact a separate strategic groups from conventional supermarkets, superstores, etc. Since the introduction of depot stores frequently involves adding capacity to a market, they would be expected to increase rivalry and depress prices even if they are in the same strategic group with superstores. Our results are unable to distinguish between the entry/introduction effect and the new strategic group effect.

The finding that price increases were even lower in markets where depot stores held over a 20% share provides some support for the notion that these stores are in new strategic groups and that the addition of one or more strategic groups enhances rivalry. In MSAs in which depot stores have captured over 20% of the market, their entry usually occurred a few years earlier. With over 20% of the market, depot stores have become an established part of these markets. Still--our results indicate that their effects on price increases are even greater than during the earlier stages of entry and market penetration. Since there were only 6 observations in which depot stores held over 20% of market, we must be cautious in interpreting the results. However, they do provide modest support for some of Porter's hypotheses concerning the rivalry effects of strategic groups.

One implication of these results is the importance of ensuring that markets are free of any artificial barriers to the entry and survival of depot stores, such as the price conduct described in Mueller (1984). The results also suggest that additional insights into the competitive behavior of retail food markets can be gained by considering the structure and characteristics of strategic groups.

Finally, the study has raised a question regarding the extent to which published CPI data accurately reflect changes in food prices facing consumers in areas with a significant depot store presence. This is a matter of which the BLS is well aware and which they face in any consumer goods market in which discount outlets emerge. The changes in prices analyzed in this study reflect only the effects of warehouse stores on the prices of competing stores. Had the lower prices of depot stores been included in the data set (i.e., to constitute a cost of living index rather than a price index), the effects of warehouse stores would have been even greater. For example, if warehouse stores charge prices that average 7% less than conventional supermarkets and superstores, and if they achieve 30% of an MSAs sales, the actual cost of food to consumers in that market would be approximately 2% less than indicated by the CPI.

It should be remembered that BLS considers the CPI a price index-- not a cost of living index. However, it is frequently used as a measure of the cost of living. Social security payments, some wages, and many other things are pegged to the CPI. Taken in the aggregate, the effects of the CPI being 1% high or low are enormous.

Since BLS procedures attempt to hold quality and service levels constant over time, the CPI may be an inaccurate measure of cost of living changes wherever significant new forms of retailing have developed.¹¹ Although we did not examine data on the prices of food away-from-home, the rapid development of fast-food outlets may pose a problem similar to that of warehouse stores in food retailing. The nub of the problem is whether it is possible to construct a meaningful cost of living index that allows changes in quality-service attributes and in the delivery system. On the one hand, one can argue that

when milk changed from home delivery to being purchased in supermarkets, a cost of living index should reflect the change in price attributable to the new delivery system. However, a price index tries to avoid such changes in quality-service attributes for very understandable reasons.

We have no easy solutions to propose. Our comments should not be interpreted as criticisms of BLS as their procedure appears appropriate for their objective--to measure price changes, not cost of living changes. Absent a better alternative measure, however, the CPI is used as a measure of cost of living changes. At the very least, we need to understand the problems of using the CPI in this way.

ENDNOTES

1. The definitions of store formats are somewhat nebulous, but typical are the definitions offered by Progressive Grocer (Marketing Guide Book 1983) and Grocer's Spotlight (1984).

Convenience Stores: compact store, limited line of high convenience items, long hours, easy access, high margins.

Conventional Supermarkets: smaller than 30,000 sq. feet, full line, self service, sales greater than \$2,000,000 annually.

Super Store: larger than 30,000 sq. feet, extensive service departments, approximately 1/3 of selling space devoted to non-foods, \$8,000,000 or more annual sales.

Combination Store: same as superstore, but 40% or more of selling space devoted to non-foods.

Limited Assortment ("Box") Stores: less than 1,500 items, few if any perishables, low margins.

Warehouse Stores: 1,500 to 7,500 items, some perishables, low margins and labor ratios.

Super Warehouse ("Hybrid") Stores: more than 7,500 items, some perishables, possibly specialized service departments, low margins.

2. This opinion might be tempered by the apparent success of such a store in one town of only 13,000 people (Grocer's Spotlight 1985c).
3. We are grateful to William L. Weber of B.L.S. for his assistance and patience in explaining this process.

4. Since the relative weights given different outlets are held constant between CPOPS surveys, if warehouse stores are eroding the market position of incumbent supermarkets the indirect effect of depot stores on changes in market prices may be somewhat overstated.
5. Three of the areas--Anchorage, Northeast Pennsylvania, and the New York SCA, were omitted from our analysis for lack of data for other variables.
6. Preliminary analysis was done using 3 such variables: 5-10%, 10-20%, and greater than 20%. However, the results suggested that combining the 5-10% and 10-20% categories was more appropriate.
7. For example, Stiglitz (1979, pp. 339-345) argues for the existence of a negative relationship between concentration and price in markets where search is necessary and costly. Elsewhere, Demsetz (1974) has asserted that "No serious theoretical basis yet exists for [the concentration-monopoly] doctrine..."
8. In Pittsburgh, Fayette County (8% of 1982 sales) was added, Beaver County (8.5% of 1982 sales) was subtracted; in Portland, Yamhill County (5.4% of 1982 sales) was added, and Clark County (13.3% of 1982 sales) was subtracted.
9. An exception was the Boston MSA, in which BLS defines towns and cities as the basic geographic units of the MSA, while County Business Pattern data is compiled according to New England County Metropolitan Area definitions. The practical difference between the two definitions, though, is small for purposes of this data series.
10. Preliminary regressions also included a variable reflecting the number of years in which an area's depot share was greater than 5%, but this

variable was too highly correlated with the binary variables to be retained.

11. As personnel of BLS pointed out in reviewing this paper, this statement depends on the sacrifices consumers may have to make in order to patronize a new form of retailing. BLS personnel comment:

"A shift to warehouse purchasing may provide a lower - cost solution for the fixed indifference surface, but ...the consumer may sacrifice convenience, service and proximity to buy from the warehouse store. In order to remain on the same indifference surface required by a cost of living index, a number of other complementary and substitution consumption changes may also occur. ...The new point on the indifference surface probably has lower cost, but it would be unlikely that the lower cost of living would be as great as the reduction in the food bill." (Letter from John Early, Assistant Commissioner, January 13, 1987).

REFERENCES

- Caves, Richard and Michael Porter. 1977. "From Entry Barriers to Mobility Barriers." Quarterly Journal of Economics 91:241-61.
- Competitive Edge. 1982. "Insight Report." December, p. 1-2.
- Connor, John M. et al. 1985 The Food Manufacturing Industries. Lexington, Mass.: Lexington Books.
- Demsetz, Harold. 1974. "Two Systems of Belief About Monopoly," in Harvey J. Goldschmid (ed.) Industrial Concentration: The New Learning. Boston: Little, Brown.
- Greer, Douglas. 1980. Industrial Organization and Public Policy. New York: Macmillan.
- Grocer's Spotlight. 1984. "Playing the Format Game." June, p. 1,14.
- _____. 1985a. "Safeway's Strategy is Spelled Out." June, p. 36.
- _____. 1985b. "Warehouse Stores - Format of the 80s." August 1, p.33.
- _____. 1985c. "125-Year Tradition Makes 40,500 Footer Work in Town of 13,000." September, p. 20.
- Handy, Charles and Tom Stafford. 1980. "Supermarkets React to Warehouse and Box Stores." National Food Review 12 (Fall): 8-9.
- Harp, Harry. 1979. "Labor Costs in Food Marketing." National Food Review 8 (Fall): 12-14.
- Kelton, Christina M.L. 1982. "The Effect of Market Structure on Price Change for Food Manufacturing Product Classes." Working Paper 60. Madison, WI: NC 117.
- Lamm, R. McFall. 1982. "Unionism and Prices in the Food Retailing Industry." Journal of Labor Research 3 (Winter): 69-79.
- _____. and Paul C. Westcott. 1981. "The Effects of Changing Input Costs on Food Prices." American Journal of Agricultural Economics 63 (May): 187-196.
- Marion, Bruce W. 1984. "Strategic Groups, Entry Barriers and Competitive Behavior in Grocery Retailing." Working Paper 81. Madison, WI: NC 117.
- Mueller, Willard F. 1984. "Alleged Predatory Conduct in Food Retailing." Working Paper 78. Madison, WI: NC 117.
- _____. 1986. "The New Attack on Antitrust." Working Paper 90. Madison, WI: NC 117.

- Newman, Howard H. 1978. "Strategic Groups and the Structure-Performance Relationship." Review of Economics and Statistics. 60 (August): 417-427.
- Pautler, Paul. 1983. "A Review of the Economic Basis for Broad-based Horizontal-Merger Policy." The Antitrust Bulletin, Fall: 571-651.
- Porter, Michael E. 1976. Interbrand Choice, Strategy, and Bilateral Market Power. Cambridge, MA: Harvard University Press.
- _____. 1979. "The Structure Within Industries and Companies' Performance." Review of Economics and Statistics. 61 (May): 214-227.
- _____. 1981. "Strategic Interaction: Some Lessons from Industry Histories for Theory and Antitrust Policy." in Steven Salop (ed.), Strategy, Predation and Antitrust Analysis. Washington, D.C.: FTC.
- Progressive Grocer. 1972. "What Makes Warehouse Markets Go." August, p.61.
- _____. 1983. "Composite Chain Report." April, p. 96.
- _____. 1985. "Composite Chain Report." May, p. 96.
- Progressive Grocer's Marketing Guidebook. 1983. New York: Progressive Grocer Co.
- Pindyck, Robert S. and Daniel L. Rubinfeld. 1981. Econometric Models and Econometric Forecasts. New York: McGraw-Hill.
- Scherer, F.M. 1980. Industrial Market Structure and Economic Performance. 2nd Ed. Chicago: Rand McNally.
- Stiglitz, J.E. 1979. "Equilibrium in Product Markets with Imperfect Information." American Economic Review 69 (May): 339-345.
- Supermarket News. 1983a. "Says Few Areas Can Support Depots." November 14, p. 1.
- _____. 1983b. "Store Opening Puts Lucky in Super Warehouse Field." December 12, p. 1.
- _____. 1984. "Cub Foods Out Front in Green Bay Market." January 9, p. 1, 21.
- _____. 1985. "Town and Country Opens Cub to Stem Competition." November 11, p. 8A.
- _____. 1986. "Says Big Depot Stores Are Losing Their Advantage." April 14, p. 1, 22.
- Tremblay, Victor J. 1985. "Strategic Groups and the Demand for Beer." Journal of Industrial Economics 34 (December): 183-198.

United States Department of Labor, Bureau of Labor Statistics. 1984.
BLS Handbook of Methods, Volume II, The Consumer Price Index.
Washington, D.C.: GPO.

Weiss, Leonard. 1985. "Concentration and Price--Not Concentration and Profits." (Processed) Madison: University of Wisconsin.

Appendix A: Spending Categories Comprising the Food at Home Composite

CPOPS Category	Expenditure Category	Item Stratum	ELJ
110	1-Cereal & Cereal Products	1	Flour
Misc. Prepared Foods, Cereals, Condiments & Seasonings	18-Misc. Prepared Foods		Prepared flour mixes
		2	Cereal
		3	Rice
			Macaroni/similar products, corn meal
		1	Canned, packaged soup
		2	Frozen prepared dinners
			Frozen prep. food, excluding dinners
		3	Potato chips, other snacks
			Nuts
		4	Salt, other seasonings, spices
105	2-Bakery Products		Olives, pickles & relishes
		5	Condiments, excluding sauces & gravies
			Sauces & gravies
		6	Salads, desserts, misc. prepared foods
			Baby foods
		7	Other canned, pkged prepared foods
			White bread
		1	Bread Other than White
		2	Biscuits, rolls, muffins, - fresh
		3	Cakes, cupcakes - fresh
106	3-Beef	4	Cookies
		5	Crackers
		6	Bread crumbs, stuffing, cracker crumbs, and meal
			Sweetrolls, coffee cake, donuts -fresh
		7	Frozen & refr. bakery products
		8	Pies, tarts, turnovers - fresh
			Ground beef other than canned
		1	Chuck roast
		2	Round roast
		3	Roasts other than chuck & round
Meats & Poultry		4	Round steak
		5	Sirloin steak
		6	Steak other than round & sirloin
		7	Beef other than canned, ground, roast, or steak

Appendix A, continued

CPOPS Category	Expenditure Category	Item Stratum	FLI
082 Fish & Seafood	4-Pork	1	Bacon
		2	Pork chops
		3	Ham other than canned
		4	Pork other than bacon, chops, ham, or sausage
107 Dairy Products Inc. Eggs	5-Other Meats	5	Sausage
		6	Canned ham
		1	Frankfurters
		2	Bologna, liverwurst, salami
		3	Lunchmeats other than bologna, liverwurst, or salami
		4	Lamb & organ meats
082 Fish & Seafood	6-Poultry	1	Fresh chicken, whole
		2	Fresh or frozen chicken parts
		3	Poultry other than fresh chicken or frozen parts
		1	Canned fish & seafood
107 Dairy Products Inc. Eggs	7-Fish & Seafood	2	Fresh & frozen shellfish
			Fresh & frozen fish
		1	Eggs
		1	Fresh whole milk
108 Fresh Fruits & Vegetables	8-Eggs	2	Fresh milk other than whole, & cream
		1	Butter
		2	Cheese
		4	Ice cream & related products
		5	Dairy products other than butter, cheese and ice cream
108 Fresh Fruits & Vegetables	9-Fresh Milk & Cream	1	Apples
		2	Bananas
		3	Oranges
		4	Fresh fruits other than apples, bananas, oranges
108 Fresh Fruits & Vegetables	10-Other Dairy Products	1	Potatoes
		2	Lettuce
		3	Tomatoes
		4	Fresh vegetables other than potatoes, lettuce, tomatoes
108 Fresh Fruits & Vegetables	11-Fresh Fruits	1	Apples
		2	Bananas
		3	Oranges
		4	Fresh fruits other than apples, bananas, oranges
108 Fresh Fruits & Vegetables	12-Fresh Vegetables	1	Potatoes
		2	Lettuce
		3	Tomatoes
		4	Fresh vegetables other than potatoes, lettuce, tomatoes

Appendix A, continued

CPOPS Category	Expenditure Category	Item Stratum	ELI
083 Processed Fruits & Vegetables	13-Processed Fruits	1	Frozen orange juice Frozen fruit & fruit juices other than orange juice Fruit juices other than frozen Canned & dried fruits Frozen vegetables Canned beans other than lima Canned cut corn Canned & dried vegetables other than beans and corn
085 Sugar & Other Sweets For Home Use	14-Processed Vegetables	2 3 1 2 3	
	15-Sugar & Other Sweets	1 2 3	Candy, chewing gum Sugar & artificial sweeteners Sweets excluding candy, gum, sweeteners
084 Fats, Oils, Peanut Butter, Salad Dressings, & Dairy Products Substitutes	16-Fats & Oils	1 2 3	Margarine Lard, shortening, oil, mayonnaise, salad dressing Non-dairy substitutes, imitation milk Peanut butter
109 Carbonated Beverages for Home Use 086 Coffee, Tea, Fruit- Flavored Drinks, Other non-carbonated Drinks for Home Use	17-Non-Alcoholic Beverages	1 2 3 4 5	Cola drinks excluding diet cola Carbonated drinks excluding non- dietary cola Roasted coffee Freeze dried & instant coffee Non-carbonated fruit-flavored drinks Tea Non-carbonated beverages excluding coffee, tea, fruit drinks

Appendix B

The estimate of the one period price change for the z th item stratum in a given MSA is computed as:

(1)

$$R_{zt,t-1} = \frac{R_{zt,0}}{R_{zt-1,0}} = \frac{\left[\sum_{i \in z} W_{zi} (P_{zit}/P_{zi0}) \right] \div \sum W_{zi}}{\left[\sum_{i \in z} W_{zi} (P_{zit-1}/P_{zi0}) \right] \div \sum W_{zi}}$$

P_{zit} is the price of the i th quote in the current pricing period, t , for item z ; in our case, the i th quote is generally from the i th retail outlet;

P_{zit-1} is the price of the i th quote in the previous pricing period, $t-1$, for item z ;

P_{zi0} is the base period price for the i th quote for item z ;

W_{zi} is the quote weight of the i th quote for item z .

The quote weight, W_{zi} , consists of the product of the following factors: the percent of sales (α) that the ELI represents of the total sales of the POPS category for the urban population (U) in an MSA; a duplication factor (f) to reflect any special subsampling of outlets or quotes; the proportion (B) that the ELI selected represents of the item stratum in the region; and (m) the number of usable quotes for the ELI for the item stratum and MSA.

$$W = \frac{\alpha E f}{MB}$$

(Source: BLS Handbook of Methods
CPI Statement p. 28)

To illustrate this procedure, assume the following price quotes
($i=1,2,3,4$) and expenditure information for the z th item stratum in the
Milwaukee MSA:

<u>Outlet A</u>			<u>Outlet B</u>		
<u>ELI 13011:</u>					
$\frac{\text{ELI Sales}}{\text{POPS Category Sales}} = .10 = \alpha_1$			$\frac{\text{ELI Sales}}{\text{POPS Category Sales}} = .15 = \alpha_2$		
<u>Store Item:</u> Minute Maid O.J., 12 oz. Concentrate			<u>Store Item:</u> Donald Duck O.J., 6 oz. Concentrate		
		<u>Price/Oz.</u>			<u>Price/Oz.</u>
P_{z10}	\$.48	\$.04	P_{z20}	\$.30	\$.05
P_{z1t-1}	\$.60	\$.05	P_{z2t-1}	\$.42	\$.07
P_{z1t}	\$.72	\$.06	P_{z2t}	\$.48	\$.08
$\frac{P_{z1t}}{P_{z10}} =$	$\frac{\$.06}{\$.04} = 1.5$		$\frac{P_{z2t}}{P_{z20}} =$	$\frac{\$.08}{\$.05} = 1.6$	
$\frac{P_{z1t-1}}{P_{z10}} =$	$\frac{\$.05}{\$.04} = 1.25$		$\frac{P_{z2t-1}}{P_{z20}} =$	$\frac{\$.07}{\$.05} = 1.4$	
<u>ELI 13012:</u>					
$\frac{\text{ELI Sales}}{\text{POPS Category Sales}} = .05 = \alpha_3$			$\frac{\text{ELI Sales}}{\text{POPS Category Sales}} = .01 = \alpha_4$		
<u>Store Item:</u> Sunkist Frozen Strawberries, 24 oz.			<u>Store Item:</u> Topco Frozen Grape Juice, 12 oz. concentrate		
P_{z30}	\$.72	\$.06	P_{z40}	\$.48	\$.04
P_{z3t-1}	\$.96	\$.08	P_{z4t-1}	\$.72	\$.06
P_{z3t}	\$1.20	\$.10	P_{z4t}	\$.84	\$.07
$\frac{P_{z3t}}{P_{z30}} =$	$\frac{\$.10}{\$.06} = 1.67$		$\frac{P_{z4t}}{P_{z40}} =$	$\frac{\$.07}{\$.04} = 1.75$	
$\frac{P_{z3t-1}}{P_{z30}} =$	$\frac{\$.08}{\$.06} = 1.33$		$\frac{P_{z4t-1}}{P_{z40}} =$	$\frac{\$.06}{\$.04} = 1.5$	

Milwaukee MSA

i) Total daily expenditure for POPS category 083: \$10,000 = E

ii) $\frac{\text{ELI 13011} + \text{ELI 13012 Sales}}{\text{Item Stratum 1 Sales}} = 1.00 = B$

Further, assume that only two stores are sampled, each providing one usable quote for each ELI, and the no special subsampling is done; i.e., $m = 4$, $f = 1$. Then the quote weights for the four price quotes are:

<u>Outlet A</u>	<u>Outlet B</u>
$W_{z1} = \frac{.10(\$10,000)1}{4(1)} = \250	$W_{z2} = \frac{.15(\$10,000)1}{4(1)} = \375
$W_{z3} = \frac{.05(\$10,000)1}{4(1)} = \125	$W_{z4} = \frac{.01(\$10,000)1}{4(1)} = \25

Multiplying the quote weights by the price ratios as in equation (1) yields:

$$\begin{aligned} R_{zt,t-1} &= \frac{[\$250(1.5) + \$375(1.6) + \$125(1.67) + \$25(1.75)]/\$775}{[\$250(1.25) + \$375(1.4) + \$125(1.33) + \$25(1.5)]/\$775} \\ &= \frac{1.58}{1.34} = 1.18 \end{aligned}$$

This reflects an 18% increase in prices of the sampled items from period $t-1$ to period t . Note that this results in a measure of price change, not price level, in an item stratum.

The price relative so calculated for a stratum is then multiplied, or "weighted", by an estimate of expenditure for the previous month in the stratum, say \$15,000, to provide an estimate of the current month's expenditure in the MSA in that stratum:

$$\$15,000(1.18) = \$17,700$$

Then, the item strata expenditure values are aggregated and compared to total reference period expenditures to form the overall CPI. The original "cost-population weights," or the $P_z \times Q_z$ expenditure levels for each item stratum z , were obtained during the CE survey period. Although BLS never explicitly determines the quantities (Q_z) implied in the cost-population weights, it is our understanding that the percentages of total expenditures accounted for by each item stratum are calculated by the Bureau. However, it is not clear if they, like the cost-population weights, have been calculated separately for each area.

APPENDIX C

METROPOLITAN AREAS INCLUDED IN STUDY

Atlanta, GA MSA

Baltimore, MD MSA

Boston, MA MSA

Buffalo, NY MSA

Chicago, IL-Northwestern IN MSA (includes Chicago MSA and Gary MSA)

Cincinnati, OH-KY-IN MSA

Dallas-Fort Worth, TX MSA

Denver-Boulder, CO MSA

Detroit, MI MSA

Honolulu, HA MSA

Houston, TX MSA

Kansas City, MO-KS MSA

Los Angeles-Long Beach-Anaheim, CA MSAs

Miami, FL MSA

Milwaukee, WI MSA

Minneapolis-St. Paul, MN MSA

Philadelphia, PA-NJ MSA

Pittsburgh, PA MSA

Portland, OR-WA MSA

St. Louis, MO-IL MSA

San Diego, CA MSA

San Francisco-Oakland, CA MSA

Seattle-Everett, WA MSA

Washington, DC-MD-VA MSA

APPENDIX D

DEPENDENT AND CONTROL VARIABLE DESCRIPTIVE

STATISTICS

A. Pooled Data Set

<u>Variable</u>	<u>Min.</u>	<u>Max.</u>	<u>Mean</u>
% Δ Price	-0.9	15.3	6.9
Δ CR4	-6.000	8.600	-.842
% Δ Per Cap. Income	-2.8	16.7	8.9
% Δ Population	-6.2	15.0	1.1
% Δ Rent, Energy Prices	-2.9	39.3	10.8
% Δ Payroll/Sales	-20.8	53.4	-0.8

B. Cross Section Data Set

<u>Variable</u>	<u>Min.</u>	<u>Max.</u>	<u>Mean</u>
% Δ Price	41.4	61.5	49.1
Δ CR4 (Ave. Annual Δ)	-2.97	1.82	-.754
% Δ Per Cap Income	41.3	85.4	66.9
% Δ Payroll/Sales	-32.9	34.5	-6.5