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Comparative Market Basket Indexes:

By Kinds-Locations of Supermarkets-Analysis of Observed Differences

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COMPARATIVE MARKET BASKET INDEXES: BY KINDS - LOCATIONS OF SUPERMARKETS - ANALYSIS OF OBSERVED DIFFERENCES Paul E. Nelson; National Economics Division; Economic Research Service; U.S. Department of Agriculture; Washington, D.C. 20250; August 1983; ERS Staff Report No. AGES 830629.

ABSTRACT

This report proposes procedures for answering four questions: (1) Do food costs differ enough by region to justify geographical variations in the value of distributed food stamps? (2) How much does the cost of a market basket vary by the location and kind of supermarket where it was purchased? (3) For the same quantity, how much does the cost of the Thrifty Food Plan mix differ from that reported for food stamp households by the Nationwide Food Consumption Survey? (4) What factors explain differences in cost indexes observed among sample supermarkets for the NFCS based market basket?

Keywords: Market basket; Thrifty Food Plan, indexes, economic integration, supermarket, areas: low income central city, residual Standard Metropolitan Statistical Area.

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INTRODUCTION

Studies (1-5, 7, 9-16, 18-19) conducted in numerous cities during the 1960's addressed three questions:

(1) Do households handicapped by low incomes pay higher prices for the same foods than do higher income households?

(2) Do retail food firms raise prices during the week when food stamps are issued, and lower them during the remainder of the month?

(3) Do multi-unit retail food firms use stores located in low income areas as outlets for disposing of lower quality merchandise?

Results indicated that residents had less opportunity to take advantage of lower supermarket prices because the universe of stores in low income areas contained substantially higher proportions of small, independent stores. No statistically significant difference in pricing practices was found among establishments of a multi-unit firm, located in high and low income areas. In addition, there was no evidence that indicated deliberate product quality discrimination among their establishments on the part of multi-unit companies.

Society's latent value judgment underlying these questions was that each food store in a retail market should provide uniform quality, services, and prices. But this implicit value judgment recently has been questioned.

Changes in retail food store market structure, and price inflation, exemplify the dynamics that change value judgments and mean that old questions need updated answers. Box and warehouse stores have entered proffering lower pices and far fewer services than were historically provided by both single and multi-unit supermarkets.

Now the public does not appear to believe it needs uniform quality prices and services from each and every food store. At least what seemed to be a consensus of the 1960's appears to have disintegrated.

This Staff Report focuses upon methodology developed to treat certain questions relating to food assistance programs, and the Food Stamp program in particular. It is a part of the larger effort directed toward determining the extent to which prices in supermarkets vary among firms and cities, and the reasons for those differences. For purposes of brevity the larger study will be designated as Grinnell-Handy, and this portion as the Nelson study. The Grinnell-Handy portion includes nonfood as well as food items, and makes comparisons according to the customary departments found within a supermarket, e.g. the dairy case. The Nelson analysis is limited to foods, and the comparisons are organized according to the food groups composing the USDA's Thrifty Food Plan (TFP).

QUESTIONS ADDRESSED

Both old and new questions addressed are presented within the context of each of three analyses identified below.

Data Analysis I

Data Analysis I's results will answer the question: Does the cost of the TFP vary sufficiently among localities so that the maintenance of a nationwide average cost base for determining the value of stamps issued is no longer appropriate? That is, should the value of stamps issued each specified type of household vary at least by region, if not locality?

Data Analysis II

This analysis will answer the question: Does the cost of the TFP Basket and that of the Nationwide Food Consumption Survey (NFCS) Modified Basket both vary substantially by kind of: (1) location (e.g. low income central city; and the Residual Standard Metropolitan Statistical Area (RSMSA)? and (2) Supermarket Firm (e.g. nonintegrated; partially integrated; substantially integrated and fully integrated)? How much difference is there in the cost of the TFP's basket, and the basket which represents actual Food Stamp household selections as reported by the NFCS?

Data Analysis III

Results of regression analyses discussed below will provide partial answers to the queries: Which variables contribute most toward explaining the cost index differences found among supermarkets for the five person household NFCS Modified Basket? To what extent do the findings provide insights with respect to how food stamp households might lower their market basket costs? The NFCS basket was chosen because it represents the product selections which Food Stamp households composed of two adults and three children actually purchased.

DATA BASES

Data obtained from this study's survey and continuing Departmental programs will include: prices, wage rates, store services, building characteristics, total sales, food sales, and food stamp redemptions. Data from secondary sources consists of socioeconomic data for each zip code area in which a sample supermarket is located (6)[1/]. Each supermarket's immediate trading area is defined as the zip code area in which it is located. Resources were not available to conduct the research needed to precisely identify the total trading area for each sample supermarket. However, zip code areas typically are large enough to encompass residences of patrons who walk to the store, and to represent patron household characteristics of many who drive to it.

The Market Baskets

Market basket indexes provide the data used to answer the questions raised when delineating Data Analyses I and II. Use of multiple market baskets permits analysis representative of various ages, both sexes, and related food use practices. More specifically, two baskets will have their total food poundages, and the poundages for each food which are specified by the TFP for two distinct households. One will be composed of 1 male and 1 female, both at least 65 years of age; the other, of 1 male and

1/ Underscored numbers in parentheses refer to items listed in the References section.

1 female, both falling within the span of ages 35-55, 1 female age 12, 1 male age 17, and 1 child age 3.

From 1975 through 1980 about half of all food stamp households were composed of either 1 or 2 persons. About 40 percent were composed of from 3 to 5 persons (17). The two person household was selected because food use is more representative of both sexes, than would be the corresponding use of one person households. The five person household was chosen because multiple age and sex groups are represented.

While the Department's TFP provides a distinct product mix, tailored for each type of household, this product specification does not necessarily represent the poundage of each food actually purchased by the specified household. Consequently, while the total food poundage for each of the two households will be identical to that specified for them by the TFP, the two NFCS Adjusted Baskets, will have the pounds for each food which represent the actual food choices reported by the food stamp households in their response to the NFCS in 1977-78. Thus, there are four distinct market baskets which will be priced according to specified locations and kinds of supermarkets. Table 1 summarizes these four baskets.

Table 1--Market Baskets

Household Composition	Product Mix	
	Thrifty Food Plan	TFP Mix Adjusted for NFCS Findings 1/
Five person	*	*
Two person	*	*

1/ The NFCS basket contains the same quantity of food (pounds) as the TFP basket but the distribution differs among food groups. The TFP basket contains quantities determined by nutritionists to provide an adequate diet, given cost constraints. The NFCS basket represents actual purchases by food stamp households in 1977-78 as reported by the NFCS.

Statistical Design

A total of the 203 SMSA's in the U.S. each had a population of at least 150,000 persons, and comprised the universe of cities in this study. Within each SMSA all supermarkets, including limited assortment box and warehouse stores, constituted the supermarket universe. Convenience stores, delicatessens, and specialty food stores were excluded. All foods and most nonfoods typically found in supermarkets composed the item universe. Product categories were identified from Chain Store Age, July 1981. Product exclusions were limited to those which could not be price checked without substantial loss of data quality. Perfumes, flowers, and mops are representative.

The combined market share of the largest four retail food marketing firms (four firm concentration) was determined for each of

the 203 SMSA's. Each SMSA was then classified in one of four categories: four firm concentration less than 40% of total retail grocery store sales; 40-49.9%; 50-59.9%; at least 60%. Using this 4 category stratification, respectively there were 44, 74, 47, and 38 SMSA's from which, 7 SMSA's were selected per stratum. Within each stratum the probability of selection was based upon SMSA population.

A subsample of SMSA's was chosen for the purpose of comparing the market basket costs for supermarkets in low income areas of the primary central city of each SMSA. It is composed of 10 of the 11 SMSA's in the 28 SMSA sample which have at least 1,500,000 persons (San Diego was excluded because it is practically adjacent to Los Angeles, and the larger SMSA was preferred). Budget constraints permitted only 10 SMSA's.

Within each SMSA firms were selected randomly (from a list of supermarkets provided by Progressive Grocer) supermarkets for each of the 6 leading as follows: 1 supermarket if the firm operated from 1 to 4 establishments in the SMSA; 2 supermarkets if it operated 5 to 10 establishments; and 3 supermarkets if it operated 11 or more. One additional supermarket was also selected for each of the remaining firms (not necessarily a multi-store firm) that accounted for 1.0 percent or more of market sales in the largest cities. In addition, 5 more supermarkets were randomly selected from all remaining firms, with no more than 1 supermarket selected per firm. This list of supermarkets composed the sample for the 28 SMSA's, and is the sample utilized in computations for Data Analysis I.[2/]

For the purposes of Data Analyses II and III, this sample was expanded for the 10 SMSA'S, by randomly selecting additional supermarkets from the low income central city areas. The supermarkets in low income central city areas which were part of the initial random selection were kept for analyses II and III. The composition of the 10 SMSA sample is exhibited by table 2.

BASKET COMPARISONS

For each of the 28 SMSA'S this treatment will provide market basket index values for the two kinds of households. The index values for the 2 and 5 person households will show by how much the cost of each market basket differs among the 28 SMSA'S.

Price comparisons of a basket of products between (among) stores is confounded when each store does not carry all of the items in the basket. If prices for the basket are simply summed, the store with the fewest items is likely to have the smallest sum, regardless of its pricing policies. Some studies have imputed prices of missing items by assuming that, if a store had handled a missing item, its price would have equalled the average price charged by those stores that did handle the item. This study rejects that assumption, and instead, will assume the missing

2/ This sampling procedure made provision for replacement supers due to refusals and for establishments which had ceased to conduct business between the time the Progressive Grocer's list was compiled and the time of data collection.

Table 2--Composition of 10 SMSA Sample: Data Analyses II and III

Location within SMSA	Extent of functional integration 1/: None	Partial	Substantial	Full	Total
	Number of Supermarkets				
Low income central city	37	19	3	24	89
Residual SMSA	52	47	44	103	240
Total	89	66	47	127	329

1/ A firm is considered to be functionally integrated, and fully so, when it maintains at least two distribution centers with two buying offices. It is treated as substantially integrated when it operates at least one distribution center with one buying office. It is partially integrated when it maintains only one buying office, and it is nonintegrated when it has neither a distribution center nor a buying office. Any Census tract in a principal central city which had at least 20% of its households at or below the poverty income level was included as a part of the low income central city category. Any other tract was placed within the residual Standard Statistical Metropolitan Area (RSMSA).

item(s) in a supermarket would have been priced higher or lower than prices found in other stores in the same proportion as were prices for items that the store did carry.

Conversion of Item Prices to Price Relative

This assumption was made operational by converting all prices to price relatives (or indexes). A price relative is the unit price (may be per pound, per gallon etc.) of a particular product (same brand type, package size, flavor) in a single supermarket divided by the average unit price for like items in all supermarkets. The quotient will be multiplied by 100 to derive index units. Once the individual prices are converted to price relatives, the unit of measure (pounds, gallons etc.) is no longer needed.

Price relatives for different products, thus can be averaged together, using appropriate quantity weights, to obtain price indexes for desired product categories and departments, and for the entire supermarket. These indexes can then be compared among stores or averaged to obtain index values for individual firms, or SMSA'S, or to obtain SMSA averages.

Price indexes will be calculated separately for each of three pricing waves. Summary indexes for each supermarket (e.g. by product category and department) will be averaged across the three waves to obtain one set of indexes covering the entire price collection period.

Price Indexes for TFP and NFCS Baskets

Product weights to be used for the index calculations described above are based upon typical sales data for all U.S. supermarkets. However, index calculations for the TFP and NFCS market baskets will require different weights (Refer to table 4). Initially, the 28 SMSA all supermarket weighted average unit price for each brand type that was obtained from the above calculations for each detailed product category listed on the price collection schedule, will be converted to a per-pound basis by multiplying by the appropriate conversion factor. Table 3 illustrates conversion factors used for the TFP Food Group: 01 Milk, cheese and ice cream. When the unit is ounces, the conversion factor is 16.0, when gallons, it is 0.1163, (the reciprocal of the 8.6 lbs. of weight of a gallon of milk).

Following the conversions to price per pound each product is sorted into the fifteen TFP Food Groups, and becomes a component of the appropriate food group. Thus, for Wave I, the product, one gallon of whole white milk belongs in 01 Milk, cheese, ice cream food group. The all SMSA price per pound for each product on the price collection schedule is entered under column 1, table 4.

Expenditure based brand type 3/ weights were then converted to a quantity base by removing that portion of the expenditures that was due to price differences among the brand types (these adjustments are described by table 4 [Columns 1, 1A, 2 and 2A]). The all brand average unit price was then calculated for each sample product category using these weights (columns 3 and 4 illustrate this step).

Then the expenditure-based product category weights were converted to quantity based weights (table 4, columns 5, 5A, and 5B). Using these quantity weights, all brand average unit prices for the sample product categories were averaged to obtain a value for each TFP product category (table 4, column 6). Finally, the average unit prices of the TFP product categories were averaged together, using quantity weights used in the TFP, to obtain the U.S. average unit prices for TFP food groups (columns 7, 8, and 9 of table 4).

These quantity based average prices were entered in column 2 of table 6, and multiplied by the quantities specified by the TFP (column 1) to obtain expenditures based upon quantity weights that could be used to aggregate price-relative indexes for the TFP and the NFCS market baskets.

Table 5 aggregates each supermarket's index values for each brand type in each detailed product category, sampled into averages for food groups as defined in the TFP and NFCS baskets. The output from Column 9, table 5, is inserted in Column 5 of table 6.

3/ Brand weights were derived by determining the share of U.S. sales accounted for by each brand type, viz. advertised (National), private labels, generic, and unbranded.

Table 3--01 Milk, cheese, ice cream food group; Product codes and conversion ratios for computing price per pound

[Wave 01]

Product	Pound equivalents	Conversion factors 1/	Brand type	and codes
Whole milk	8.6 lbs. = 1 gal.	0.1163	National	2010111-2010149
			Private L.	2010151-2010169
			Generic L.	2010171-2010189
	4.3 lbs. = 1/2 gal.	0.2326	National	2030111-2030149
			Private L.	2030151-2030169
			Generic L.	2030171-2030189
	2.15 lbs. = 1 qt.	0.4651	National	2050111-2050149
			Private L.	2050151-2050169
			Generic L.	2050171-2050189
Whole milk, chocolate flavored	2.2 lbs. = 1 qt.	0.4545	National	2060111-2060149
			Private L.	2060151-2060169
			Generic L.	2060171-2060189
Low fat milk	8.63 lbs. = 1 gal.	0.1159	National	2020111-2020149
			Private L.	2020251-2020169
			Generic L.	2020271-2020189
	4.32 lbs. = 1/2 gal.	0.2317	National	2040111-2040149
			Private L.	2030151-2040169
			Generic L.	2040171-2040189
Cottage cheese	1.00 lb. = 16 oz.	16.0000	National	2090111-2099149
			Private L.	2090151-2090169
			Generic L.	2090171-2090189
Processed American cheese products	1.0 lb. = 16 oz.	16.0000	National	2100111-2100149
			Private L.	2100151-2100169
			Generic L.	2100171-2100189
			National	2110111-2110149
			Private L.	2110151-2100169
			Generic L.	2110171-2110189
			National	2120111-2120149
			Private L.	2120151-2120169
			Generic L.	2120171-2120189
American cheese natural	1.0 lb. = 16 oz.	16.0000	National	2130111-2130149
			Private L.	2130151-2130169
			Generic L.	2130171-2130189
Sour cream dip	1.0 lb. = 16 oz.	16.0000	National	2201111-2200149
			Private L.	2201151-2201169
			Generic L.	2201171-2201189

1/ Enumerated prices were converted to unit prices (e.g. per gallon, per quart, per ounce) and then multiplied by the conversion factors to obtain price per pound. See text page 11, and footnote 3.

Table 4—Illustration of how 28 SMSA weighted average unit prices are aggregated into the Thrifty Food Plan's food groups: 01 Milk, cheese, ice cream group, the case in Point

[Wave 1 products used]

THRIFTY FOOD PLAN CATEGORY: USDA sample's category brand type	(0) Container: size	(1) 28 SMSA: price per lb.	(1A) Brand type: weight Adjusting factor 1/	(2) Brand : type exp. : weight:	(2A) Adjusted brand type : weight (quantity) 2/	(3) : (1) :(2A) 3/	(4) Weighted price for USDA samp. category 4/	(5) USDA : sample selection: weight	(5A) Weight adjust factor 5/	(5B) USDA adjust: sample weight quantity 6/	(6) Weighted mean price for TFP 7/	(7) TFP quantity weight 8/	(8) (6) (7)	(9) Weighted mean price for TFP food group 9/
Whole milk														
White milk	gallon													
National brands		.280	1.000	.20	.200	.056								
Private label		.260	1.077	.75	.808	.210								
Generic label		.230	1.217	.05	.061	.014								
All brands average							0.2619	3	1.2127	3.6381				
White milk	1/2 gal.													
National brands		.299	1.000	.30	.300	.090								
Private label		.264	1.133	.70	.793	.209								
Generic label		-	-	-	-	-								
All brands average							.2736	1	1.1591	1.1591				
White milk	1 qt.													
National brands		.310	1.000	.80	.800	.248								
Private label		.290	1.069	.20	.214	.062								
Generic label		-	-	-	-	-	.306	1	1.0379	1.0379				
All brands average														
Chocolate milk	1 qt.													
National brands		.330	1.000	.40	.400	.132								
Private label		.310	1.065	.60	.639	.198								
Generic label		-	-	-	-	-								
All brands average							.3176	1	1.0000	1.0000	0.2787	8.2490	2.2990	
Low fat milk	gallon													
White milk 1% fat		.250	1.000	.20	.200	.050								
National brands		.220	1.136	.75	.852	.187								
Private label		.180	1.389	.05	.069	.012								
Generic label							.2221	2	1.0531	2.1062				
All brands average														
White milk, skim	1/2 gal.													
National brands		.250	1.000	.25	.250	.062								
Private label		.230	1.087	.73	.794	.183								
Generic label		.200	1.250	.02	.025	.005								
All brands average							.2359	1	1.0000	1.0000	0.2265	0.4280	0.0969	
Processed Cheese														
Pr. Am. Ch. Prod.	12 oz.													
National brands		1.80	1.000	.65	.650	1.170								
Private label		1.70	1.059	.30	.318	.541								
Generic label		1.50	1.200	.05	.060	.090								
All brands average							1.7519	3	1.0000	3.0000				
Pr. Am. Ch. Prod.	12 oz.													
National brands		1.75	1.000	.75	.750	1.312								
Private label		1.68	1.042	.20	.208	.349								
Generic label		1.40	1.250	.05	.062	.087								
All brands average							1.7137	2	1.0223	2.0446				
Pr. Am. Ch. Food	12 oz.													
National brands		1.69	1.000	.80	.800	1.352								
Private label		1.55	1.090	.16	.174	.270								
Generic label		1.45	1.166	.04	.047	.068								
All brands average							1.6552	1	1.0584	1.0584	1.7223	0.5760	0.9921	
Natural cheese														
Brick ch. prepkg.	8-9 oz.													
National brands		2.50	1.000	.70	.700	1.750								
Private label		2.35	1.064	.25	.266	.625								
Generic label		2.30	1.087	.05	.054	.124								
All brands average							2.4029	3	1.0000	1.0000	2.4029	0.6550	1.5739	
Sour Cr. dip														
S.Cr. dip. bac.+hr.	8-15 oz.													
National brands		1.60	1.000	.80	.800	1.280								
Private label		1.55	1.032	.20	.206	.319								
Generic label		-	-	-	-	-								
All brands average							1.5895	1	1.0000	1.0000	1.5895	0.0130	0.0207	
Cottage cheese														
Cot. low fat	17-32 oz.													
National brands		.90	1.000	.40	.400	.360								
Private label		.85	1.059	.55	.582	.495								
Generic label		.80	1.125	.05	.056	.045								
All brands average							.8671	1	1.0000	1.0000	0.8671	0.1260	0.1093	
TFP Food Group Mean														0.507

Table--4 Illustration of how 28 SMSA weighted average unit prices are aggregated into Thrifty Food Plan's food groups: Milk, cheese, ice cream group, the case in point--continued

1/ Column 1A is needed to adjust the expenditure weights of column 2 to be on an equivalent quantity weight basis. This is achieved by taking the brand type (National, etc.) with the highest price within each brand grouping, and dividing it in turn by each of the prices of the other brand types. For example, for Whole Milk, sold in gallons, 0.23 and 0.26 are divided into 0.28 to derive the respective figures of 1.217 and 1.077.

2/ Column 2A equals column 1A multipled by column 2.

3/ Column 3 equals column 1 multiplied by column 2A.

4/ Column 4 is computed by taking each of the group sums of column 3, and dividing by the corresponding sum of brand type weights from column 2A. For example for Whole Milk, in gallons, this is: .28/1.069 = 0.2619.

5/ Within each TFP product category (e.g. whole milk), divide the highest USDA category price in column 4 by the other USDA category prices also in column 4. For example, for whole milk: 0.3176/0.2619=1.2127; 0.3176/0.2737=1.1591; 0.3176/0.3060=1.0379; 0.3176/0.3176=1.0000.

6/ Column 5B equals column 5 multiplied by column 5A.

7/ Column 6 is computed by multiplying column 4 by column 5B and summing for each commodity category, e.g., Whole Milk. Then divide this total by the sum of corresponding weights (column 5B). For Whole Milk this equals: [(0.2619) (3.6381) + (0.2736) (1.1591) + (0.306) (1.0379) + (0.3176) (1.0000)]/(3.6381 + 1.591 + 1.0379 + 1.0000) = 0.2787.

8/ Weights from TFP.

9/ The sum of column 8 divided by the sum of column 7 derives the TFP mean price, in this illustration, for the TFP commodity group: Milk, Cheese, and Ice cream. Corresponding computations are then made for each of the TFP commodity groups.

Table 5--Illustration of how the price index is calculated for one Thrifty Food Plan
Food Group: 01 Milk, cheese, ice cream, for one supermarket

[Wave 1 products used]

THIRFTY FOOD PLAN FOOD GROUP	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
USDA sample's category brand type	Container size	Index 1/	Brand type weight 2/	[(1)(2)] 3/	Weighted $\bar{M}$ index for USDA sample category 4/	USDA sample selection weight 5/	Weighted M for component 6/	Thrifty food plan expenditure weights 7/	[(6)(7)] 8/	Weighted $\bar{M}$ for TFP food group 9/
Whole milk										
White milk	gallon									
National brands		105	.20	21.00						
Private label		110	.75	82.50						
Generic label		107	.05	5.35						
All brands average					108.9	3				
Whole milk	1/2 gal									
National brands		95	.30	28.50						
Private brands		97	.70	67.90						
Generic label		-	-	-						
All brands average					96.4	2				
White milk	1 qt									
National brands		101	.30	30.30						
Private label		99	.70	69.30						
Generic label		-	-	-	99.6	1 All brands average				
Chocolate milk	1 qt									
National brands		101	.40	40.40						
Private label		116	.60	69.60						
Generic label		-	-							
All brands average					110.0	1	104.2	2.2990	239.56	
Low Fat Milk										
Low fat milk (1%)	gallon									
National brands		110	.20	22.00						
Private label		90	.75	67.50						
Generic label		96	.05	4.80						
All brands average					94.3	2				
White milk, skim	1/2 gal									
National brands		83	.25	20.75						
Private label		93	.73	67.89						
Generic label		103	.02	2.06						
All brands average					90.7	1	93.1	0.0969	9.02	
Processed Cheese										
Pr. Am. Ch. Prod.	12 oz									
National brands		96	.65	62.40						
Private label		111	.30	33.30						
Generic label		112	.05	5.60						
All brands average					101.3	3				
Pr. Am. Ch. Prod.	12 oz									
National brands		99	.75	74.25						
Private label		115	.20	23.00						
Generic label		110	.05	5.50						
All brands average					102.75	2				
Pr. Am. Ch. Food	12 oz									
National brands		101	.80	80.80						
Private label		112	.16	17.92						
Generic label		102	.04	4.08						
All brands average					102.80	1	102.0	0.9121	93.03	
Natural Cheese										
Brick Ch. prepkg.	8-9 oz									
National brands		100	.70	70.00						
Private label		104	.25	26.00						
Generic label		109	.05	5.45						
All brands average					101.45	3	101.45	1.5739	159.67	
Sour Cream Dip										
S. Cr. dip. bac.+ thr. rd.	8-15 oz									
National brands		91	.80	72.80						
Private label		88	.20	17.60						
Generic label		-	-	-						
All brands average					90.40	1	90.40	0.0207	1.87	
Cottage Cheese										
Cot. Ch. Low F.	17-32 oz									
National brands		87	.40	34.80						
Private label		94	.55	51.70						
Generic label		90	.05	4.50						
All brand average					91.00	1	91.00	0.1093	9.95	
TFP Food Group Mean										102.0

1/ The index numbers will be provided by the Grinnell-Handy computations.
2/ Column 2 is a repeat of column 2, table 4.
3/ Column 3 is the product of columns 1 and 2.
4/ Column 4 represents the sum of column 3 for each USDA.
5/ Column 5 is a repeat of column 5, table 4.
6/ Column 6 is the sum of the product of columns 4 and 5, divided by the sum of column 5 for each TFP category.
7/ Column 7 equals column 8 of table 4.
8/ Column 8 is the product columns 6 and 7.
9/ Column 9 is the sum of column 8 divided by the sum of column 7, for each TFP Fod Group.

Table 6 Example of weights/prices used in computing food market basket for one store

	Food Group	(1) Lbs.	(2) All SMSA mean price	(3) [(1) (2)]	(4) (3) item (3) total	(5) 28 SMSA based price index Store A	(6) [(4) (5)]
		THRIFTY FOOD PLAN					
01	Milk, cheese, ice cream	41.60	0.51	21.22	.1954	102	19.93
02	Meat, poultry, fish	10.54	2.26	23.82	.2193	105	23.03
03	Eggs	2.29	.77	1.76	.0162	115	1.86
04	Dry beans, peas, & nuts	1.70	1.23	2.09	.0192	87	1.67
05	Potatoes (white)	7.73	.24	1.86	.0171	112	1.92
06	Citrus fruits and tomatoes	8.02	.86	6.90	.0635	109	6.92
07	Dark-green-deep yellow vegetables	1.85	.65	1.20	.0110	150	1.65
08	Other vegetables and fruit	16.40	.88	14.43	.1329	101	13.42
09	Flour	3.71	.19	.70	.0064	90	.58
10	Cereal (including pastas)	4.52	.87	3.93	.0362	94	3.40
11	Bread	8.49	.47	3.99	.0367	110	4.04
12	Other bakery products	4.83	1.90	9.18	.0845	118	9.27
13	Fats, oils	3.41	2.27	7.74	.0713	130	9.27
14	Sugar, sweets	3.96	.27	1.07	.0100	98	.98
15	Accessories	6.10	1.43	8.72	.0803	100	8.03
	Total	125.15		108.61	1.000		106.67
		NFCS FOOD STAMP HOUSEHOLD PROXY					
01	Milk, cheese, ice cream	36.89	0.51	18.81	.1568	102	15.99
02	Meat, poultry, fish	20.02	2.26	45.25	.3772	105	39.61
03	Eggs	2.60	.77	2.00	.0167	115	1.92
04	Dry beans, peas, and nuts	1.53	1.23	1.88	.0157	87	1.37
05	Potatoes (white)	6.91	.24	1.66	.0138	112	1.55
06	Citrus fruit and tomatoes	5.03	.86	4.33	.0361	109	3.93
07	Dark-green-deep yellow vegetables	1.79	.65	1.16	.0097	150	1.45
08	Other vegetables and fruits	22.36	.88	19.68	.1640	101	16.56
09	Flour	3.59	.19	.68	.0057	90	.51
10	Cereal (including pastas)	1.44	.87	1.25	.0104	94	.98
11	Bread	6.02	.47	2.83	.0236	110	2.60
12	Other bakery products	3.95	1.90	7.51	.0626	118	7.39
13	Fats, oils	1.53	2.27	3.47	.0289	130	3.76
14	Sugar, sweets	6.01	.27	1.62	.0135	98	1.32
15	Accessories	5.48	1.43	7.84	.0653	100	6.53
	Total	125.15		119.97	1.0000		105.47

Columns 4, 5, 6 in table 6 illustrate how the TFP NFCS food groups are aggregated to arrive at overall averages for the individual supermarket. In the example shown in table 6, the TFP market basket purchased in this supermarket cost 6.7 percent more than the average prices paid in all supermarkets in all SMSA'S.[4/]

The NFCS basket of products cost 5.47 percent more than the all SMSA average. Due to differences in product weights consumers who bought the TFP basket in this supermarket would have paid 1.2 index points (1.1%) more than consumers who bought the NFCS basket of products.

Specific Market Baskets

Data for individual supermarkets require additional aggregation to address Analyses I and II discussed on pages 2 and 3. The initial aggregation will be one which combines all supermarkets within each SMSA in order to compare the differences among the 28 SMSA'S.

28 SMSA Comparisons

In order to ascertain the variation in the TFP market basket among the 28 SMSA's, only the stores chosen for the basic sample will be utilized. Excluded will be the stores in 10 SMSA'S which were added in the low income central city sector. These supermarkets were excluded because the basic sample provides valid inferences and because differences in sample design would require major weighting to adjustments to obtain valid statistical inferences.

Stores may be aggregated to obtain an average for each SMSA. Each sample store has a weight proportional to its share of market sales. For the 28 SMSA analysis, sampling was done by firm so that each supermarket selected for a leading firm has a weight equal to that firm's market share divided by the number of stores that firm operates in the SMSA. The combined market shares of less than leading firms is divided by the number of supermarkets selected to represent these firms to obtain each supermarket's sample weight. Table 7 illustrates the computation of supermarket sample weights.

Table 8 illustrates the application of table 7 data when computing the summary index for a single SMSA. Corresponding steps must be followed for each of the 28 SMSA'S composing the main sample. Column 1 identifies sample supermarkets owned by each specified firm (company), except that supermarkets listed for "all others," are operated by different firms. Column 2 presents the individual market basket price index for each supermarket.

The weight developed for each establishment of each firm when computing table 7 has been repeated in column 3 (table 8). Column 4 equals the product of columns 2 and 3. Column 5's value is derived by dividing the sum of column 4 by the sum of

4/ A supermarket's weighted average price also may be referred to as the weighted average cost to the customer.

Table 7--Sample supermarket weights (hypothetical data)

Firm rank:	Number of supermarkets in SMSA	Share of market sales (%):	Number of supermarkets in sample	Sample weight per supermarket
1	51	27	3	9.00
2	60	15	3	5.00
3	27	12	3	4.00
4	11	10	3	3.33
5	10	9	2	4.50
6	3	2	1	2.00
All other	150	25	5	5.00

column 4 by the sum of column 3. In this instance 107.67, represents average price index for our illustrative SMSA. This means that this SMSA'S prices on average were 7.7 percent higher than the average for all 28 SMSA'S. Separate index values will be computed for the TFP and NFCS baskets. Corresponding computations for each of the 28 SMSA'S will provide the indexes needed to answer the questions posed in Data Treatment I.

10 SMSA Comparisons

The construction of market basket indexes for 10 SMSA'S to measure price differences among supermarkets according to their location within an SMSA and by their extent of functional integration will require adjustments in the weighting procedures used for the index construction for the 28 SMSA comparison. Adjustments are required because the 28 SMSA sample did not include the extra supermarkets randomly drawn from supermarkets located in low income central city areas in the 10 SMSA'S. It will be necessary to restratify "ex post" to assure that unbiased estimates were obtained for each type of location and extent of functional integration stratum. The strata weights had to be incorporated into the firm weight system (described above) because stores from the primary sample were included with the added low income area supermarkets.

All firms (the universe) in these 10 SMSA'S were classified according to their extent of functional integration. Their supermarkets then were distributed between two locational strata [low income central city (LICC), and the residual SMSA (RSMSA)], according to each supermarket's zip code.

Within each principal central city where a zip code area crosses locational strata a four step procedure will be required to estimate which supermarkets within the zip area are located

Table 8--Hypothetical illustration: For one SMSA

(0) Firm:	(1) Supermarkets in sample	(2) Computed index carried forward 1/	(3) Sample weight:	(4) (2) (3): [(Col. 4)] [(Col. 3)]	(5)
1	a	106.67	9	960.03	
	b	105.00	9	945.00	
	c	110.00	9	990.00	
2	d	99.00	5	495.00	
	e	90.00	5	450.00	
	f	95.00	5	475.00	
3	g	110.00	4	440.00	
	h	100.00	4	400.00	
	i	90.00	4	360.00	
4	j	120.00	3.33	399.60	
	k	110.00	3.33	366.30	
	l	135.00	3.33	449.55	
5	m	102.00	4.50	459.00	
	n	105.00	4.50	472.50	
6	o	105.00	2	10.00	
All others	p	130.00	5	650.00	
	q	140.00	5	700.00	
	r	99.00	5	495.00	
	s	95.00	5	475.00	
	t	115.00	5	575.00	
Total		NA	100.00	10,766.98	107.67

1/ The index for each supermarket was computed and reported in table 6. In this hypothetical example, supermarket (a) of Firm 1, has an index of 106.67, as may been seen in the table 6 example presented above.

within each locational stratum. The initial step will involve estimating the proportion of each zip area that fell within each of its component strata. For example see table 9.

The second step will determine the average number of households per supermarket in all zip code areas of an SMSA that are composed entirely of low income Census tracts [tracts in which 20 percent or more of the households are at or below the poverty income level]; and, in contrast, the average number of households per supermarket in all zip code areas that contain no low income Census tracts.

The third step will adjust the proportions found in Step 1 by the differential availability of supermarkets found in Step 2. In each zip code area, the percentage of area that was low income (from Step 1) is divided by the average number of households per supermarket in low income areas (from Step 2). Similarly, the percentage of the zip code's area not defined as low income (Step 1) will be divided by the average number of households per supermarket in non-low income areas of the SMSA. These adjusted percentages will then be scaled upward so that they sum to 100 percent in each zip code area.

For example, assume that 60 percent of a give zip code area is low income, and the remaining 40 percent is non-low income (Determined in Step 1). Then assume that in this SMSA, there is an average of 20,000 households per supermarket in low income areas, and 5,000 households per supermarket in non-low income areas (Step 2). In Step 3 the following calculations will be made:

$$60\%/20{,}000 = 0.003 \quad 0.003/\ 0.011 = 27.3\%$$

$$40\%/5{,}000 = \frac{0.008}{0.011} \quad 0.008/\ 0.011 = \frac{72.7\%}{100.0}$$

Consequently, in this zip code area 27.3% of the supermarkets are expected to be in low income areas, and 72.7 percent in non-low income areas. This process will be repeated for all zip code areas within each SMSA. The number of households per supermarket (e.g. 20,000 and 5,000) will be constant for all zip code areas within an SMSA but will vary among the SMSA'S (except by accident).

After estimating the number of supermarkets in each income stratum (i.e. LICC and RSMSA) for zip code areas that cross strata, in the final step the computer will randomly assign the appropriate number of supermarkets to each stratum.

Total sales of supermarkets in each income-integration stratum will be summed to obtain strata weights. A stratum's weight will equal its share of total supermarket sales in the SMSA.

Table 10 presents the cells into which supermarkets of each SMSA will be sorted, a separate table being constructed for each SMSA. Table 10 classifies each supermarket in the universe according to its locational and functional integration characteristics.

Each of the leading firms in each stratum will be assigned a weight equal to its share of sales in that stratum (or cell) and this weight will be apportioned equally among its sample supermarkets. The combined market shares of less than leading firms will be equally apportioned among the remaining sample supermarkets in the stratum. Table 11 illustrates this procedure. These supermarket weights can be used for aggregation of index values for any desired group of stores within an SMSA. SMSA aggregates, in turn, can be averaged with other SMSA'S, with each SMSA weighted equally.

Table 9--Proportions of each zip which fall within or straddle principal central boundaries: Hypothetical SMSA

Zip code	Proportion of each zip code area located within: LICC: RSMSA	
	RSMSA	LICC
02108	100.0	
02109	100.0	
02110	71.6	28.4
02113	70.4	29.6
02114	100.0	
02115	57.2	42.8
02116	66.1	33.9
02118	54.7	45.3
02119	64.1	35.9
02120	79.1	20.9
02121		100.0
02122	100.0	
02124	75.4	24.6
02125	66.1	33.9
02126	100.0	
02127	71.6	28.4
02128	69.3	30.7
02129	55.0	45.0
02130	91.7	8.3
02131	100.0	
02132	100.0	
02136	100.0	
02150	100.0	

For example, to compute the average TFP 5 person basket price (cost) index for nonintegrated supermarkets located in low income central city areas, the weighted mean index value of all sample supermarkets in this locational-functional integration category would be computed for each of the 10 SMSA'S independently. The 10 index values then will be summed and divided by 10 to derive the index representing this category of supermarkets, in this illustration, supermarkets that are not functionally integrated, and which are located in low income central city areas.

Basket Mix Comparison

Results from Data Treatment II also will reveal how much difference there is between the cost of the same poundage of food assorted as the TFP assumes, and as Food Stamp Households actually purchased, because the indexes for the NFCS mix were computed as part of the procedure for deriving results for these data treatments.

REGRESSION ANALYSIS

The index values computed for each supermarket in the 10 SMSA'S (not all 28 SMSA'S) as derived in table 6, will be adopted as the dependent variable in the regression analyses. The data set for the independent variables is described in detail. An

Table 10--SMSA supermarket assignment by locational and functional characteristics 1/

Location within SMSA	Extent of functional integration: None	Partial	Substantial	Full
	Supermarket Identification Number			
Low income central city	114401	114801		110301
	114501			111206
	114601			
	114901			
Residual SMSA	113701	113201	111703	110901
	113901	113301	112501	110902
	113001	113303	111701	111903
	113801	113401	113101	110202
	114001	113601	112502	110203
	114101		112503	
	114201		113102	

1/ Each supermarket in the SMSA will be assigned. Here for illustration the supermarket codes for a few of the supermarkets in an SMSA have been assigned the correct cell.

independent variable will be included in the proposed model, only if it has been justified by either or both economic theory, and prior empirical observation.

Only after structuring the model on the basis of theory and observations will a SAS stepwise regression procedure be used. This particular SAS procedure will introduce one variable at a time, provided that it is statistically significant at the 5 percent level. In contrast to a "forward stepwise procedure" this SAS approach does not immediately lock in each variable into the computation process. After a variable has been added, the stepwise procedure examines all variables already included by previous entries, and deletes any which fail to product a partial "F" statistic significant at the 5 percent level. Only after this check has been conducted and the necessary deletions completed will another variable be introduced. The stepwise procedure ends when no new variable has a partial "F" statistic signficant at the 5 percent level, or when the variable to be added is the one just deleted from it (8).

The model is constructed to help explain the differences observed among the market basket index values of the supermarkets which in aggregate compose the sample for the 10 SMSA'S which were expanded to include more low income central city supermarkets. The market basket adopted is the one for the five person household, but also the one for which the product mix represents that

Table 11--Calculation of sample weights for individual supermarkets, hypothetical illustration for SMSA I

Location-integration strata : Firm 1/ : Sample supermarket	Location 2/ integration strata wt. (1)	Firm share of stratum weight (2)	Sample supermarkets's share of Firm wt. (3)	Sample supermarkets's share of SMSA sales 3/ (4)
LICC-NI	0.060			
Firm 1		0.20		
Supermarket 1			1.000	0.01200
Firm 2		.18		
Supermarket 2			1.000	.01800
Firm 3		.12		
Supermarket 1			.500	.00360
Supermarket 2			.500	.00360
Remaining firms		.50		
Supermarket 1			.200	.00600
Supermarket 2			.200	.00600
Supermarket 3			.200	.00600
Supermarket 4			.200	.00600
Supermarket 5			.200	.00600
LICC-PI	.015			
Firm 1		.42		
Supermarket 1			.333	.00210
Supermarket 2			.333	.00210
Supermarket 3			.333	.00210
Firm 2		.18		
Supermarket 1			1.000	.00270
Firm 3		.15		
Supermarket 1			1.000	.00150
Firm 4		.10		
Supermarket 1			1.000	.00250
Remaining firms		.15		
Supermarket 1			.50	.00113
Supermarket 2			.50	.00113
LICC-SI	.025			
Firm 1		.35		
Supermarket 1			1.000	.00880
Firm 2		.33		
Supermarket 1			1.000	.00830
Remaining firms		.32		
Supermarket 1			.250	.00800
Supermarket 2			.250	.00800
Supermarket 3			.250	.00800
Supermarket 4			.250	.00800
LICC-FI	.0675			
Film 1		.40		
Supermarket 1			.500	.01350
Supermarket 2			.500	.01350
Firm 2		.25		
Supermarket 1			1.000	.01688
Firm 3		.35		
Supermarket 1			.250	.01591
Supermarket 2			.250	.01591
Supermarket 3			.250	.01591
Supermarket 4			.250	.01591
RSMSA-NI	.0300			
Firm 1		.65		
Supermarket 1			1.000	.01950
Firm 2		.30		
Supermarket 1			1.000	.00900
All remaining firms		.05		
Supermarket 1			.500	.00075
Supermarket 2			.500	.00075
RSMSA-PI	.0525			
Firm 1		.50		
Supermarket 1			1.000	.02625
Firm 2		.50		
Supermarket 1			.500	.01313
Supermarket 2			.500	.01313
RSMSA-SI	.2625			
Firm 1		.50		
Supermarket 1			1.000	.13125
Firm 2		.50		
Supermarket 1			1.000	.13125
RSMSA-FI	.3000			
Firm 1		.60		
Supermarket 1			1.000	.29250
Firm 2		.30		
Supermarket 1			1.000	.14620
All remaining firms		.10		
Supermarket 1			.25	.01220
Supermarket 2			.25	.01220
Supermarket 3			.25	.01220
Supermarket 4			.25	.01220

1/ Firms with equal to or greater than 10 percent of sales in column 2, and all firms with 2 or more sample supermarkets in a stratum are listed separately. All others are included in "remaining firms". The "remaining firms'" share of sales in a stratum is divided equally among the remaining sample supermarkets.

2/ Percentage of toal SMSA supermarket sales.

3/ The values arrayed in Column 4 were calculated by multiplying supermarket's share of firm weight (Col. 3), by firm share of stratum weight (Col. 2), and then the product was multiplied by the stratum's share of SMSA sales (Col. 1).

reported by the Nationwide Food Consumption Survey for participating food stamp households.

Dependent Variable

The 5 person NFCS market basket index for each of the 329 supermarkets in the 10 SMSA sample will serve as the dependent variable.

Independent Variables

The independent variables may be classified according to whether they are: internal (including specific store characteristics) to each supermarket; external to it; or related to the households which form the pool of potential patrons residing within the supermarket's immediate trading area.

Internal Firm-Supermarket Related Variables

Firms dependent upon other firms to provide both their buying and warehouse services have less control of their costs than do firms which self-supply either or both. Presumably firms with the greatest control are able to make decisions faster, and have more extensive and often higher quality information on hand than firms that must rely upon others. Such differences should be reflected in firm merchandising practices and consequently costs. However, some quantification of the relative importance of economic integration may be derived by using the extent of economic integration as a dummy variable. In this regression three dummy variables are adopted to represent the extent of economic integration of each firm. The partially integrated firm maintains at least one purchasing office but no distribution center; the substantially integrated one maintains at least one purchasing office and one distribution center; the fully integrated firm maintains at least two distribution centers and two purchasing offices.

The coefficient of each dummy variable tells by how much the average index value of each class of integrated firm differs from the average value of the index of the same market basket shopped in nonintegrated firms. More specifically, if the value of the variable representing partial integration should be 0.2, then the mean value of the market basket shopped is 0.2 index points higher when shopped in partially than in supermarkets of nonintegrated firms; if it were -.2 it would of course be 0.2 index points less than when shopped in nonintegrated firms.

In competitive markets efficiencies associated with economic integration over time are passed on through lower prices. In imperfect markets the size and timing of any pass through is related to the extent of market imperfections. If a substantial pass through has occurred, the sign is expected to be negative.

(1) Partially integrated firms: This is a dummy variable. A "1" will be assigned each supermarket that is owned by a firm that is partially integrated.

(2) Substantially integrated firms: This is a dummy variable. A "1" will be assigned each supermarket which is owned by a firm that is substantially integrated.

(3) Fully integrated firms: This is a dummy variable. A "1" will be assigned each supermarket that is owned by a fully integrated firm.

(4) Store wage rates: These rates (including fringe benefits) directly affect supermarket pricing practices. The sign should be positive if higher rates become reflected in higher prices.

(5) Security costs: It is impossible to obtain all security related costs experienced by supermarkets. Many firms would rather absorb the cost of replacing a plate glass window than report it to their insurance firm because of the rate increase they might experience. Thus, the cost of store security can be represented quantitatively only as a relative or an index. An index based upon insurance rates per thousand dollars of coverage for $15,000 per instance for either or both burglary and robbery, will reflect differences in risk costs confronting each sample supermarket. (Any two or more supermarkets classified as having the same rate, of course, will have the same index value, where as in reality a store might self-insure or carry no insurance.) This variable is not used to imply precise individual store insurance costs, but a relative degree of locational risk among individual supermarkets. The sign should be positive.

(6) Occupancy cost (including utilities): The unit price for rent and utilities combined will represent this cost of operation. The higher the cost, the higher the prices must be to cover them. A positive sign is expected.

(7) Sales per square foot of sales area: Average sales per square foot of sales areas is an indicator of efficiency of space use. The higher the ratio, the more effectively that sales area is being used. If the store is in a competitive trading area, it can use such sales effectiveness to lower prices. If it is in a trading area where the market is less competitive, then the amount used to lower prices will be less. The sign probably will be negative.

(8) Service index: Addition of services will increase costs and if successful will also increase the inelasticity of demand for the supermarket on the part of its patrons. The number of services (excluding special meat service department and electronic scanning equipment) proffered by each supermarket will be summed and divided to obtain the mean supermarket number of services. This mean then will be divided into the number proffered by each supermarket to derive that particular supermarket's index of services. Meat service and electronic scanning are sufficiently important to be incorporated, each as a dummy variable.

(9) Warehouse type operation: This is a dummy variable. If a supermarket was constructed to conduct a high volume, "no frills" operation, it was given a dummy designation of a "1" and if not a "0". The expectation is that this type of supermarket will have a lower price index and the coefficient of this variable is expected to be negative.

(10) Square footage of selling area: Economies of scale are possible as the supermarket increases in size to a point where, ceteris paribus, diminishing returns are encountered. The anticipated sign is negative.

(11) Front door stocking: Some supers were built so that all deliveries must take place through the front door. This was treated as a dummy variable. It was assigned a "1" when a supermarket had only front door deliveries and a "0" when an unloading dock with separate entrance was provided. Such supers usually are in low income areas. The sign will be positive because of unusually high handling costs.

(12) Supermarket's food stamp redemptions/Its total sales: Proponents of the hypothesis that the "poor pay more" probably also subscribe to the corollary that because stores located in low income areas typically have higher ratios of food stamp redemptions to total sales than stores located elsewhere, that food stamp households also pay more. This study includes only supermarkets and there are fewer supermarkets in low income areas than there are other kinds of retail food stores. This variable will reflect whether supermarkets with high ratios of food stamps to their total sales, irrespective of their location, have market basket indexes higher than stores with lower ratios. If they don't have substantial differences the variable will not have statistical significance. The statistical significance is more important than the sign. The sign would be expected to be positive.

(13) Use of electronic scanners: Multi-unit firms which are installing electronic scanners have yet, with one exception not in this study, to complete their installation in every store. Since this regression includes individual supermarkets it will have supers from firms, some with scanners in operation, and others without. The installation of scanners are expected to lower operating costs, and, given competition, prices should be lower. It may be too early to expect lower prices because some firms may wait until they have their total operation using scanners before they have a sufficient understanding of the cost savings to lower prices. However, this is too important a variable to exclude. If costs are lowered enough so that competition is resulting in lowered prices, the sign will be negative.

(14) Meat service facility: This type of facility is analogous to the historic meat market where most sales are custom cuts following butcher-patron discussion. It is a dummy variable. Because such operations must be more costly than the usual meat department operation the coefficient is expected to be positive.

Factors External to Supermarkets

(15) Number of households per supermarket: As the number of households per supermarket increases so does the probability that the demand for a particular super's services is becoming more inelastic. This is modified by the extent to which the households within a super's immediate trading area have regular

access to a motor vehicle. However, the sign is expected to be positive as any increase in the inelasticity of demand for a super's services gives it more power to administer its prices.

(16) Transportation cost index: A weighted transportation cost index will be used to reflect the difference in cost of transporting goods bought by these supermarkets from various points of origin to the SMSA in which the supermarkets are located. The focus will be upon produce, meats and dairy products. Supermarket sales shares of these three types of commodities will be used as weights to create a single index from the three indexes independently derived for each. In this instance every supermarket within the same SMSA will have the same composite index. The sign of the index is expected to be positive because it directly reflects increased costs of conducting business. In addition to this variable differences in cost of goods sold are reflected in the degree of integration variables.

(17) Location of store within SMSA: Is the supermarket in a shopping center complex, or is it not? Dummy variable, if in shopping center complex, enter a "1", otherwise, a "0".

This will indicate whether being in a shopping center adds any market power that would derive from one stop shopping patrons. In other words, the convenience of being able to shop for all items at one location may build up the inelasticity of demand for all firms in the complex so that they could charge slightly higher prices than the SMSA wide average. If the sign is positive this would indicate such convenience based power exists. If negative, it would not. The statistical significance will be as important as the sign in interpreting this variable.

(18) Immediate Market Competition: Multi-establishment firms need not follow an identical pricing policy in each of their establishments. Firms differ with respect to the extent to which individual managers are encouraged to establish individual pricing practices. Indeed, the results reported in (16) found that one parent company was unaware of the extent to which one of their managers had established his own pricing initiatives. Consequently, while the Herfindahl Index (Variable 20) will capture the overall context within which interfirm competition took place it can not identify the competitive context for individual market segments which this study has identified as immediate trading areas, viz. each supermarket's zip code area. Hence, each sample supermarket's extent of immediate competition will be quantified by computing the proportion of the total supermarket sales of each zip code area accounted for by its sales.

The number of supermarkets per immediate trading area for the 10 SMSA's encompassed by the regression analysis range from 1 to 25. Presumably the supermarkets without immediate competition will price differently than those with numerous close competitors. The proposition is the traditional one that the higher is the indivdual supermarket's share of its immediate trading area's total supermarket sales, the more inelastic will be the demand

function for its services, and the greater will be its ability to charge higher prices for many, if not all items stocked. The sign is expected to be positive if on the average there are more trading areas where the individual supermarket's share of its immediate trading area sales is high.

(19) Interfirm competition: In some market situations large multi-unit firms may choose to be less price aggressive than they are in others. The Herfindahl index (or a truncated one), captures size inequalities among firms. Measuring large multi-unit's aggregate share of market sales should detect if this kind of structure prevails. Index is defined as the sum of the squared market share of firms. Thus, where H_N is the Herfindahl index, N is the number

$$H_N = \sum_{i=1}^{N} S_i^2$$

of firms and S_i is the market share of the ith firm. Where ratios are at least 75%, the sign probably will be positive.

Household Related Variables

The household composition in a store's trading area reflects its business practices. Stores located in an affluent sector will pursue different inventory and pricing practices than those located in low income areas. Two variables which reflect compositional differences, particularly affluence, will be tried. There may be such a high intercorrelation that only the more powerful will be kept.

(20) Immediate trading area quality rating: This number represents whether an immediate trading area is higher, lower, or equal to the US quality norm, which is 50. A figure higher than 50 suggests established affluence. It is the result of a four factor weighted socio-economic score of: income, education, home value, and highest factor weights were given incomes over $25,000 per annum; at least four years of college education; a home over $50,000; and a managerial or professional occupation. This variable provides a sensitive total for identification of lower, middle and upper class trading areas.

(21) Percent of households with access to a car: The higher the proportion of households with regular access to a motor vehicle, the greater is the opportunity for these households to shop at alternative supermarkets. The assumption is that such freedom introduces more competition into the market. The sign is expected to be negative in that the more competition the lower will be the prices. This regression model contains 21 independent variables. Because there are 329 supermarkets for which we have observations, there are 329 minus 23, or 296 degrees of freedom. Thus there should be no degrees of freedom problem encountered. The model may be stated as:

Model Summarized

Dependent Variable

M_b = each supermarket's market basket index. The index is for a 5 person household participating in the Food Stamp Program. The basket mix represents the food assortment reflected in the data for food stamp households collected by the NFCS.

Independent Variables

(1) P_i = partially integrated firm. Firm maintains at least 1 purchasing (buying) office.

(2) S_i = substantially integrated firm. Firm maintains at least 1 purchasing office, and 1 warehouse.

(3) F_i = fully integrated firm. Firm maintains at least 2 distribution centers and 2 buying offices.

(4) W_r = wage rate, including fringe benefits, paid by firm.

(5) C_s = index of cost for protection against security risk.

(6) C_o = occupancy costs paid by supermarket for utilities and rent.

(7) S_{ft} = sales per square foot of selling area within supermarket.

(8) I_s = index of supermarket provided services.

(9) W_o = "no frills" type operation.

(10) F_{sq} = square feet of selling area within supermarket.

(11) D_f = stocking of supermarket only possible through front door; no unloading dock with independent entrance.

(12) R_{fs} = food stamp redemptions/total supermarket sales.

(13) S_e = use of electronic scanner.

(14) F_{ms} = meat service facility.

(15) P_s = number of households per supermarket.

(16) T_c = transportation cost index.

(17) L = store location; is it in shopping center complex, or otherwise. Dummy variable. Assign "1" if it is.

(18) I_{mc} = immediate market competition.

(19) Z = inter-firm competition. Herfindahl index.

(20) A = quality score (rating) of supermarket's immediate trading area. Based upon combination of factors: income, education, value of house, occupation.

(21) Vm = percent of households with regular access to a motor vehicle in each trading area.

Consequently:

$$M_b = P_i + S_i + F_i + W_r + C_s + C_o + S_{ft} + I_s + W_o + F_{sq} + D_f + R_{fs} + S_e + F_{ms} + P_s + T_c + L + I_{mc} + Z + A + V_m + E_t$$

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