The nature of competition in food retailing units: A Tucson case study

Order Number 1342995

The nature of competition in food retailing units: A Tucson case study

Washington, Melvelyn Ronett, M.S.

The University of Arizona, 1990

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

THE NATURE OF COMPETITION IN FOOD RETAILING UNITS: A TUCSON CASE STUDY

by

Melvelyn Ronett Washington

A Thesis Submitted to the Faculty of the

DEPARTMENT OF AGRICULTURAL ECONOMICS

In partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

1 9 9 0

STATEMENT BY AUTHOR

This thesis has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgment of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in her or his judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

SIGNED: Melissa Washington

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Molly Longstreth

Molly Longstreth
Assistant Professor
of Agricultural Economics

6/6/90
Date

DEDICATION

To my family, thanks for believing in me. I love you all.

ACKNOWLEDGEMENTS

The author wishes to express her sincere appreciation and thanks to Dr. Molly Longstreth for her guidance, assistance, and editorial comments during the preparation of this thesis. It was her willingness to give her time, knowledge and patience that gave me the incentive to complete the graduate program.

Appreciation is also extended to the thesis committee members, Drs. Roger Dalgren and Neil Conklin, for their constructive comments and suggestions.

A special appreciation is extended to my husband, Gary, for his faith and assistance in making a dream become reality.

TABLE OF CONTENTS page

TABLE OF CONTENTS -- continued page

TABLE OF CONTENTS -- continued page

TABLE OF CONTENTS -- continued page

TABLE OF CONTENTS -- continued page

TABLE OF CONTENTS -- continued page

LIST OF ILLUSTRATIONS page

LIST OF TABLES page

LIST OF TABLES -- continued page

ABSTRACT

The purpose of this study was to analyze price variations across the city of Tucson to determine whether any systematic patterns of noncompetitive pricing existed and to explore their causes. Prices were examined for three alternative baskets of food and non-food items which consisted of 1) national brand items; 2) house brand items; and 3) the cheapest brand items. Also, several characteristics pertaining to firm size, competition level, and neighborhood demographics were examined to determine their effects on the price of the national brand basket. And finally, average weekly prices were examined to determine the effect of the week on the prices of the three alternative baskets.

Ordinary least squares regression equations showed that only those variables related to the competition level were significant in influencing the price of the basket. In addition it was found that price differences were brand specific. That is, BRAND1 prices were found to be higher on the south side of town, whereas BRAND3 prices were highest on the north side of town. Similar results were found when looking at the number of close rivals, stores within the same chain, and the week of the month.

CHAPTER ONE

INTRODUCTION

1.1 Problem Statement

The nature of competition within the food retailing industry has the potential to seriously influence consumers' well-being. For economists and policy makers, the size of the industry and the fact that food is a necessity makes the industry's performance a critical concern. Are the firms within the industry pricing competitively? Are governmental interventions needed to promote competition within the industry? Should governmental policies be implemented to reduce the amount of competition within the industry? These questions are difficult to answer and thus, require a more detailed look into the current situation.

The food marketing system, the largest marketing system in the U. S. economy, is characterized as those firms (excluding farmers) involved in the preparation and/or selling of food stuffs. These include over one million establishments: 250,000 retailers, 40,000 wholesalers, 16,000 food processors and 700,000 service operations. The industry employs more than 12 million full-time employees, one out of every 10 workers in the U. S., making this industry one of the largest employers (Handy, 1986, p. 33).

In 1987, the food industry reached sales of more than $600 billion and grocery sales, alone, reached an all time high of $295 billion (USDA, NFR #34, 1988, p. 45) compared to $36 billion in 1955. For more than two decades, food stores (which account for approximately one-fourth of all retail sales) have contributed just over 3% to Gross National Product (GNP) (Statistical Abstract, 1987, pp. 441, 779). The industry is also the number one purchaser of U.S. domestic crop and animal production, purchasing more than 80% of the country's production.

Furthermore, it has been estimated that consumers spend 15% of their disposable income on food purchases (Dunhan, 1986). However, the rapid demographic changes, over the past three decades, have shifted the allocation of monies spent. Consumers have spent less of the total food bill on food for "at-home" consumption and more on food purchases for consumption "away-from-home" (Dunham, 1986). In the 1980s, consumers have busier lives, smaller families, yet more money to spend on food than their forerunners. This trend in food consumption patterns has, consequently, created innovations in the manufacturing and retailing industries in an attempt to capture the expenditures of the changing food shopper/diner.

Traditionally economists and food manufacturers believed that retailers in the food industry were passive in

nature, with little or no control over marketing, promotional or pricing policies. However, the structural changes experienced by the industry have resulted in a reevaluation of this assumption. Items previously sold in individual specialty shops (e.g. fish market, butcher shop, bakery) are again being offered under one roof, resembling the general mercantile (combination store) of the 1900's. The concept of mass marketing was introduced in the late 1930's which changed the physical presentation of the merchandise. This led to a greater use of marketing, and reduced overhead costs. Also in the tradition of the old general store, more and more grocery stores are supplying items which reflect neighborhood (community) preferences in their product mix and in the services they offer.

The introduction of private label products and the interchanging roles of retailers and manufacturers have further refuted the notion of retailers' lack of control. Low cost alternatives (with standard quality) to the high priced products sold under national labels were first introduced in the late 1940's. However, as the number of private labels increased and the coordination of management by distributor increased, private label sales increased. Therefore, in addition to retailers competing on the basis

of price they also compete through product differentiation, flexibility in merchandising, selection of locational sites and the number of services offered. Competition between retailers and other subsectors (primarily manufacturing and services) of the industry involves the product/service mix. In an effort to further attract today's consumer, retailers offer a wide variety of services ranging from post offices to soup and salad bars complete with restaurant areas.

Industrial organization (I/O) theory has been used to characterize competition in the food retailing industry. Inherent in the theory of I/O are the concepts of product differentiation and non-price forms of competition. However, the uncertainty involved with anticipating of rivals' responses to price changes has limited the success of the many alternative models of industrial organization (monopolistic competition, oligopoly, and spatial monopoly) in predicting the pricing behavior of firms operating in a non-perfect market. Thus, analyzing the industry from an industrial organization framework has led to contradictory policy recommendations.

Consumers are interested in minimizing the cost (while obtaining a desired quality) of these exhaustible repetitious purchases. However, the changing strategic

behavior of food stores may have confused the consumer's decision-making process and increased the cost of search. The price and quality information received from retailers, coupled with the services offered, and the overall price image of the food store involves trade-offs based on the individual's budget constraints and attitudes. Detecting and understanding the patterns of food pricing within a city translates into savings for the consumer.

1.2 Objectives

The purpose of this study is to analyze spatial price variations in the food retailing industry to determine discriminatory pricing patterns among grocery stores in Tucson, Arizona. If spatial variations in food prices do exist, the results of this study will help Tucson food buyers with future food purchasing decisions. Additionally the results of this case study will further increase the knowledge about pricing mechanisms in the food retailing industry. There are four main objectives of this study: 1) to determine the extent of intra-city price variations in Tucson; 2) to examine interbrand price variations; 3) to analyze the relationship between price and competition levels; and 4) to analyze the effect of temporal

distribution of family assistance income has on prices.

Objective 1. Objective 1 is to determine the extent of spatial price variations across neighborhoods. Studies in the United States during the 1960s and early 1970s asked the question, "Are the poor paying more for their food purchases?" In general the answer was no. Income was not found to be a determining factor in food prices (Goodman, 1968; Sexton, 1971; Alcaly and Klevorick, 1971). However, studies conducted during the late 1970s and early 1980s concluded that food stores servicing poor neighborhoods had a tendency to be smaller stores, with higher operating costs and, therefore, higher prices (Kunreuther, 1973; Nelson, 1983). Yet, the mobility enjoyed by most Americans (even in poor neighborhoods) led to the conclusion that food stores (chains) were not price discriminating. Instead, higher prices were justified by smaller stores with higher costs in low income areas and in general, the poor were not paying more for food (Kunreuther, 1973; Hall, 1981). The studies which looked at neighborhood income levels explicitly, tended not to find higher prices in low income areas (Donaldson and Strangways, 1973). However, the studies looking at income levels implicitly using such variables as

age, central city location and ethnicity tended to find higher prices in low income areas (Campbell and Chisholm, 1972; Parker, 1974; Ambrose, 1979; Hall, 1981).

Objective 2. It has been established that consumers can save by purchasing the private brand alternatives offered by retailers. These products are considered standard quality but are more economically priced. The few studies differentiating between brands generally look at one of two issues: 1) the quality differences between the brands, and 2) the extent of potential savings from buying the lower priced private label items (McCartney, 1980; Gray and Anderson, 1981). However, few have addressed whether retailers of private labels follow similar pricing strategies on national brands as they do for their own private labels. Hall (1981) found product quality, selection of brands and sizes, and prices offered for low priced items tend to be better in stores operating in low income neighborhoods. In contrast, prices of brand name items, choice and types of fresh produce and cleanliness were worse in low income areas. Acuna (1988) also looked at interbrand price differentials. Utilizing the data used in this study, Acuna (1988) ranked and compared prices of both the national and the cheapest branded items. When comparing

the price rankings of both baskets, the stores' rankings were shifted. This leads one to investigate the pricing patterns of non-national branded items, and ask the question, "Are basket (national, house, cheapest) totals different due to differences in neighborhood characteristics?" That is, since neighborhood brand choices can easily be assessed (by store managers), are grocers overpricing the brand of choice, while underpricing alternative brands?

Objective 3. This objective looks at different competitive levels of food stores, to determine if any pricing patterns exist. Distances have been found to be important for items which require frequent shopping trips and in which product differentiation is relatively low (Gripsrud and Gronhaug, 1978), as with grocery stores. However, less is known about what determines which store will be visited when there are two or three stores within the same given distance. Empirical evidence has shown that the more stores (of the same kind) within a short distance (in direct competition) the lower the overall prices (Campbell and Chisholm, 1970). In addition, economic theory has established economies of scale as a benefit of firm agglomeration. Therefore, the number of shops (of all

kinds) located within a (shopping) center, as well as the number of food stores in direct contact may also affect food store prices. The more isolated the store, the higher its prices.

However, this appears to be a secondary issue. Most studies have looked explicitly at such factors as store organization (chain, affiliated independent, and independent) and size, and have concluded that larger, chain affiliated food stores generally operate in larger shopping centers, offering lower prices (Campbell and Chisholm, 1970; Hall, 1981; Nelson, 1983). This implies, therefore, that store size tends to influence food store prices. It is posited herein that the larger the store the lower the price.

Objective 4. This final objective concerns the income effect of higher prices associated with a relatively inelastic demand for food during the weeks in which family assistance payments (food stamps) are made. Studies that have addressed this issue have done so implicitly. Analyses of sales variability throughout the month have led to the conclusion that food sales decrease as the time since payday increases (Ambrose, 1979; Carmen and Figueroa, 1986).

Each month, more than 32,000 Tucson households

receive family assistance payments (Statistical Abstract, p. 178, 1987). These payments are disbursed at the beginning of each month. It is, therefore, logical to assume that as the month passes Tucsonans' total demand for food decreases. Empirical evidence has also confirmed this in other cities (Carmen and Figueroa, 1986). With these decreases in demand should come decreases in prices. However, as suggested above, an inverse relationship exists (Carmen and Figueroa, 1986) between income and sales variability. Thus, for purposes of this study, it is hypothesized that variation in sales from the first week in the month to the last week of the month is reflected in decreased prices at the end of the month. Furthermore it is hypothesized that the amount of the decrease differs from one neighborhood to another. The implications of such a relationship are consistent with food price comparisons (that is, higher prices in low income areas). If such a relationship exists, the loss in purchasing power of the poor is extended to all Tucsonans.

1.3 Hypotheses

Question 1

When looking at intra-city price variations, there

is one major hypothesis, that prices vary across the city. However, this question is to determine the extent of price variations based on certain firm, and neighborhood characteristics.

H_{1a}: Are prices higher in smaller food stores than in the larger food stores?

H_{1b}: Do food stores follow similar pricing patterns for differing alternative brands as they do for the national branded items?

$H_1c_:$ Do prices increase as the percent of ethnic minorities, elderly and high school non-graduates increase?

H_{1d}: Do prices decrease as the percent of children and the number of individuals on food stamps increase?

Question 2:

This question concentrates on the competitive level of the food store. Looking at both the number of shops within the shopping center and the number of food stores operating within the localized market. Theoretically as the competition level increases prices should decrease. The hypothesis are therefore:

H_{2a}: Are food prices lower in the center of the city?

H_{2b}: Are food prices lower in Isolated food stores?

H_{2c}: Are food prices lower the more food stores in direct competition?

Question 3

This question concentrates on the effects of the week of the month has on prices.

H_3: Are prices lower around the first two weeks of the month, as opposed to the rest of the month?

CHAPTER TWO

SELECTED CHARACTERISTICS OF THE TUCSON MARKET

2.1 Socioeconomic Characteristics

The Tucson Metropolitan area is located in the southeastern corner of Arizona, and is the second largest city in the state. The majority of the estimated 625,000 inhabitants of this city reside in Tucson and South Tucson (a separate square mile city located within the Tucson city limits). Observations for this study were restricted to stores located within the cities of Tucson and South Tucson.

Tucson's population has grown at a rate 3.2% annually over the past six years and this growth rate is expected to continue. In 1986 Tucson was ranked as the 5th fastest growing city (from a list of 50) in the nation. It is also known for its dedication to improving the quality of workers, lifestyles, and public institutions in the city (Inc. Magazine, 1987).

2.2 Economic Situation

Tucson's overall cost of living index (which measures inter-city cost of living differences), closely approximates the national average. It has lower prices than 40% of the 232 cities measured in 1985 (ACCRA, pp.1-4). When comparing the grocery item component of the index, Tucson is ranked lower than 45% of the cities listed. Even

though Tucson's cost of living nearly mirrored the averages, its overall level of consumer prices rose 15%, while the U.S. city Consumer Price Index (CPI) average rose only 11.4% from the first quarter of 1983 to the fourth quarter of 1985 (de Gennaro, 1986).

In 1987, the Tucson Metropolitan area had 489,000 adult residents with a 5.3% unemployment rate. The same year the national unemployment level was 0.9% higher or 6.2% (Tucson Enterprise Directory, 1988, p.70). Relatively low rates of unemployment have persisted throughout the eighties.

The typical Tucsonan is between the ages of twenty-five and thirty-four, married, with fewer than five children. She or he is a white collar worker with some college education, owns her/his own home, and earns between $15,000 and $34,999 annually. These figures closely match the national levels (Tucson Enterprise Directory, 1988, p.124).

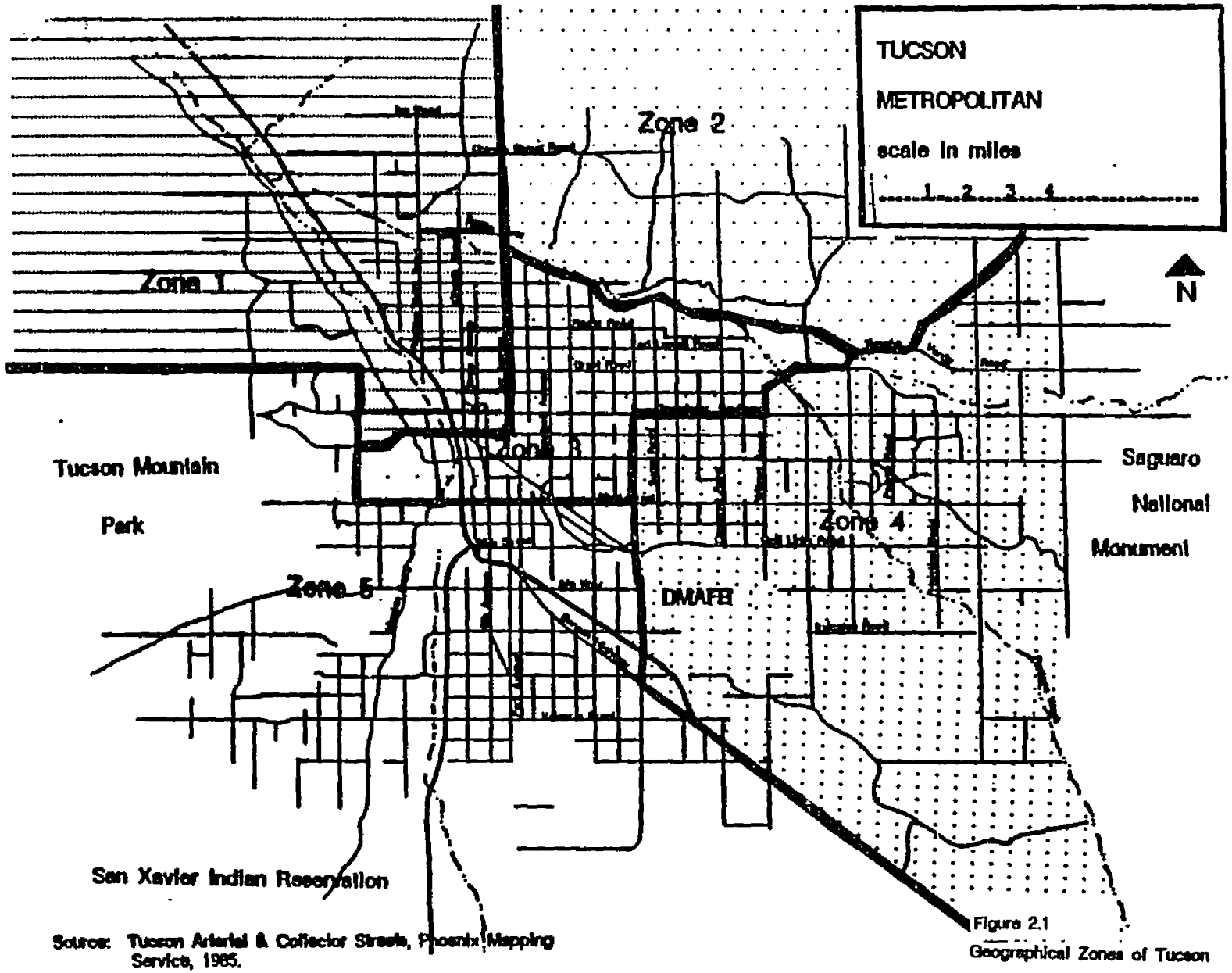
The composition of ethnic groups within the area parallels the national level for whites only. Because of the proximity of various Indian reservations and Mexico, Tucson's Native American (2.8%) and Hispanic (21.0%) populations are much higher than the national level. On the other hand, the percentages of Black Americans, and Asian

and Pacific Islanders have been minimal, 2.8% and .09%, respectively (1986-87 Annual Performance Report, p.16).

2.3 Regional Characteristics

The apportionment of geographic zones in the Tucson Metropolitan area has recently been redefined. Prior to 1986 the census tracts of the city were utilized to define regional boundaries of each district (Tucson Trends, 1986). To promote simplicity and uniformity, Tucson Trends, a publication of a local bank, restructured its districts by grouping zip codes into economic zones. The number of districts has since been decreased from twelve to ten and finally to five economic zones. For 1988, Zone 1 identifies the northwestern area of metropolitan Tucson (hereafter referred to as Tucson); Zone 2 identifies the north central portion of the city; Zone 3, the central area; Zone 4 the east-southeastern region; and Zone 5, the south side of Tucson (Figure 2.1).

Household incomes are somewhat higher in Zones 1, 2 and 4, while the youngest adults live in Zone 3 (the area around the University of Arizona). Another distinct difference between zones can be seen in the large proportion of retired adults living in Zone 5 (south). However, this zone also includes the retirement community of Green Valley.



Source: Tucson Arterial & Collector Streets, Phoenix Mapping Service, 1985.

Figure 2.1
Geographical Zones of Tucson

Independent food stores operate in all zones; each zone had more independents than chains. As a matter of fact, three of the zones had more independents than the total number of chains in those zones.

Zones 1 and 5 contained the highest number of food stores, with 39 and 38 total units, respectively (Table 2.1). Zone 1 is also one of the more populous areas of town.

Zone 2, which has the highest median incomes and the lowest population density, has the lowest number of food retailers, only 12 units. Zones 3 and 4 have a small common boundary and roughly the same number of food stores. Zone 3 has 24 units, while zone 4 has 22 units. However, the age profiles of these two zones are very dissimilar. The median age in Zone 4 is more than 10 years older than that in Zone 3 which may account for the 37% differential in median incomes. The adult population in Zone 4 is twice that of Zone 3. Thirty-seven percent of those in Zone 3 own their own homes compared with 74% in Zone 4.

Zone 5 has the second to the highest number of food stores, but has one of the lowest median incomes.

Table 2.1
Characteristics of Tucson's Geographic Zones

ZONE	LOCATION OF STORES	TOTAL NO.	POP.	MEDIAN INCOME	MEDIAN AGE
ONE	Northwest	39	105,600	26,100	38
TWO	North-Central	12	68,900	32,700	39
THREE	Central	24	70,900	20,500	31
FOUR	East	22	119,300	28,100	42
FIVE	South	38	104,200	22,500	45

Source: Tucson Trends, 1988.
Store Source: U.S. West Directory Yellow Pages, 1986.

2.4 Tucson Food Retailers

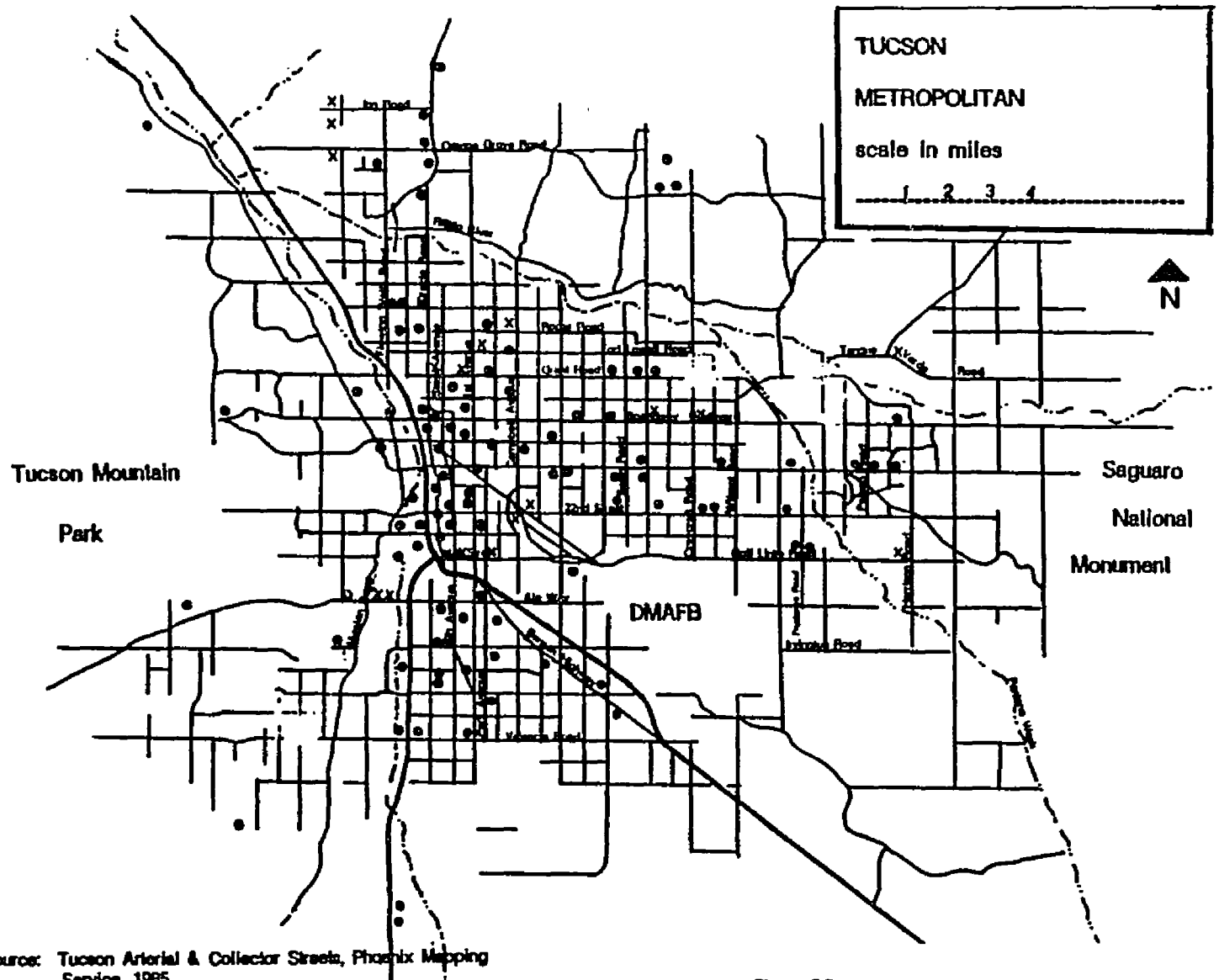
For purposes of this study the store population was considered to be the 285 food retailers listed in the Tucson U.S. West Direct Yellow Pages issued in June/July of 1986. Through verbal (via telephone), as well as visual (traveling to the locations) verification, stores that were too small,

non-operational and/or in outlying areas were deleted to obtain the sampling frame. Mom and pop stores, convenience stores, membership discount stores, and restaurants were also deleted. Therefore the sampling frame of food retailers for this study consisted of the remaining 135 stores.

In 1986, seven major chains and two smaller chain firms each operated three or more units within the cities of Tucson and South Tucson. Four of the major chains operated eight or more units, two chains had fourteen or more units and one international chain had a total of 15 units within the city. Nearly 45% (of the 135 stores) were chain stores, and the remaining stores were independents.

CHAIN OPERATIONS. The population of 135 food stores, was plotted on a map of Tucson (Figure 2.2). Three patterns of location existed among the chains within the sampling frame. First, most stores are clustered toward the center of the city. Second, chains differ with respect to the degree of localization, and finally, no chains operate in the city of South Tucson. It is serviced only by independent grocery stores. Table 2.2 gives the locations of the major chain stores that were operating within the city in 1986.

Safeway (hereafter referred to as Chain I), had a



Source: Tucson Arterial & Collector Streets, Phoenix Mapping Service, 1985.

Source: Tucson Trends, 1988

Figure 2.2
Locations of Food Stores Included in the Sampling Frame

total of 15 units servicing Tucson. These stores are concentrated in the eastern and northeastern regions of the city. Four units each are located in both Zones 1 and 4. There were three Chain I stores in Zones 2 and 3, and one in Zone 5. The store located in Zone 5 is the only Chain I store located south of Golf Links Road, which is one of the fastest growing areas of town.

Lucky (hereafter called Chain II), with 14 units operating in 1986, had six units located on the east-southeastern (Zone 4) side of Tucson. Three were located in Zones 2 and 5, two in Zone 1 and one in Zone 3.

Fry's (hereafter called Chain III), had a total of 9 units. Three Chain III stores operated in Zone 4, and two Chain III stores operated in each of three zones, 1, 3, and 5. No Chain III stores operated in north central Tucson in 1987.

A. J. Bayless (hereafter called Chain IV), had eight stores servicing Tucson. Chain IV, like Chain III, had no units operating in the north central area of town. There were three Chain IV stores in both Zones 4 and 5, and one Chain IV unit in Zone 3 (Table 2.2).

Table 2.2
Sample Food Stores In Tucson By Zone (Geographical Location)

Store Name	Classi-fication	Total no. of Stores	Geographical Location Zone One	Zone Two	Zone Three	Zone Four	Zone Five
Safeway	Chain I	15	4	3	3	4	1
Lucky	Chain II	14	2	3	1	6	3
Fry's	Chain III	9	2	0	2	3	2
A.J. Bayless	Chain IV	8	1	0	1	3	3
Warehouse	Chain V	3	0	0	1	1	1
Abco	Chain VI	4	1	0	1	1	1
Rays' Market	Ind. I	1	0	0	1	0	0
United Market	Ind. II	1	0	0	0	0	1
El Grande	Ind. III	1	0	0	0	0	1
Fairmart	Ind. IV	1	0	0	0	0	1

Source: U.S. West Directory Yellow Pages, 1986.

Four Warehouse Foods stores (hereafter called Chain V) operated in Tucson. This is a "no frills," non-membership discount food store. No frills means, for example, that it requires patrons to bag their own groceries. Each unit was located in a different zone (Zones 1, 3, 4 and 5).

Alpha Beta (ABCO), hereafter called Chain VI, operated four stores in Tucson in 1986. There was one unit each in four of the five zones. Like Chains III and IV, Chain VI did not operate a store in Zone 2 which has the highest income level within the city.

INDEPENDENT OPERATIONS. Independent retailers, are scattered throughout the city, although many are located along a narrow strip which cuts the city lengthwise. These stores are concentrated between First Avenue and Miracle Mile (Oracle) Road, and from as far south as Valencia Road to the northern end of the city at McGee Road. Approximately 55% of the grocery stores from the sampling frame were independent grocers.

2.5 Tucson Food Stamp Program

Under the Federal Food Stamp Program, eligible low-income families receive food stamps which can be redeemed at most grocery stores for the purchase of food items only.

Food stamp participation by the retailer, however, is not automatic. The food store must be authorized by the Department of Agriculture to participate in the program before it can accept the food coupons. This condition, which requires additional bookkeeping records, adds to the operating costs of participating stores. Those most likely to be adversely affected by the additional costs are the smaller independent stores, and thus they might be expected to not accept the stamps (NCFM #10, 1966). However, all stores (chains and independents) in this study accepted food stamps in 1987.

The Department of Economic Security (DES) is responsible for assessing eligibility and disbursement of food stamps to recipients. Prospective participants have easy access to DES. In Tucson, these offices are placed where high proportions of low-income families reside.

According to Tom Brooks, the Administrative Assistant for the Tucson district, Tucson spends over $3 million a month for family assistance, of which over $14,000 is issued directly for food stamp purchases in the form of food stamps. When including AFDC and WIC payments, this figure grows tremendously. Food stamps and other forms of

family assistance, accounted for a total of $44.0 million dollars expended in Tucson in 1988.

The east side office has approximately 2,700 monthly cases. The downtown office, which encompasses a vast area, services approximately 3,000 cases a month. The northwest office has nearly 2,000 monthly participants and the south side office services about 5,100 monthly cases (Brooks, 1988). Two of the DES offices are located on the south side of Tucson in Zone 5 and two offices are in Zone 3, central Tucson.

Food stamps are issued alphabetically (by recipient's last name) during the first two weeks of each month, and generally family assistance checks are disbursed around the 2nd or 3rd day of the month. Therefore, by the 15th of the month all family assistance checks have been disbursed.

2.6 Updated Information

Competition in Tucson for the grocery industry has been intense and the composition of stores has shifted since 1987, the year in which these data were collected. Stores have remodeled, restructured and/or left the market. In 1986, Chain II owned a series of regional discount food stores, from which they have currently divested. These discount units (which operated under a different name) were

replaced with two additional Chain II units. Two other chains closed in 1986. However, these units were not originally included in this study.

A total of nine new food stores have opened since 1986, all of which are bigger than stores previously operating in Tucson. One chain, Chain III, remodeled one of its units, expanding it to 60,000 square feet, making it the largest single location in the country. However, a new chain has moved into the vicinity, and all of its units run between 60,000 and 78,000 square feet. These units offer a plethora of food and non-food items as well as services and it has attracted numerous regular customers (Tucson Enterprise Directory, 1988).

CHAPTER THREE

LITERATURE REVIEW

3.1 Food Retailing History

The conventional definition of a grocery store is "... a store dealing in general supplies for the table (such as flour, sugar, coffee, etc.) and other household supplies" (Random House Inc., 1975). However, today's grocery stores sell much more than food and household supplies. Traditional items have been supplemented with specialty departments such as fresh fish counters, bakeries, delicatessens, prepared cooked and uncooked meats, prescription drugs and freshly cut flowers. Also housed in many grocery stores are such organizations as banks with automatic teller machines (ATM), restaurants, barber shops and portrait studios.

Grocery stores come in a variety of sizes, types, and formats. Well accepted classifications of food stores are based on such criteria as annual sales, number of items carried, number of services offered, and/or physical size of the selling unit. Common types of food stores include: 1) Convenience stores which sell a limited variety of food and non-food items; 2) Superette grocery stores which are primarily self-service in operation, sell a variety of food and non-food items, and have annual sales less than $1.0

million; 3) Mom and Pop grocery stores which are often run by members of a minority group eager to get started in the United States by catering to specific ethnic neighborhoods, and may not be well served by wholesalers (Markin, 1982); and 4) Supermarket grocery stores which are primarily self-service operations, provide a full range of departments (e.g. meats, health and beauty, etc.) and have sales of at least $1.0 million in 1972 dollars (Nelson, 1983).

The supermarket requires a fuller description. According to Nelson (1983), supermarket formats include: 1) the limited assortment supermarket which stocks fewer items than other supermarkets and are typically less than 10,000 square feet in size; 2) the conventional supermarket which generally displays between 9,000 and 11,000 prepackaged items; 3) the combination supermarket which contains a pharmacy, a non-prescription drug department and greater variety of health and beauty aids than the conventional supermarket; 4) the superstore supermarket which has a greater variety of products than the conventional supermarkets with specialty counters (e.g. sea food counter, bakery counter, etc.), service departments and considerable amounts of general merchandise; and 5) the warehouse supermarket which has limited product variety and fewer services, and incorporates case lot stocking and shelving

practices.

Table 3.1 shows differences in supermarket formats by size. Rankings of physical size, yearly sales and the number of services are given on an ascending scale, where 1 represents the smallest size and 5 the largest. The averages of these rankings constitute the aggregate size measurements, which are plotted in Figure 3.1.

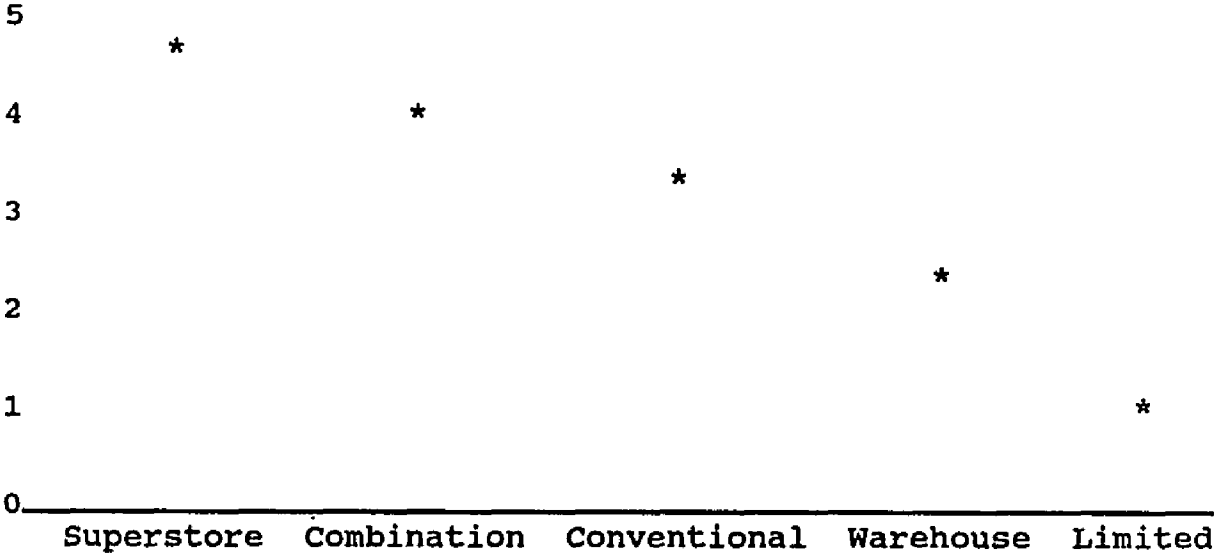
Table 3.1
Size Rankings for Supermarket Formats

FORMAT	PHYSICAL SIZE	SALES	SERVICES	AVERAGE RANKING
Combination	2	4	5	3.7
Conventional	4	3	3	3.3
Limited Assortment	1	1	1	1.0
Superstore	5	5	4	4.7
Warehouse	3	2	2	2.3

Source: U.S. Supermarkets: Characteristics and services USDA Bulletin #501 Price, Charlene C. and Doris J. Newton, 1986.

The focus of this study is the nature of competition among food stores. Because of the limited product variety and physical size found in Mom and Pop operations, as well as in convenience stores, these types of food stores were excluded from the study. Therefore, the stores in this study represent supermarket type grocery stores, although formats may be different. Several superettes and a warehouse store were also represented.

Figure 3.1
Size rankings for Supermarket formats



Source: U.S. Supermarkets: Characteristics and Services USDA Bulletin #501 Price, Charlene C. and Doris J. Newton, 1986.

Food retailing units in America, the services they offer and the nature of competition among these units, have undergone extensive changes over the past eighty years. Because of the interdependence between the food retailing (distributing) units and the food manufacturing units, these changes have affected the entire industry.

Beginning with the general mercantile of the 1900's and ending with the hyper-supermarkets of the 1980's, the notion of "one-stop" shopping has been re-evaluated. The general mercantile supplied staple foods, household items, clothing, farming supplies and other fundamental supplies needed for the rural family. In those days credit was usually extended and service was very personalized. Typically, the customer came into the mercantile and handed a list to the counter clerk, who then filled the order from shelves behind the counter. Bartering home products for store items was a widely accepted practice (Mueller and Garoin, 1961).

As the U.S. grew and population centers became more concentrated, the economic efficiencies in stores along with customer satisfaction were improved (Morrill, 1970). The efficiencies were gained largely as a consequence of specialization in merchandising of one food item, hence the name, "specialty shops." Specialty stores included

bakeries, dairies, delicatessens and butcher shops. Service was still conducted over the counter and was very personalized.

3.1.1 The Chain Store Movement

Since the turn of the century the U.S. food marketing system has undergone three very distinct phases of merger activity. Each epoch affected all operations within the industry, resulting in a restructuring of the entire industry.

In 1859, there was only one food chain store (NCFM #7, 1965). However, retailers began acknowledging the cost advantages gained by integrating their supply sources, and between 1910 and 1930 the food store industry went through a restructuring period, usually referred to as the "chain store movement" (Padberg, 1968). The expansion of the chain store movement was accomplished through a series of horizontal mergers and buyouts. It put many small retailers together in one organization, leaving the retail units virtually unchanged, but making substantial developments in the supply organizations behind them (Padberg, 1968). By organizing, retailers were able to receive preference over independent firms in the form of quality discounts and favorable credit terms. They exchanged loyalty for these benefits. With dependable suppliers and price preferences

the chains were able to operate with similar policies over wide geographic areas, regardless of the characteristics of individual markets and still maintain the products, services, and prices to draw consumers away from other shopping alternatives (Padberg, 1968).

3.1.2 The Supermarket Movement

As chains became more powerful and, therefore, more profitable, retailers which had remained independent also began to organize. It was in their best interest to duplicate the efficiencies that chains had created through integration of supply. The success of this endeavour was evidenced by increases in the sales of independent-affiliated grocers. Chain store sales stabilized, but affiliated grocery store (voluntary chains) sales escalated. However, statistics on actual growth within the industry during the 1930's can be deceiving. By 1932 the number of chains and the number of stores within each chain organization were changing so fast that figures were out of date before they could be compiled and published (Hass, 1979, p.18).

After World War II, conditions were depressed and competition from the chains was fierce. Independent retailers were forced to create alternative marketing strategies that would enhance their abilities to compete

effectively. One consequence was the concept of self-service developed by a group of independent retailers. As a result, fresh meats, fresh fruits and vegetables, dairy products and grocery items became available again in the same store -- called a combination store. The combination store, in contrast to the conventional supermarkets of the 1930's, incorporated several departments under one roof and doubled the size of the family owned and operated units. These units contained pharmacies, non-prescription drug departments, and a greater variety of health and beauty aids than typically carried by the conventional supermarkets of earlier times.

The advantages of these combination stores led to the development of the "supermarket movement." The change in the physical presentation of the merchandise allowed a greater degree of flexibility in marketing and lowered overhead costs. Among other important changes, supermarkets began a policy of cash and carry only (NCFM #7, p.37).

By the mid-sixties of chain stores' sales began to stagnate, possibly due to the homogeneous policies followed by supermarket chains across heterogeneous areas. Their marketing and merchandising policies had become inflexible while food sales from independent retailers, who were not limited by these inflexibilities began increasing.

Independent supermarkets grew faster than chain supermarkets. Thus supermarket chains were compelled to focus on the local characteristics of the market in an attempt to boost sales (Padberg, 1968).

3.1.3 The Conglomerate Movement

The idea of supermarkets, in general, and mass marketing specifically, attracted the attention of other industries as well, creating a wave of conglomerate mergers. Organizations not previously involved in the food industry (e.g. ITT, LTV, Greyhound and RCA) began heavy acquisitions of food processors, wholesalers and retailers.

Between 1977 and 1986, merger activity in the food industry reached an all time high, in number of firms acquired as well as in dollar value. This restructuring changed the competitive environment again. The supermarket industry was plagued with low cash flows, undervalued assets, low profit margins, and a slower growth rate in food prices. Many of the non-food conglomerates which had previously acquired supermarket operations during the "supermarket movement" of the 1950's and 1960's began divesting these same operations. Therefore, "conglomerate movement" may be a misnomer, because the final epoch in food retailing history involved more divestitures than mergers. From 1982 through 1986, 286 food retailing units were sold,

of which over 60% were actually divestitures by non-food conglomerates (USDA AER #590, 1986, p. 40).

In addition to the conglomerates leaving the food industry by divesting their food retailing units, supermarkets began divesting their non-food operations in an effort to concentrate on what they do best (Business Week, 1987). Retail food managers agreed that supermarkets could no longer be referred to generically, and as a result of the conglomerate activity of the 1970's and 1980's, supermarkets began to tailor their retail units (in format, services and product mix) to favor the individual neighborhood characteristics in which they operated (Forbes, 1987).

Since it is impossible for firms to be cognizant of all their rivals' actions, catering to neighborhood-specific market segments may have the advantages of reducing costs associated with analyzing and predicting rivals' reactions, thereby, increasing patronage, and profits. On the other hand, this level of competitive behavior may also have the disadvantage of discriminatory pricing policy as a result of the neighborhood demographics.

3.2 Industrial Organization and Its Influence on Price

Industrial organization (IO) theory is traditionally used to analyze pricing behavior within the food retailing industry. Underlying this model of competition are the

concepts of structure, conduct and performance relationships. Traditional views on structure-conduct-performance (SCP) relationships assert that market concentration (structure) fosters collusion (conduct) resulting in monopoly rents (performance). However, an alternative view, the efficient structure hypothesis, asserts that market concentration is a result of market competition, and profits earned are Ricardian in nature.

Although proponents of both views emphasize the necessity of fair competition, policy recommendations differ. Advocates of the SPC view have suggested implementation of additional anti-trust legislation to limit the market power of large firms within the food retailing industry (Conner et al., 1985). In contrast, proponents of the efficient structure hypothesis assert that the food retailing industry in the U.S. epitomizes the nature of competition, and if intervention is warranted then it should be in the form of economic incentives as opposed to legislative policies. Examples of economic incentives include: 1) subsidizing customers plagued with higher neighborhood food prices to help eliminate their welfare losses, or 2) offering incentives to larger chain operations in order to entice them into low-income neighborhoods, thereby, reducing prices in those neighborhoods.

For years economists have attempted to develop a model of firm behavior for U.S. food retailing units which would give some insight into the nature of competition within the industry. In general, studies in food retailing have moved in one of three directions over the past twenty-five years. These studies have focused on the structure of the industry (Mueller & Garoian, 1961; USDA, 1966; Padberg, 1968; NCFM #7, 1966; Marion, et al., 1986), the conduct of the firms and industry (Padberg, 1968; Holdren, 1971; Padberg 1974), and the performance of the industry (Albion, 1986; Connor et al., 1983; Benson and Faminow, 1975; Carmen and Figueroa, 1986).

3.2.1 Market Structure Studies

The pricing behavior of retailers in the food industry may reflect the market structure in which it operates. Such measures as concentration ratios, market shares, prices, profits, and forms of the cost and demand functions have all been utilized as indicators of market structure. However, the variety of pricing patterns found in firms operating in markets influenced by imperfect competition makes the task of developing only one acceptable model almost impossible (Baumol, Quandt, and Shapiro, 1978). Without understanding the conduct, let alone the structure of the industry, the performance measures become difficult

to interpret. Researchers in the food industry have conducted studies to test differing views. The results have clearly been mixed, and often, the methodology and data used determine which view to consider to be correct.

In analyzing the nature of competition within the food retailing industry, some researchers have found local markets to be competitive (Padberg, 1968; Holdren 1971). While others (Marion, 1985; Connor et al., 1985) have concluded the opposite. Of the latter group, researchers at the USDA (1966) asserted that it is important to address competition at both the national and local levels. Firms in local markets may have more competitive importance than firms at the national level. Because the sizes of firms vary greatly in local markets, the USDA authors have suggested that these markets are plagued with monopolistic elements. The high costs of entry preclude small firms from entering the market and thereby give larger firms (already in the market) superior power in determining selling prices.

In contrast, Padberg (1968) concluded that monopoly power may exist at the national level, but that at the local level food retailing is probably operating competitively. He also asserts that in a competitive environment, the long run implications of Chamberlin (1953) could be considered desirable for the grocery industry. Chamberlin's model

predicts that excess capacities, non-price competition and inefficiencies (where price is greater than marginal cost, and additional units are therefore, worth more to consumers than it costs the firm to produce them) are all conditions which arise in the industries operating in imperfect markets. Padberg (1968) posits that competition is a necessary ingredient for development and innovation, higher profits for the firm, and eventually lower prices for consumers. He argues that the increased innovations within the food retailing industry demonstrate that local markets operate competitively.

3.2.2 Market Conduct Studies

A number of the studies focusing on firm pricing behavior have also looked at the competitive conduct of firms within the industry. Firms operating in an imperfect market are uncertain of rivals' reactions to price changes. Therefore, in some industries firms attempt to coordinate. Through formal (cartels) or informal (price leadership) methods of collusion firms agree to restrict output and fix prices, which enable all firms to reap oligopoly profits. A majority of the studies looking at firm conduct in the retail food industry have analyzed the effects of Retail Food Price Reporting Systems (RFPRS) on price movements (Boyton, Blake and Uhl, 1983; Faminow and Benson, 1975;

Faminow and Benson, 1985). These studies have looked at firms' responses to rivals' published prices. In general, the surveyors collected and then published prices of individual items (typically in the local newspapers) offered by competing grocery stores within a given area. Instore visits were utilized to observe price movements of the publicized items.

Faminow and Benson (1975) studied the implications of reporting comparative prices over an extended period of time. Unlike previous studies on RFPRS, Faminow and Benson were interested in isolating firm behavior, and therefore, conducted an experiment in a laboratory setting. They assumed that since food markets are characterized by spatially dispersed firms and consumers, the cost of distance affects marketing decisions and therefore, posited that firms view their closest rivals (geographical) as their most formidable competitors. Therefore, a model was used which emphasized seller behavior under uncertainty. They found that price reporting in the long run was utilized by food retailers to reduce uncertainty in their rivals' pricing policies and thus, may result in increased prices and firm profits.

Handy and Padberg (1971) developed a model of firm behavior to better understand the competitive behavior of

firms within the food retailing industry. Previous literature on the nature of competition within the food industry had utilized industrial organization (I/O) theory. Handy and Padberg felt this model had little predictive power for the food industry, however, because I/O theory was designed primarily for distribution channels dominated by the manufacturer which is not believed to be the case for the food retaining industry.

According to Handy and Padberg (1971) the distribution and manufacturing systems are divided into two substructures: a core and a fringe. The core food distribution system is usually oligopolistic, and has competitive advantages with respect to cost and efficiency in its preretailing operations. These distributors have warehouses, manufacturing plants, quality control laboratories and computer controlled logistic systems which enable them to concentrate on growth and progressiveness (e.g. laser scanners, ATM machines by the cash registers). The largest number of food distributors belong to the second substructure; they are the fringe distributors. Fringe retailers contribute the majority of the industry's output and tend to be less oligopolistic in nature. These retailers are small-to-medium sized firms with advantages in merchandising flexibilities and store design. It is assumed

that smaller retailers can better adapt their stores to accommodate the communities they serve, than core distributors. Compared with core retailers they also typically carry a wider range of more progressive products which are supplied by large food manufacturers. In contrast, core retailers due to efficiencies in retailing and economies of scale, emphasize standard quality (their own brand) at lower prices.

3.2.3 Market Performance Studies

The distribution (retailing as well as wholesaling) function is vital to the economic well-being of society. It provides desired products and services to consumers, at a cost. Retailers contribute to the value of the product by getting it to the right place at the time consumers want to buy it (Boone and Kurtz, 1979). Gross margins are also influenced by such factors as the cost of labor and other factor inputs, the adoption of new technologies, sales per square foot, services offered by retailers, and many other variables (Marion, 1985). However, most studies analyzing the performance of the food retailing industry focus on such basic variables as market shares and concentration ratios. Marion (1986) looked at the performance of supermarkets in 173 SMSA's. Concentration ratios were calculated as the percentage of supermarket sales accounted for by the largest

four and eight supermarket firms within a SMSA. The market shares were represented by the store's market share divided by the sum of the market shares of the top four firms in the city. He found both to be positively related to store profits and concluded that larger firms with high market shares and high concentration ratios (the majority of the chain supermarkets) were enjoying monopoly power and profits. His conclusions were based on profit margins which were predicted for different levels of concentration.

Looking at performance measures, Handy and Padberg (1974) focused on the traditional conflict between efficiency oriented norms of performance (e.g. sales per square foot of selling area, merchandise turnover rates, store hours) and the performance measures which emphasize progress and qualitative change (e.g. new product development, product and market research, advertising and promotion expenses).

Although a few economists believe that both norms are theoretically valid measures of performance Handy and Padberg (1971) believed this to be empirically impossible. They found that firms concentrating on progress and quality were organized differently than those emphasizing efficiency. They also found that larger distribution firms tended toward price competition while smaller firms tended

toward non-price competition, implying a degree of specialization unaccounted for in the traditional theory. Therefore, they modified the existing industrial organizational theory to incorporate: 1) the presence of a bilateral interaction between the manufacturer and the distributor, implying a degree of interdependence between the two; and 2) the concept of functional specialization between the manufacturing and distributing sectors of the industry.

Conner et al. (1985) also looked at the performance of the industry. They found the market to be unstable as a consequence of operating in an oligopolistic environment. Their conclusion was based on the same characteristics found by Chamberlin (1953) as evidence of monopolistic competition. Like Chamberlin, they considered the degree of product differentiation within the food industry as a barrier, due primarily to the high capital investment needed to establish and ensure product identification and success. They characterized the food industry as anticompetitive, inefficient and unstable. The authors also stated that other barriers to entry (e.g. economies of scale) are insignificant in the food retailing industry. However, contemporary economists now agree that strategic locational sites, zoning restrictions and capital limitations are all

significant entry barriers in the food retailing industry (Padberg, 1983).

Marion et al. (1986) also stress the insignificance of economies of scale in the food retailing industry. They found entry of new firms affects the market only if the entry is in a small town. Usually stores enter the market gradually and attempt to penetrate the market, and only if successful in this expansion, could the firm influence competition within the market (Marion, 1986).

In summary, the majority of the studies, from the I/O literature which examined competition (whether by structure, conduct, performance) within the food industry have described the market as monopolistic in nature. However, the assessment becomes blurred when distinguishing between local and national markets. Here results are few and mixed. The varying sizes of food units operating within a local market and the high cost of entry leads Marion, et al. (1985) to conclude there are monopolistic elements within local markets. On the other hand, the development and growth of the industry has lead Padberg (1968) to define the market as competitive, although growth and development is usually accomplished through product differentiation and non-price competition (two conditions of imperfect competition)

Most studies have tended to restrict food retailing studies to chain store operations (which are national or regional in scope). However, since the number of non-chain store operations far outweighs the number of chain stores operating within the country, those studies are rather limited in their ability to fully evaluate the nature of competition in food retailing. Therefore, the addition of the nonchain operations in this study may provide a better description of the industry.

3.3 Defining a Market Basket

The "market basket approach" (i.e. defining, then pricing a bundle of goods) is the most common method used to analyze price variations within the food retailing industry. Traditionally, a fixed-item basket of goods is defined and prices are collected. Generally, the prices are collected weekly, over an extended period of time. However, there are some studies where prices were collected only cross-sectionally (Campbell and Chisholm, 1971; O'Farrell and Poole, 1972; Parker, 1974).

Since food consumption patterns differ greatly from individual to individual, conclusions drawn from food retailing studies which utilize this approach are subject to the researcher's interpretation of a market basket. That

is, determining how many items, what sized items, and what brand items to include in the study is very subjective. A variety of methods have been employed but each has significant disadvantages, and no consensus has been reached about which alternative is most satisfactory, nor has an obviously superior method surfaced.

Researchers have, however, come to some agreement about a possible relationship between consumption patterns and socioeconomic status. It has been shown that such characteristics as income, age and ethnicity are a few of the factors which should be considered when developing a basket for intercity comparisons (Alcaly and Klevorick, 1971; Kunreuther, 1973; Ambrose, 1979). When comparing a basket of goods across socioeconomic classes, it is important not to bias the results by including products that are not equally represented in all socioeconomic classes. That is, for example, there are products preferred by low-income consumers which will not necessarily include items considered to be big sellers in the higher income areas (Donaldson and Strangways, 1973). Examples include such products as hamburger, tuna helper and pig's feet.

The dietary practices of the poor also differ, often resulting in diets that fail to meet daily recommended requirements (Ambrose, 1979). Therefore, those studies

which utilized nutritional requirements to guide the development of the market basket may have diminished the results of the study (Ambrose, 1979).

Weights have also been used to reflect characteristics which differ between individual geographic areas. Hawkins, Warrack, and Pattison (1968) suggested that weights be assigned to each item according to its importance to the "average food purchaser." Ambrose assigned importance to each item based on weights obtained from the Consumer Price Index (CPI).

Nelson (1983) and Goodman (1968) employed an alternative strategy. They attempted to construct a representative basket of food items by specifying a particular family (e.g. 1 man age 35, 1 woman age 32, 1 boy age 17, 1 girl age 13, 1 child age 5). The recommended poundage of individual foods was then calculated for that family from the table of Nutritional Requirements, published by the U.S. Department of Health and Human Services. To increase the value of the study, Nelson (1983) conducted tests for two hypothetical families using separate market baskets. Goodman (1968) used three hypothetical families.

Obviously, the common goal in most studies is to develop a market basket of goods which will accurately reflect the typical food shopper's basket of goods.

However, most studies developed their baskets based on the researchers' judgments, weekly advertisements, and nutritional recommendations. The baskets, in general, are not meant to approximate the contents of a weekly purchase of an average consumer, but rather to represent a basket of goods typically purchased in a grocery store. To obtain such an extensive data set (one approximating a weekly purchase) would not only be extremely costly, but by comparing an average shopping basket across different socioeconomic classes would understate any patterns found with respect to price and socioeconomic status.

Selection of product size is another issue in constructing market baskets. Decisions about product size involve several factors. First, low income populations may be strongly constrained by budget and storage limitations. Therefore, they may be forced to purchase smaller sizes (Donaldson and Strangways, 1973). Second, low income consumers purchase a smaller number of items, with more in-store visits than consumers who are not as constrained (Sexton, 1979).

Regardless of the market basket, one problem researchers seem to inevitably face is the need to delete items which were not stocked by all sample stores. The extent of missing products may pose a serious problem.

Ambrose (1979), for example, began with 105 items, but ultimately reduced that number to 54. Hall (1980) found that out of 30 items, 20 were available in 85% of the stores, 6 additional items were stocked in 70% of the stores, and 4 were found in only 20% of the stores surveyed (Hall, 1980, p. 285).

There is no average (or common) market basket size among the studies reviewed. Sizes ranged from 14 items in the O'Farrell and Poole (1973) study to 207 items in the Sexton (1968) study. However, it is generally agreed that the more items in the basket, the more reliable the results.

3.4 Price Variations and Influential Factors

Prices of individual items have been shown to vary significantly across stores (Campbell and Chisholm, 1971; Parker, 1974; Hall, 1980), across regions (Goodman, 1968; Hall, 1980; Donaldson and Strangways, 1973; Kunreuther, 1973), between units of the same chain (Hawkins, Warrack and Pattison, 1968) and from week-to-week (Carman and Figueroa, 1986). It has been estimated that consumers would save anywhere from 10% (McCartney, 1980, p. 86) to 34.9% (Handy, 1985, p. 14) on their total food bill if they had the benefit of more information about how prices vary.

There may be many reasons for these price differences. The most commonly cited reasons involve ignorance

in the market place, operating cost differentials between stores, quality differentials between brands and services offered, the location of the store, the size of the store and the week of month.

3.4.1 Ignorance in the Market Place

Stigler (1961) and Maynes (1966) have posited that price variations are largely due to ignorance in the marketplace. Consumers' lack of information (ignorance) allows sellers the opportunity to charge higher or lower prices for goods or services of similar quality than the next store, without fear of repercussions from the buyer (i.e. patronage shifts). Numerous empirical analyses indicate that price dispersion decreases with improved consumer information (Benson and Faminow, 1975; Urbany, 1973).

However, Faminow and Benson (1985) indicate that while price dispersion may decrease with increased information, prices may rise. Believing that consumers could benefit from the presence of additional price information, Faminow and Benson (1985) conducted an experimental study to analyze the effects of additional information on consumer behavior and therefore, price levels. They utilized a spatial duopoly model as the economic structure underlying the experimental design. Since the primary purpose of the study was to analyze firm

behavior under conditions of Retail Food Reporting Systems (RFPRS), a control market was defined (for comparison) and consumer response was controlled through an experimental laboratory setting.

The results of the study led to the conclusion that the price information was of more value to the retailers than to the consumers. Without price information oligopolists may find market coordination very difficult. Information received from price reports could lower the cost of competition to the firm, causing profits to increase. Sellers attempting to underprice rivals may come to realize that they do not have to set price as low as they had been (Faminow and Benson, 1975). They found prices increased over extended periods of price reporting, suggesting that by eliminating consumer ignorance, prices could rise as well as decrease.

3.4.2 Operating costs

Empirical evidence has shown that low income neighborhoods are serviced primarily by independent food stores, supplemented with a limited (if any) number of supermarket chains. Prices in independent food stores are significantly higher than those in larger chain supermarkets (Nelson, 1983; Hall, 1980). These higher prices may reflect

the higher cost of operating of the smaller independent stores.

One of the most comprehensive studies on the effect of operating costs on food prices was conducted by Hall (1980). Total operating expenses of poverty area supermarkets were 20.8% of total sales, while in nonpoverty areas supermarkets total operating expenses were only 19.9% of sales (Hall, 1980, p. 287). He stated that stores located in low income areas are most likely faced with higher insurance costs, higher rents, higher employee turnover, and higher pilferage rates, resulting in higher consumer prices (Hall, 1980). Of these, he found that the crime rate in low income areas was the most important cost associated with higher food prices.

Other expenses noted by Hall (1980) to influence operating costs were labor expenses, and the size of the operation, especially if there are economies of scale in purchasing, management, finances, etc.

3.4.3 Quality differences

Most foods, with the exception of fresh meats, fresh fruits, and the majority of fresh vegetables, are sold under brand names. The rivalry between products sold under manufacturers' labels and products sold under retailers' labels has implications for retail food prices, product

innovation and market structure. Many studies have confirmed the fact that buying private labeled products translates to savings on a predetermined market basket total. Savings on individual items have been found to range from 1.7% for a 32 ounce can of coffee to 77.1% on baby powder (Handy, 1985, p. 14).

Manufacturers' brands are generally national or regional in nature. They are heavily advertised and/or promoted by the manufacturer on a large scale basis. The distribution of manufacturers' brands is extensive. They imply a higher level of quality.

On the other hand, private labels are the distributors' brands. The merchandise is packaged mainly to a distributor's specifications, either by the distributor or a small manufacturer (Handy and Padberg, 1971) for resale only by the requesting distributor, under its house label. The quality of these products are considered by many as standard quality equivalents of the national brands at an economical price. It has been suggested that since firms are cognizant of their consumers' aversion to radically different goods, any interbrand differences (in quality, package, size, etc.) are only incremental in nature (Pagberg and Westgren, 1979).

McCartney (1980) tested the relationship between price and quality of distributors' and manufacturers' brands. Food quality was classified into two broad categories: subjective or sensory attributes, and objective attributes. After determining brand price differences for a number of processed foods, McCartney tested for any significant interbrand sensory differences. She found a clear difference in brand sensory preferences for only half of the products tasted.

3.4.4 Firm characteristics

Store size has been examined with respect to prices and in general, studies have shown negative relationships between price and store size. Variables used to measure size have included: 1) annual store sales (Donaldson and Strangways, 1973; Hall, 1981); 2) selling area in square yards and feet (Campbell and Chisholm, 1971; Parker, 1974); 3) number of full and parttime employees (Parker, 1974 and O'Farrell and Poole, 1972); and 4) the number of cash registers (Hall,1981).

Hall (1981) looked at size of the operation as an expense influencing operation cost. At the store level he used total sales as a proxy for price. However, because the cost of goods sold affects total sales, the number of cash registers was used as the size variable for chain-affiliated

grocers. He found that the average number of cash registers increased as the income of the neighborhood rises and decreases as the percent of black and elderly residents increase. Hall (1981) looked at two price equations, one included branded items, the other used the lower priced alternative to the branded items. He found that store size was the best predictor of relative differences in store and product characteristics. Cost decreases associated with increased store sizes had a consistent impact on consumer choices (consumers were able to buy the larger sized items or the same size at a savings). Cost decreases associated with lower crime rates and affiliation with a supermarket chain of any size, are associated with better price offerings for the low priced items as well as the brand name products. Hall's (1981) estimates of the effect of these cost factors on consumption choice sets are consistent in predicting that prices will be lower and selection will be larger where costs are lower (implying larger stores and higher income neighborhoods).

Donaldson and Strangways (1973) did not find such a relationship. They asked, "Can ghetto grocers price competitively and make a profit?" Although the primary focus of their study concentrated on the profitability of these food stores, annual sales were analyzed with respect

to store size. The study (conducted in a predominately Black city) surveyed prices offered by large chain stores, independent stores and a smaller four-unit chain operating in the low-income section of the city. They found prices to be lower in the smaller chain operation than all but one larger chain.

However, when using physical size as the size variable, researchers have found a significant negative relationship between store size and price (Campbell and Chisholm, 1971; Parker, 1974).

Campbell and Chisholm (1971) used a multiple regression model to express price as a function of store size and some other variables. Size was measured in square yards, which was established to be highly correlated to organizational structure (chain or independent). Both size and organizational structure were related to price. As the size of the food store increased prices decreased and if the store was associated with a chain operation rather than operated independently, prices were lower.

Additionally, Parker (1974) found a negative relationship when using square footage. When the number of employees was included in the model, his results were further enhanced. He found the largest stores were significantly cheaper than the middle-sized stores and the

middle-sized firms were significantly cheaper than the smallest stores.

When incorporating full-time and part-time employees as the size variable O'Farrell and Poole (1972) found a pattern of prices increasing systematically with decreasing store size, but none of the relationships was statistically significant.

An interesting concept addressed by Kunreuther (1973) was the effect store size had on price differences for individual items. If the price per ounce for any give package size varies inversely with the size of the store, then those who shop in chains pay less for identical items than those patronizing smaller grocers. In his analysis, Kunreuther (1973) found building size to be negatively related to price.

Other studies have examined such firm characteristics as the location of the store within the city (central, suburban, or rural) and the number of services offered with respect to price differentials. For reasons similar to those found in the theory of agglomeration, firms located in the center of the city (inner city) are typically associated with lower prices. However, studies which measure the relative importance of distance to central city have been inconclusive.

Campbell and Chisholm (1970) hypothesized that shops located in the central area are more accessible to the entire population, than those in the suburbs, with potentially more customers, thereby enabling them to charge lower prices. They found a degree of confirmation resulting from the fact that it is the large chain operations which are mainly located in the central area. In contrast, Ambrose (1979) and O'Farrell and Poole (1972) concluded that grocery prices faced by the urban (inner city) poor are not significantly greater than prices in the suburbs.

Services offered by the grocer are typically considered when exploring the relationship between costs and prices in food retailing. Kunreuther (1973) suggested that price differentials may exist between large and small stores in part because the services provided to patrons are not identical. However, empirical evidence has confirmed that the larger the store, the more services offered (Hall, 1974).

3.4.5 Competition level

Since most firms operate in a spatial environment, distance is translated into transportation costs, thereby increasing prices to those consumers furthest from the grocery store. Spatial distances have been found to be important in purchases which require frequent shopping trips

and where product differentiation is relatively low (Grispsrud and Gronhaug, 1977), as with grocery stores. If transportation costs were zero, there would be no protection from spatially separated rivals, and perfect competition would prevail (Capozza & Van Order, 1978). Recent research on the theory of the firm has incorporated a spatial dimension into the design and analysis of price data, and some have argued that in a spatial context many of the conclusions of classical price theory are reversed.

Benson and Faminow (1985) developed a model of spatial competition to better understand the pricing mechanism of food retailing firms operating in a spatial environment. Counterintuitive to conclusions of the traditional spaceless model they found that as firms enter the market, prices increase. To illustrate, Benson and Faminow assume initially that a single retail food store is located at point A in Figure 3.2. This firm is selling to spatially dispersed consumers located along the line AB who must pay full prices consisting of the firm's prices plus delivery cost to their location. Each consumer has an identical linear demand given by

$$P = a - bq \qquad (1)$$

where P = delivered price (firm's price plus delivery cost to the consumer's location), q represents an individual

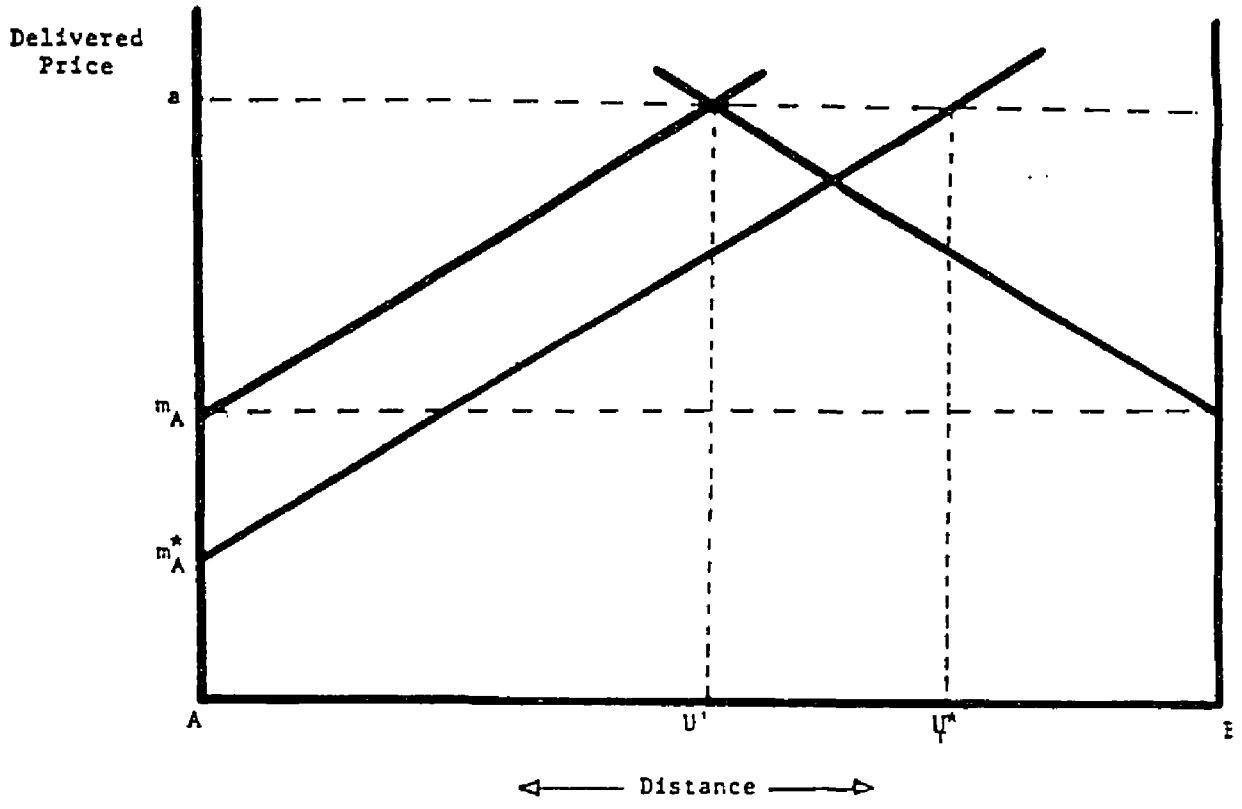
consumer's quantity demanded, and a and b, constant parameters. The full or delivered price (P) paid by consumers along U (distance) implies that the effective demand is

$$P = m + tu = a - bq \qquad (2)$$

where m is the firm's price, t represents transport cost per unit of distance. Furthermore, m_A is the price set by a spatially competitive firm, with a service area of AU'; m_A* is the price set by a spatial monopoly, with a service area of AU*.

Benson and Faminow then assume a second firm locates at point B (Figure 3.2) to compete for the consumers between A and B. As a consequence of entry, Firm A's service area is reduced. In a spatial market, a reduction in ownership concentration can lead to higher mill (delivered price less transportation costs) prices, even though average full prices may fall. The aggregate demand decreases at each price as a firm loses its most distant customers, with a resulting increase in price. The authors described two reasons for the price hikes. First, additional consumers (an increase in effective demand) are being served with the entry of B (those between U* and B in Figure 3.2) and secondly, many customers (those who shifted patronage) pay lower delivery costs than before. The authors, therefore,

Figure 3.2
Model of Spatial Competition



concluded that an increase in spatially dispersed sellers increased both supply and demand, so price may rise with entry and reduced concentration in the market.

Using a location theory approach, Hay and Johnston (1980) developed a theoretical model which assumes that the primary goal of the entrepreneur is to maximize product turnover.

The consumer's budget constraint was described as:

$$B = G + T + O \qquad (3)$$

where G = expenditures on groceries, T = expenditures on travel to the grocery store, and O = expenditures on other goods. B = the consumer's total budget.

Hay and Johnston assume that expenditures can shift between G + T, but not between (G + T) and O. Travel cost to the grocery store is paid from the grocery component. This implies that if the consumer travels to the nearest establishment she or he can minimize the travel cost, unless costs of travel to a more distant store are countered by a savings in the cost of G. Additionally, according to Hay and Johnston if there are two grocery stores (A and B), where A is located in a sizable mall, and B occupies a freestanding isolated site, when a customer visits A, the customer can also visit adjacent establishments at no additional travel cost. By visiting store B, extra travel

cost will be incurred to visit any additional establishment. In effect this makes shopping at store A (as well as other stores located within the shopping center) cheaper than shopping at the alternative store. Thus establishments benefit from consolidation of shopping trips. Hay and Johnston suggested that if an establishment benefits from agglomeration economies (from a more favorable location) it can then capitalize on the economies by raising prices. However, consumers would still have only G + T to spend and higher prices would mean fewer goods purchasedfor the same volume of goods. Any increases in price would, therefore, be illogical (Hay and Johnston, 1980).

This suggests that freestanding establishments might be cheaper, but it has been argued that relatively isolated stores' prices should higher because of what is often termed "spatial monolopy." Indeed, Hay and Johnson found higher prices in the isolated stores.

Campbell and Chisholm (1971) used the size of the shopping center as a measure of competition between grocery stores. The size of the shopping center was defined as the number of firms within the center, whether food stores or not. Although not as highly correlated as such variables as store size and organizational structure, they did show that

as the number of stores within the center increased, prices were negatively affected.

In contrast to Campbell and Chisholm (1971), O'Farrel and Poole (1972) looked at intracity variations. They defined center size as the size of the town (village) in which the food store is located. Using two different measures of competition level, village population and the number of competing grocery stores, they found that neither population size nor number of stores significantly influenced grocery store prices.

Nelson (1983) asked the question, "How much does the cost of a market basket vary by location and kind of supermarket where it was purchased?" (p.1). He contended (like Hay and Johnston, 1980) that 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 charge slightly higher prices. Therefore, a variable was included to measure the immediate market competition. Presumably supermarkets without immediate competition will price differently than those with numerous close rivals. He found that prices decreased as the number of close rivals increased.

Parker (1974) hypothesized that stores located in different size shopping centers would have significantly

different prices. To test the effects of center size on food prices, he classified each of his stores as belonging to one of three categories: a planned shopping center, adjacent to other shops, and isolated shops. He found that stores in planned centers were cheaper than other stores, and stores adjacent to other shops were had lower prices than isolated grocery stores. Parker admitted that the relationship he found may mainly reflect the fact that supermarket chains are the primary type of grocery stores located in planned shopping centers. He suggested that the high costs associated with planned shopping centers are not passed on to customers. Higher prices in food stores located in isolated locations led Parker (1974) to the same conclusion reached by Hay and Johnston (1980), that these firms enjoy a degree of monopoly power.

3.4.6 Neighborhood Characteristics

During the late sixties and seventies many studies were conducted which explored food price differentials between neighborhoods. The studies (Donaldson and Strangways, 1973; Goodman, 1968; Kunreuther, 1973; NCFM #10, 1966; Sexton, 1971) considered characteristics in localized markets that were political in nature. They accompanied community concern over the equity in price and quality of food items available to specific populations, such as blacks

and others with low incomes. Although these studies looked at neighborhood characteristics and ethnicity, the high correlation between ethnicity and income resulted in the usage of income levels as the common measure of neighborhood and ethnic characteristics. Results have been very mixed.

Goodman (1968) examined the question, "Do the poor pay more?" The answer was unequivocally, no! He found that 92% of those surveyed in the low income neighborhoods used the public transportation system or borrowed a relative's or friend's car to do their weekly (monthly) grocery shopping at the larger chain operations. Thus, low income consumers used the high priced convenience and small independent stores primarily as supplementary sources of emergency items. Goodman (1968), therefore, concluded that low income neighborhoods are not faced with inferior choices or high prices, because when consumers perceived prices to be higher in their neighborhoods, they shopped elsewhere.

In contrast, Kurenther's (1973) survey concluded that more than 60% of low income families actually do their primary shopping in the small neighborhood stores. He contends that low income families are more limited in mobility than middle income families and are more prone to shop in stores close to their homes. He found the average distance traveled to the food store for the low income

family was 1.9 miles, while middle income families will travel an average of 3.9 miles.

Sexton (1970) looked at ethnicity. He found that on average, whites living in white sections of Chicago paid 1% more than whites in the suburbs, and that blacks living in black sections of Chicago also paid 1% more than whites in the white sections of Chicago. Later Sexton (1971) examined 15 studies in differing cities, of which only five found consumers in black and/or low income neighborhoods paid more for food prices than those in neighborhoods with average or higher incomes.

Donaldson and Strangways (1973), also used ethnicity to determine causes of price differences and produced results contrary to Sexton's (1971). They defined low income and/or ghetto neighborhoods as those with average family incomes of $5,000 or less. The authors hypothesized that the purchasing patterns of the poor, predominately black, neighborhoods enable the ghetto chain to earn higher profits through higher prices than those in nonghetto stores. However, their results showed lower prices in smaller stores than in chains operating in black neighborhoods.

A few other researchers who have examined the relationship between food prices and neighborhood

characteristics, concentrated solely on mean income levels (Campbell and Chisholm, 1971; Alcaly and Klevorick, 1971; Nelson, 1983; and Parker, 1974). Mean neighborhood income levels are easily attainable. In general, studies looking at income levels as the distinguishing factor for neighborhood differences find no relationship between income and food prices. In contrast, those exploring ethnicity (as an implicit measure of income) have been inconclusive (Hall, 1981; Donaldson and Strangways, 1973).

Campbell and Chisholm (1971) categorized their neighborhoods on the basis of the social status (based on income) of the residents in a given neighborhood. The categories were: working class, middle class, mixed and non-residential. A multiple regression model was utilized to assess the relative importance of the defined explanatory variables to the total price of a predetermined basket of goods. They found that the social status of the area in which the shop operated was statistically insignificant.

Alcaly and Klevorick (1980) found that rarely does the price of a commodity increase as the median family income of the neighborhood decreases. However, for such commodities as corn flakes and chuck steak, statistically significant negative relationships were found in independent stores. As a result, the authors conclude that while most

individual commodity prices appear to remain unchanged or to rise as neighborhood incomes rise, this does not imply that the price for a weekly (or monthly) market basket, taken as a single unit, rises as income rises.

Nelson (1983) conducted an intra-city study in which he looked at neighborhood income levels and prices to determine if low income households pay higher prices for the same foods than do higher income households. His 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. However, no statistically significant differences in pricing practices were found among establishments of multiunit firms (chains), located in high and low income areas.

Other neighborhood characteristics such as education level, number of children, age, and population density all may have implications for the determination of price, yet have rarely been included as factors describing socioeconomic status in studies of food pricing.

Improving over previous studies, Hall (1980) looked at both economic and social characteristics of residents across neighborhoods. He studied at the relationship

between price and such characteristics as ethnicity and age. The degree of residential segregation of blacks and elderly populations were represented by the percentage of black and elderly in those neighborhoods. He also used income as an indicator of economic status, but unlike most studies, he (Hall, 1980) measured income on a per capita basis, and found prices were not higher in low income areas. Interestingly, he did find that prices were higher in black and elderly neighborhoods. Since the elderly and blacks are disproportionately faced with lower incomes, Hall's (1980) results lead one to question income as an appropriate measure if it is isolated from effects of ethnicity or age.

3.4.7 Time Considerations

The USDA conducted a number of studies in many cities throughout the United States during the 1960's which asked the question: "Do retail food firms raise prices during the week (or weeks) that food stamps are issued and lower prices during the remainder of the month?" However, because the USDA study looked at supermarkets only, the results were questionable. This is because low income areas (with higher ratios of food stamps to sales) are serviced primarily by independent stores with higher prices than chain stores.

Upon discovering a statistically negatively significant relationship between price and income, Alcaly and Klevorick (1971) offer as a possible explanation for higher prices the notion of whether food stores in poor areas raise prices on the days when food stamps and welfare checks are issued. However, they did not test this hypothesis.

More recently, Carman and Figueroa (1988) noted that supermarket managers are very familiar with the changing effective demand for grocery items related to nearness to payday. The authors analyzed the extent of weekly sales variations for 10 northern California supermarkets. Controlling for the level of income flows of store customers, they concluded that changing effective demand leads the firm to increase prices as the weeks progress toward the end of the month.

It was hypothesized that differences in sales variability between stores could be explained by differences in the level of income flows of the store's customers. If sales respond to effective demand which decreases through the month as the amount of monthly income left to spend decreases, then we would expect sales variability to be an inverse function of customer incomes. Information received from the major newspaper, provided the authors with data

concerning worker paydays. It was found that family assistance payments and food stamps were disbursed on the first of the month. An additional two-thirds of the city's work force was paid on the first or last of the month, and some estimated 15% of the workers received bi-monthly paychecks, resulting in a changing demand for food over the month. Also, because farm and wholesale prices vary daily, supply as well as demand conditions may tend to offset or emphasize each other. Thus, comparatively stable or unstable prices may result.

Carman and Figueroa (1988) found that in stores where food stamps were important, total sales decreased from week 1 to week 2, increased from week 2 to week 3 and decreased from week 3 to week 4, with week 1 accounting for the highest sales of the month and week 4 the lowest. They also found that week 3 contained the highest number of price specials (lowest prices) over the month.

Carman & Figeroa (1988) did not measure elasticities, however, they asserted that one would not be surprised to find a more price elastic demand (for meats at least) facing an individual store or chain, due primarily to the drawing power of specials. They suggested that the demand for all other grocery items is relatively price inelastic.

Holdren (1978) looked at the nature of competition, calculating cost (supply) and demand functions. Using computed elasticities of demand, Holdren (1978) found that as the store lowers its prices (or improved its offer) the demand became increasingly price elastic. He further found that elasticities varied widely from store to store.

CHAPTER FOUR

METHODS

4.1 The Conceptual Model

The conceptual model used in this study results from the schematic (as opposed to a quantitative) model of competitive behavior of food distributors developed by Handy and Padberg (1971). It focuses on the notion of functional specialization within differing substructures of the food distribution system.

Since the early 1960s, the roles of the food manufacturer and food distributor have intertwined, resulting in an ambiguous distinction of the two subsectors. In their model Handy and Padberg (1971) categorized the industry into two subsectors called the core manufacturers and the core distributors. Both seek to gain power through customer attention and patronage. The core manufacturers compete through product development (non-price competition) are usually diverse in their product offerings. Their emphasis is on improving the image and impact of their brands. Their products are typically distributed through small to medium-sized food stores (fringe distributors), enabling the fringe to carry a wide variety of more progressive items (e.g. salt free canned or packaged goods).

The core distributors (chains), on the other hand, have pre-retailing advantages in costs and efficiencies. They produce (or have a fringe manufacturer produce with the distributor's specifications) their own house branded items, which emphasize standard quality economically priced.

This specialization in separate functions, therefore avoids the direct competition between the distributing manufacturer and the manufacturing distributor, although their operations are clearly interchangeable. The flexibilities of the fringe distributor enable the fringe to compete more effectively. Its superior performance at the retail level reduces the cost advantages gained in pre-retailing by core distributors.

4.2 Sample Characteristics

Weekly prices on a fixed 37-item basket were surveyed in 23 Tucson and South Tucson grocery stores over a period of 16 weeks. Prices were collected every Thursday and Friday beginning the week of February 4, 1987 and ending the week of June 6, 1987. Three alternative market baskets were priced. One basket consisted of national brands only. The two additional baskets consisted of the equivalent-sized products distributed under: 1) the house or private label; and 2) the cheapest price alternative. Sometimes the

cheapest alternative was a national label and sometimes it was a house brand. This varied by the week.

4.2.1 Selection of Food Retailers

The population of grocery stores in Tucson (at the beginning of this study) consisted of 285 stores and through a process of elimination (described earlier) the sampling frame was restricted to 135 stores. To determine the number of stores to include into the sample a standard procedure ($n = [2\ Z\ \sigma/w]^2$, where n = the sample size, Z = the student t-distribution factor, σ = the estimated standard deviation, and w = the width of the interval) was employed. This method enhances the statistical significance when analyzing the data (Iman and Conover, 1983).

A map of the city was used to plot the exact locations of all stores included in the sampling frame (see Figure 2.2). The market area of each store was calculated by dividing the total area of Tucson proper by the number of stores in the sampling frame. Consequently, each store was defined to serve a market of 2.6 square miles. Utilizing a template measuring an area of 2.6 square miles, a square was drawn around individual, as well as clusters of grocery stores.

A stratified sample of twenty-three stores was drawn to represent different neighborhood characteristics and

competition levels. Each stratum was defined by the number of food stores within a given (2.6) square mile area, and was thus considered an implicit measure of the level of competition in that area. Effort was taken to depict different levels of competition throughout the city. Thus the selection process incorporated the level of competition and the location (the zone in which it operated) of the store. The stores were chosen based on the number of close rivals within a given square mile area, at different locations across the city. That is, if two grocery stores were the only food stores operating in a neighborhood on the east side of town, other neighborhoods were found where only two grocery stores were operating (within a 2.6 square mile area). Furthermore, if three firms were competing within the square mile area, attempts were made to include more than one zone (neighborhoods) where only three food stores were competing.

Table 4.1 describes and summarizes the strata. There are five strata. Stratum one stores operate with no close rivals within the market areas, stratum two stores have one close rival, stratum three stores compete with two close rivals, stratum four has three close rivals and stratum five stores are located near four or more close rivals.

Table 4.1
Classification and Locations of Sample Stores by Strata

Store No.	Number of Stratum	Zone	Close rivals
Store 14	1	4	0
Store 23	1	4	0
Store 12	2	4	1
Store 13	2	4	1
Store 19	2	5	1
Store 20	2	5	1
Store 21	2	5	1
Store 22	2	5	1
Store 9	3	4	2
Store 10	3	4	2
Store 11	3	4	2
Store 1	4	1	3
Store 2	4	1	3
Store 3	4	1	3
Store 4	4	1	3
Store 15	4	5	3
Store 16	4	5	3
Store 17	4	3	3
Store 18	4	3	3

4.2.2 Sample Description

Sample stores are described in Table 4.2. Four out of the five zones are represented in this study--Zones 1, 3, 4, and 5. There were no food stores in Zone 2 that clearly fit the criterion (described earlier) for selection.

General Description by Zone. Four stores from Zone 1 were included in this study (Table 4.2). These stores represent strata 3. That is, they each have three "close rivals" within a 2.6 square mile area. Also of importance is the fact that three of these supermarkets are located adjacent to each other, in relatively small shopping centers. The fourth unit is one mile away, but on the same arterial road.

Chain II (store 1) is the smallest sample store (in both physical size and services offered) operating in Zone 1. However, it has more cash registers (which is also used as a measure of size), than two of its three close rivals. Chain III (store 3) has the largest physical size, the most cash registers and offers a wide variety of services. However, it is located in a mid-sized (rather than a large) shopping center.

Four stores from Zone 3 were originally included in the sample, however, due to the limited number of house

Table 4.2
Sample Stores and Characteristics of Zones 1, 3, 4 & 5

Store Characteristics	Zone 1 (North)				Zone 3 (Central)							
	Store Number				Store Number							
	1	2	3	4	5	6	7	8	17	18	15	16
Number of close rivals	3	3	3	3	3	3	3	3	3	3	3	3
Number of cash registers	9	7	12	7	1	4	6	9	5	5	4	3
Square footage	4760	4928	7062	6650	676	2385	3496	5035	5129	2385	1620	1720
Shopping center size	31	17	17	22	2	7	9	13	5	6	6	0
Number of adjacent foodstores	3	0	3	3	0	0	1	0	0	0	0	0
Chain or Independent	CH	CH	CH	CH	IND	IND	CH	CH	CH	CH	IND	IND
Number of services offered	4	3	9	9	0	0	0	4	1	1	2	2

	Zone 4 (East)							Zone 5 (South)					
	Store Number							Store Number					
	9	10	11	12	13	14	23	15	16	19	20	21	22
Number of close rivals	2	2	2	1	1	0	0	3	3	1	1	1	1
Number of cash registers	8	7	7	7	10	8	9	4	3	8	9	7	3
Square footage	6020	6177	4473	3978	8064	4958	4284	1620	1700	4234	4760	5242	1378
Shopping center size	15	19	12	18	12	27	13	6	0	10	21	23	3
Number of adjacent foodstores	0	0	0	0	0	0	0	0	0	2	2	1	1
Chain or Independent	CH	CH	CH	CH	CH	CH	CH	CH	IND	IND	CH	CH	IND
Number of services offered	6	11	3	7	13	4	2	3	2	4	2	11	1

brands two of these stores were deleted from the study. Since four of the stores in this zone (including the two deleted) defined one strata, the analysis must be interpreted carefully.

Looking at Table 4.2, three main conclusions can be drawn: 1) in general, the stores operating in Zone 3 are smaller in physical size and in number of cash registers, than those in Zone 1; 2) services offered are substantially less than those offered in Zone 1; and 3) only one store had a food store directly adjacent to it, compared to 3 out of 4 stores that were directly adjacent to rivals in Zone 1.

The store with the largest physical size in Zone 3 was a warehouse type supermarket. It was located in one of the smallest shopping centers, and offered the fewest services. Chain stores in this zone offered relatively fewer services (than chains in other zones), but one independent store offered almost as many services as one of the largest chains.

Seven stores in the sample were selected from Zone 4 (Table 4.2). These were all chain stores; three were Chain II stores. The major distinction between all three Chain II stores pertains to the number of close rivals. One store had zero close rivals, one had one close rival, and one had two close rivals.

The largest store (in physical size) was located in the smallest shopping center. It had the greatest number of registers and offered the largest number of services. This store (Store 13) was over twice the physical size of Store 12, the smallest store in Zone 4. Both these stores have only one close rival -- each other.

Six stores from Zone 5 were included in the study (Table 4.2); three were independents, and three were chains. Independent stores range in size from 1,378 square feet to 1,700 square feet. On the other hand, the smallest chain had 4,234 square feet. In general, these stores were larger than those in Zone 3.

Stores 19 and 20 were close rivals and stores 21 and 22 were close rivals. The shopping center sizes differed substantially for the latter. Twenty-three shops were located in the same center as Store 21, whereas, three shops were in the same center as Store 22.

A third food store was adjacent to Stores 19 and 20. However, this was a small mom & pop store, which considered the local convenience stores in the neighborhood as its competitors as opposed to the supermarkets across the street.

Services offered by the sampled stores in Zone 5 were limited except in Store 21 (Chain I). This is a fairly

new operation with over 5,700 square feet of selling area (the largest in this zone), although Store 20 (Chain II) outnumbers it in cash registers. Store 21 was also the only Chain I store (possibly the only store) to house a portrait studio. It also had talking cash registers.

General Description by Chain Affiliation. In general, Chain I stores (Stores 4, 6, 10, and 21) are comparable to other chain in physical size only, but one Chain I store had the fewest cash registers of all the chains stores. One Chain I store (located in central Tucson) did not use laser scanning devices and was also the only Chain I unit without a salad bar or a delicatessen.

Chain II boasted a merchandising strategy which opened an additional register if more than three people were waiting in check-out lines. Therefore, they were equipped with seven to nine cash registers, a relatively large number, although the physical sizes of these stores were slightly smaller than those of Chain I stores. Chain II also offered more brands of each product than Chain I. During the course of the study, two units of Chain II were remodeled, and the variety departments were eliminated.

Two units of Chain III were included in the study. These units are larger than any other food store in Tucson. They also have more registers, with as many as 12 registers

at one unit. The sampled Chain III stores, offered more services than any other sampled store zone.

There were three Chain IV stores in the sample. In physical size, these units are similar to chain II stores, but smaller than Chain III stores.

Chain V is a "no frills" warehouse food store. After paying for the food items, customers bag the items themselves. The physical, brand and register sizes are all smaller than those of any other chain. The only service offered was fresh pizza. This store was usually busy on survey days.

Chain VI has four locations throughout the city, and one was included in this study. The physical size of this store is average, but it has a large number of registers -- more than any store in Chain I. Even with eight registers, check-out lines were very slow, however.

Independent I was formerly part of another chain. However, when that chain pulled its operations out of Tucson, two former employees reopened the store under the name of Ray's. Although this store was considered an independent retailer, it was affiliated with A. J. Bayless (Chain IV). This affiliation allowed Ray's the opportunity to integrate its supply; and thereby receive the same quantity discounts as Chain IV. The brand size and register

sizes are comparable to the smaller chains.

Independent II (Fair Mart) is located on Tucson's south side (Zone 5). It is the smallest store in physical size, with the fewest cash registers. This store offers only fresh meat; it does not handle pre-wrapped meats. Although this is a free-standing unit, there are other shops on the same corner. They are not connected like a mall, but are still considered a shopping center (for this study) with three other shops.

Independent III (United Market) is also located in Zone 5, and carries an unusually large number of ethnic foods and other items. It was about 20% larger than Independent II. It had four cash registers, but a very narrow selection of brands. It also had a small appliance department where stereos, televisions, blenders, etc., could be purchased on a lay-away plan. There was also a variety department were clothing accessories, pictures and toys are sold. This independent and Independent I were the only independent food stores offering prepared foods. The store was located in a small shopping center. The cashiers were very unfriendly, and sometimes rude to the regular customers.

Independent IV (El Grande), had a slightly smaller brand and register size than Independent III, but was

slightly larger in physical size. It was also located on the south side of Tucson, and freestanding. There were no stores of any kind (food or non-food) in the immediate vicinity.

4.3 Market Basket Composition

The composition of the market basket was developed over a period of three months. During this time, prices of weekly advertised specials (from the local newspapers) were recorded. Information received from Uhl, Boynton, and Blake (1981) as well as the Division of Economic and Business Research (1980) was also used to guide the selection of individual grocery items.

4.3.1 Selection of Market Basket Items

The market basket developed by Uhl, Boynton, and Blake (1981) was used as a model for selecting the contents of this study's market basket. The Uhl et al. basket was based on the authors' judgments about foods that fulfilled certain nutritional needs and other subjective criteria. The national brand names included in their study were of paramount importance to the final determination of brand names used in this study.

Information provided by the Division of Economic and Business Research (DEBR, 1980) was also considered in defining the market basket. DEBR listed 117 food items

required by a hypothetical Tucson family to fulfill nutritional and caloric needs. This list was based neither on actual consumption patterns nor nutritional analysis, but rather, the items reflected a collective judgment of families when asked about foods they felt were necessary and desirable. Although brand names were not disclosed, the product categories were beneficial in developing the basket for this study. Because of this information such food items as bacon, canned tuna, and corn flakes were also incorporated into the basket. Items typically consumed in southwestern cities such as refried beans, picante sauce and tortillas were incorporated through the DEBR (1980) survey.

In addition to the Uhl et al. (1981) and DEBR (1980) market basket criteria, price and brand availability data were also collected for three months prior to making the final definition of the basket. During this time, prices of weekly advertised specials from both local newspapers were recorded. This information provided the brand names carried by each store, as well as names of those items with the most price movement. Such items as coffee and bologna were also incorporated into the market basket based on the frequency with which they were advertised. Instore visits were made until a final basket was constructed to insure each brand was carried by all stores.

Consequently, the initial market basket for this study consisted of products of predetermined sizes and brands for the following of six categories: 1) cereal and bakery; 2) meats and poultry; 3) dairy and eggs; 4) canned and packaged; 5) fresh produce; and 6) non-food items (Appendix B).

4.3.2 Brand Choice and Missing Values

Basket items were stocked inconsistently from week-to-week by individual stores. This was especially a problem for the independent stores. Because 18 national brands were available at every store throughout the entire survey period the final market basket consisted of only 18 items. The price recorded for the cheapest equivalently sized item could have been for any brand.

Although the national brand items were usually available, on occasion the price for specific items was not. This problem was greater for house than name brands. Some items' prices were not available because the item was on sale and the stock was exhausted, or the store did not stock that particular item that week. Missing values also occurred due to the visual pricing policies of some stores. Since most merchandise is coded and scanned for prices, some stores did not display prices of certain items. The only

way to obtain prices in this case would have been to wait in the check-out line and have the item scanned for its price.

A three-step process was used to eliminate missing data. First, obvious prices were filled in. That is, if an item had consistently been the same price, that price was used as the proxy for the missing value. Secondly, two stores were eliminated because they carried a very limited (1-3 products) selection of house brands. The final step involved the calculation of the proxy. Proxies for missing items were calculated as a percent of the market basket total from the previous week.

4.4 Definition of Variables and Expected Signs

For purposes of this study, the most important factors considered to affect prices include: the store characteristics (i.e. size, location, and services offered), the competitive level of the food store (i.e. the number of food stores operating within a given market area and the number of shops operating within a shopping center), the characteristics of the people within the neighborhood, and the week of the month. Table 4.3 summarizes the variables used, how they were measured and their expected relationships to price (indicated by sign).

4.4.1 Firm Characteristics

"Are prices in smaller grocery stores higher than those in the larger food stores?" This is the first question posed in this study. Typically, as the size of the retail unit and scale of operation become larger, certain economies of scale are realized, resulting in a reduction of costs for the retailer, implying an association between size and efficiency. Ultimately, these cost reductions may put pressure on firms to increase the size of their operations (Padberg, 1968), but the reduction in costs should still be reflected in lower prices in the larger stores than in the smaller stores.

Here, store size was initially measured in three ways: 1) the number of cash registers available in the store (REGSIZE), 2) the square footage of the selling area (PHYSIZE), and 3) the number of services offered (SERVICES). In-store visits were made to measure the size of the selling area and to count cash registers within the store. Services offered per store were noted on survey days and counted at the end of the survey.

4.4.2 Competition Level

Retail trade is the most important and common central place activity. Therefore, central place theory provides a good framework for analyzing retail food markets.

Central place theory encompasses ideas concerning consumer and business behavior and defines the locational balance to be expected for a set of competing retail units. The theory also asserts that activities will group into a central place (shopping centers as well as center city) for spatial efficiencies. This implies that spatial distances between firms will influence the level of competition between firms, which provides one of the theoretical bases for agglomeration of shops in centers as opposed to freestanding units.

According to spatial price theory firms locate close to one another in an attempt to maximize the number of potential customers. And through agglomeration firms are able to maximize their potential number of customers. However, as the number of firms (of the same kind) within the immediate area increase prices tend to increase. The more firms clustered together the more information demanded by consumers, which decreases the uncertainty of price responses by close rivals, thereby increasing price.

However in spaceless economics lower prices are predicted as a result of agglomeration. The increased competition increases both supply and demand, and in the long run prices should fall.

Central place theory also includes central location in relation to the rest of the city. The ideal of a central

area refers to the distribution of customers, and stores that locate within a shopping center (which draws huge crowds) or center city (which is typically the most populated section of the city) are able to maximize the availability of their services with as many customers as possible. Dense populations attract more and larger supermarkets and when a number of supermarkets locate side by side each is able to capture a larger portion of the market. This larger portion of the market prompts sellers located close to each other to increase output, causing prices to fall. It is therefore posited that stores located in center city or in larger shopping centers offer lower food prices.

Three measures of competition were defined. To analyze the effect of agglomeration, the number of shops (of all kinds) located within the grocery store's shopping center were counted. Thus NUMSHOP refers to the size of the shopping center in which the store is located. The number of shops located in the same mall as the sample store ranged from one shop (isolated grocery) to 31 individual shops.

The second measure of competition measured the competitive level of food stores within a short distance of each other. This variable was defined as RIVALS and represented a count of all sample-frame food stores within a

given square mile area.

The third competition indicator focused on the ability of firms within the center of the city to capitalize on the location of the store to increase their customer patronage. Store location with respect to the center of the city was considered an important store characteristic which affected the prices offered a given store. CENTRAL was indicated with dummy variables. Stores located in the center of the city (Zone 3) were given a value of 1, and those not operating in Zone 3 were denoted with a zero.

4.4.3 Neighborhood Characteristics

Given the nature of competition within the food retailing industry (local in nature), the primary objective when looking at neighborhood characteristics is to determine the extent of price discrimination based on specific sociodemographic differences between market areas. The neighborhood was defined as the census tract in which the store operated.

Studies have been conducted which have renounced the relevance of cost differences between chain and independent food retailing operations (Hall, 1981), suggesting that the systematic price variations are due primarily to ignorance in the market place. Consumers of different income levels, ages, ethnicity, and education vary in the amount of search

(therefore, information) put into food purchases (Ambrose 1979).

Since the literature is ambiguous about whether neighborhood demographics contribute to intra-city or inter-store price variations, and about which attributes are the best indicators, the following characteristics were evaluated: 1) income; 2) number on family assistance; 3) age; 4) population density; 5) ethnicity; and 6) education level.

Two measures of income were used in this study. Initially, income was measured as the median income within the census tract in which the grocery store was located and defined as INCOME. The other measure counted the number of families using food stamps within the neighborhood (STAMPS).

Age statistics for Tucson's population were obtained from Tucson census data gathered in 1980. The proportions of adults over 65 years of age (ELDERLY) and children under 19 (YOUNG) within the census tract were used as the age variables.

Ethnicity (ETHNIC) was measured by the percentage of non-whites within a census tract. The numbers of Black Americans, Asian Americans, Native Americans, and Hispanics were combined and calculated as a percent of the population.

Table 4.3
Definition of Variables

SYMBOL	DEFINITION	EXPECTED SIGN	SOURCE
Dependent Variables			
BRAND1	Total price of the national brand market basket averaged over 16 weeks in 1987		In-store visits
BRAND2	Total price of the house brand market basket averaged over 16 weeks in 1987		In-store visits
BRAND3	Total price of the cheapest brand market basket averaged over 16 weeks in 1987		In-store visits
$WEEK_i$	Price of market baskets, aggregated by week, where i = 1, 2, or 3 for the three BRANDS		In-store visits
Independent Variables			
A. FIRM CHARACTERISTICS			
PHYSIZE	Measures the actual selling area of the store, expressed in square feet	-	In-store visits
REGSIZE	Measures the size of the store by counting the number of cash registers in the store	-	In-store visits
SERVICES	Measures the number of services offered per store; interval measure counting where number of services were counted	-	In-store visits
B. COMPETITION LEVEL			
NUMSHOP	The number of shops (of all kinds) located within the shopping center housing the grocery store	-	shop-ping center visits

Table 4.3 (continued)
Definition of Variables

SYMBOL	DEFINITION	EXPECTED SIGN	SOURCE
RIVALS	The number of grocery stores within a 2.6 mile area. It is measured on a 4-point scale, where 0 = no close rivals, 1 = 1 close rival, 2 = 2 close rivals, 3 = 3 close rivals, and 4 = 4 or more close rivals.	-	Tucson Metro map 1986
CENTRAL	Defines the Central Metropolitan Tucson Zone as 1, and non-central zones as 0.	-	(Tucson Trends, 1986)
C. NEIGHBORHOOD DEMOGRAPHICS			
INCOME	A continuous variable equal to the average income of the census tract in which the store operated	-	1980 Tucson Census
STAMPS	Defines the number of families receiving food stamps per zone	+	Tom Brooks DES
ELDERLY	Defines the proportion of persons over 64 years old within a neighborhood. Measured as a percent of the population within the census tract in which the food store is operating.	+	1980 Tucson Census
YOUNG	Defines the proportion of population who were children less than 18 years of age within a store's census tract	+	1980 Tucson Census
POP	Defines the population density of the zone in which the food store operates. It is measured as a population density-specific dummy variable for three different levels of density; 0 = 0-3 people per acre, 1 = 4-7 people per acre and 2 = 8-11 people per acre.	-	1985 Special Pima County census

Table 4.3 (continued)
Definition of Variables

SYMBOL	DEFINITION	EXPECTED SIGN	SOURCE
ETHNIC	The percentage of non-white persons in the census tract in which the store operated.	+	1985 Special Pima County census
SCHOOL	The percentage of individuals in the food store's zone who have not completed high school.	+	1980 Tucson census

4.5 Statistical Analysis and Model

Initial analysis involved the examination of average prices. Stores were grouped and averaged according to the zone in which they operated, the number of close rivals within the area, their chain affiliation and their weekly basket totals. T-tests were then performed, by BRAND, to determine whether the prices differed by zones, rivals, chain affiliation or week.

Secondly, the price variations were analyzed over time. Indices were computed as relative prices to compare each store's variations with respect to the zone averages, the strata averages, the chain averages, and weekly

averages. For example, all stores in Zone 1 were averaged and individual stores were represented as a percent of the Zone 1 average. These indices were then graphed to show weekly variations from the zone mean.

Regression analysis was used to determine the effects of three major characteristics on the price of the national brand market basket. The conceptual model tested was:

$$BRAND_i = f(\text{firm characteristics, competition level, neighborhood demographics}) \quad (4)$$

where $BRAND_i$ equals the average price of the market basket; i = BRANDs; firm characteristics include such variables as PHYSIZE, REGSIZE, CENTRAL, and SERVICES; competition level describes such variables as NUMSHOP and RIVALS; and neighborhood demographics are characterized by INCOME, POP, ELDERLY, YOUNG, ETHNIC, SCHOOL, and STAMPS.

Scatter plots and simple correlation analyses were used in preliminary analyses to disclose the degree of collinearity among the independent variables. The following pairs of independent variables were found to be highly correlated: (INCOME) and (SCHOOL); (SCHOOL) and (YOUNG); (INCOME) and (ETHNIC); and (RIVALS) and (PHYSIZE). To further explore the collinearity, each independent variable was regressed on the others, which showed that many of the

variables were in fact, highly correlated.

Because the variables were conceptually congruent, factor analysis was performed as an initial method of managing the multicollinearity problem. Using a SAS/STAT multivariate procedure, factor analysis with rotation was performed. However, there was insufficient structure to complete the analysis. This inability to effectively combine common factors led to the abandonment of this technique.

An alternative method was used to address the multi-collinearity in store size and neighborhood characteristics measures. Because there was no conceptual basis to differentiate between the variables which were implicitly measuring the same concept, initially a series of regression equations were estimated for each of the 3 major characteristics. Like variables were used separately in the regression analysis to determine which variable was the better measure. In other words, one variable was excluded from the first equation but a second (or third) equation which include only the second (or third) variable was also estimated. Four series of equations were estimated. The final equation included the variables retained from the previous three equations.

To determine the effects of the time of the month on grocery prices, the conceptual multiple regression model was

$$PRICE = f(WEEK1, WEEK2, WEEK3, WEEK4, WEEK5) \quad (5)$$

where PRICE = prices of the national, house, and cheapest brands averaged over stores, and $WEEK_i$ is a week specific-dummy variable which indicates the week of the month.

Least squares was used to estimate these regression equations. Regression equation 2 was estimated twice, first omitting WEEK1 and secondly omitting WEEK2.

CHAPTER FIVE

EMPIRICAL RESULTS

5.1 Summary of Sample and Variables

A general description of the continuous variables in the sample is presented in Table 5.1. Summary statistics (means, standard deviations, and maximum and minimum values) are presented for all variables. Table 5.2 gives the frequencies of the categorical variables.

5.1.1 Sample Statistics

As expected, the mean price of the national-brand basket (BRAND1) was highest (Table 5.1). Furthermore, the mean price of BRAND2 (the house brand) was higher than the price of the cheapest market basket (BRAND3). The average brand differential between BRAND1 and BRAND2 was $5.32, and $6.24 between BRAND1 and BRAND3. The average brand difference between BRAND2 and BRAND3 was only $.91. These interbrand differences are statistically significant ($p \leq .01$).

The average selling area (PHYSIZE) of the food stores sampled was 4,612 square feet. They offered an average of 5 services and contained 7 cash registers (REGSIZE). On average, 14 other shops also operated in the shopping center with each of the sample food stores. Each store had an average of two close rivals.

Table 5.1
Summary Statistics of All Variables

VARIABLE NAME	MEAN[ab]	STANDARD DEVIATION	MAXIMUM	MINIMUM
DEPENDENT VARIABLES				
BRAND1	$28.34[a]*	1.70	$32.50	$26.42
BRAND2	23.02*	1.07	24.79	20.34
BRAND3	22.11[b]*	1.48	24.52	17.74
INDEPENDENT VARIABLES				
PHYSIZE	4,612 ft^2	1778	1,378 ft^2	8,064ft^2
SERVICES	4.95	3.69	13	0
REGSIZE	7	2	12	3
NUMSHOP	14	8	1	0
RIVALS	2	1.09	4	0
CENTRAL	.190	.402	1	0
POP1	.476	.512	1	0
POP2	.333	.483	1	0
ELDERLY	17.5%	.128	64%	8%
YOUNG	24.7%	.091	37%	3%
ETHNIC	33.5%	.30	87%	2%
SCHOOL	26.7%	.165	72%	9%
INCOME	$17,553	5886	$29,359	$10,180
STAMPS	2.429	1.121	4	1

[a] highest priced market basket
[b] lowest priced market basket
* statistically significant ($p \leq .01$)

Table 5.2
Categorical Variables and Frequencies

VARIABLE	VALUE	FREQUENCY	PERCENT
Central			
Center City zone	1	4	19.0%
Non-center city zones	0	17	81.0%
Total		21	100.0%
Population Density			
Pop1	1	10	47.6%
Non-Pop1	0	11	52.4%
Total		21	100.0%
Pop2	1	7	33.3%
Non-Pop2	0	14	66.7%
Total		21	100.0%

Table 5.3
Zone Frequencies and Percentages

VARIABLE	FREQUENCY	PERCENT
Zone 1	4	19.0%
Zone 3	4	19.0%
Zone 4	7	34.0%
Zone 5	4	19.0%
Total	21	100.0%

Table 5.4
Strata Frequencies and Percentages

VARIABLE	FREQUENCY	PERCENT
Strata 1	2	9.5%
Strata 2	6	28.6%
Strata 3	3	14.3%
Strata 4	8	38.1%
Strata 5	2	9.5%
Total	21	100.0%

5.2 Description of Price Variations

The first major question to be addressed focuses on the extent of price dispersion across the city. "Do market basket prices differ among selected major grocery stores operating in Tucson, Arizona?" Several specific questions were examined in conjunction with this major concern. To answer these questions, weekly as well as average prices were analyzed with graphs and t-tests. Average market basket totals were examined across: 1) geographic zones; 2) strata (number of close rivals); 3) chain affiliation (if any); and 4) time. They were analyzed from both the industry and the firm levels. The industry analyses utilized summary statistics to describe the fundamental spatial price variations found in food stores throughout Tucson.

Secondary analyses scrutinized pricing patterns at the firm level. Weekly prices for each store were examined with respect to the localized market in which it operated. That is, in addition to comparing the average prices for each zone with the other zones, stores within the same zone were also examined for patterns. Strata were analyzed the same way. First, the average price of each stratum was viewed to detect any differences between prices based on the number of close rivals. Then weekly store prices within a given

stratum were analyzed. Chain affiliation and variations over time were also analyzed.

5.2.1 Prices With Respect To Geographic Zones

Analyzing average food prices with respect to the geographic zone in which the store operated produced the following results.

Comparisons between Zones. Differences in the average price of each market basket (per zone) were analyzed with t-tests to compare the mean value for each zone with the mean prices of other zones. The appropriate statistical model and the degrees of freedom to use for the t-tests were based on three important critera: 1) whether there was a non-zero correlation between the two populations; 2) whether the variances of the two populations were homogeneous; and 3) whether there was an equal number of subjects in each sample. Since the samples were uncorrelated, the selection of the t-model centered around the second and third criteria. The separate variance model

$$t = \frac{X_1 - X_2}{\sqrt{\frac{S^2_1}{n_1} + \frac{S^2_2}{n_2}}} \qquad (6)$$

was used. The degrees of freedom were contingent upon the equivalence of n_1 and n_2, as well as the homogeneity of S^2_1 and S^2_2. When $n_1 = n_2$ and $S^2_1 = S^2_2$ the degrees of freedom

equal $n_1 - 1$ or $n_2 - 1$. However, when $n_1 \neq n_2$ and $S^2_1 \neq S^2_2$ the degrees of freedom are the average of a) $n_1 - 1$ and b) $n_2 - 1$.

To determine if the variances (mean squares) were homogeneous F-ratios were calculated. The formula used was:

$$F = \frac{S_g^2}{S_l^2} \qquad (7)$$

where F = the value by which variance homogeneity will be tested, S_g^2 = the greater (larger) sample variance and S_l^2 = the lesser sample variance, with degrees of freedom equal to $n - 1$.

Table 5.5 shows that Zone 1 had the highest nominal market basket prices for both the house brand (BRAND2) and the cheapest brand (BRAND3). The national brand (BRAND1) was the exception; its price was ranked highest in Zone 5 and second highest in Zone 1.

The prices of the BRAND1 market basket were significantly higher in Zone 5 than in the other zones. The lowest BRAND1 nominal prices were found in Zone 3 but they were not significantly lower than BRAND1 prices in other zones. For BRAND2 less than $.50 separates the highest priced zone average (Zone 1) from the lowest priced zone average (Zone

Table 5.5
Average Prices of Market Basket by Zones[c]

	BRAND1	BRAND2	BRAND3
(ZONE 1)	28.09	23.19[a]	22.81[a*]
Store 1	26.62	22.08	21.90
Store 2	29.37	23.63	23.07
Store 3	28.32	23.02	22.89
Store 4	28.06	24.04	23.40
(ZONE 3)	27.64[b]	22.72[b]	21.57[b]
Store 6	28.06	23.97	23.16
Store 7	26.83	21.87	21.23
Store 17	26.42	20.45	17.91
Store 18	29.24	24.60	23.98
(ZONE 4)	27.66	23.05	21.57[b]
Store 9	28.65	23.03	21.92
Store 10	27.69	24.22	22.87
Store 11	26.67	22.13	20.99
Store 12	29.13	23.14	21.22
Store 13	28.29	23.46	21.79
Store 14	26.55	22.77	20.73
Store 23	26.66	22.66	20.66
(ZONE 5)	29.77[a**]	22.83	21.66
Store 15	31.58	22.22	21.49
Store 16	32.50	22.35	20.89
Store 19	29.25	23.53	21.71
Store 20	26.79	22.60	20.79
Store 21	27.81	24.16	22.20
Store 22	30.70	22.15	22.93

[a] highest zone average for each BRAND.
[b] lowest zone average for each BRAND.
[c] T-test show that the means are significantly different. The significance levels are indicated as follows: ** represents $p \leq .01$ and * represents $p \leq .05$.

3). Thus, none of the zone averages was priced statistically significantly higher or lower than any of the others.

BRAND3 prices were found to be significantly higher in Zone 1 than in any other zone. The t-tests also indicate that the market basket totals were similar in all other zones.

In summary, prices of store brands (BRAND2) were the most stable and possibly indicate the highest degree of competition citywide. National brands varied in price with highest prices in the zone with one of the lowest incomes while the cheapest basket was most expensive in the zone with the one of the highest incomes. The cheapest prices for all three brands were found in the center of the city.

Comparisons within Zones. Weekly prices of all stores operating within an individual zone were also examined to determine the extent of price differences within the geographical zones (localized markets).

Zone 1. Zone 1, one of the most populous and most affluent areas in the study, also contained the highest number of grocery stores competing within the zone. Stores 1, 2, 3, and 4 were included in this zone (Appendix C). Zone 1 had the highest prices for the BRAND2 and the BRAND3 market baskets, and the BRAND1 basket was priced second to

the highest. Store 1 (Chain II) was found to have the lowest weekly prices for stores operating on Tucson's north side, during the course of this study, whereas, Store 2 (Chain I) tended to have the highest prices from week to week.

Within Zone 1 BRAND1 exhibited the least variability. Weekly price differentials ranged from 7% above the zone average to over 7% below the zone average.

BRAND2 (the house brand), the BRAND with the most consistent prices across all zones, showed more variability in Zones 1 and 3 than in the other two zones. It tended to have the highest price differentials (whether above or below the zone average) of any of the BRANDs. Prices of BRAND2 ranged from 9.5% below the Zone 1 average to 9.5% above the Zone average.

Zone 3. Stores 6, 7, 17, 18 (Appendix D) represent Zone 3, central Tucson. Store 17 (the warehouse store) consistently priced below the Zone 3 average, for all brands. It also had the largest deviations from the average, with prices as low as 22% below the zone average. In contrast, store 18 (an affiliated independent store) tended to price above the weekly zone prices most consistently for all three BRANDS.

Prices for BRAND1 had the most weekly variations in Store 6 (Chain I), wavering from above the zone average one week, to below the average the next week. For example, in week 6 BRAND1 was priced 7% higher than the zone, yet week 7 showed prices of BRAND1 below the zone average by nearly 3%.

BRAND2 and BRAND3 prices fluctuated greatly from week to week in Zone 3 for all stores except in Store 18, which consistently maintained the highest prices.

Zone 4. Zone 4 (the east side of town) contained three stores (nos. 11, 14, & 23) with prices consistently below the zone average, and another four stores (nos. 9, 10, 12, & 13) with prices consistently higher than the zone average (Appendix E). The stores pricing below the zone average were all affiliated with Chain II. The prices of BRAND1 regularly had the largest discrepancies from the average, and the prices of BRAND2 showed the least. Store 10 (Chain I) showed more variability for prices of the BRAND1 and BRAND3 market baskets than the BRAND2 basket. In contrast, Store 12 (Chain IV) showed more price stability than most stores within this zone, for all three BRANDS.

Prices for BRAND2 were relatively stable. Store 9 (Chain VI) had the most variability in BRAND2 prices.

For one week only, Store 13 (in week 8) and Store 14 (in week 16) showed the largest deviations from the Zone 4

average, with prices 22% below and 32% above the zone, respectively. For Store 13, this occurred for the cheapest market basket (BRAND3), whereas, the price of BRAND2 showed the largest deviation for Store 14.

Zone 5. Zone 5 was comprised predominately of independents, Stores 15, 16, 19, 20, 21, and 22 (Appendix F). No stores in Zone 5 consistently priced above or below the zone average. Typically stores operating in this zone followed opposing pricing policies between market basket types. That is, if a store priced BRAND1 above the zone average, it priced BRAND2 and BRAND3 below the zone average. Interestingly, the independents priced BRAND1 highest yet priced the cheaper brands below the average. The exception was Store 22 (Independent 4). In general Store 22 priced BRAND3 the highest above the average and priced BRAND2 comparable to the zone average.

The highest BRAND1 prices were found in Store 15 (Independent 2), and the lowest prices for BRAND1 were in Store 20 (Chain II). Store 16 (Independent 3) offered the lowest prices for the BRAND2 and BRAND3 baskets, and Store 21 (Chain I) offered the highest prices for the BRAND2 basket.

5.2.2 Prices With Respect to the Stratum

STRATA describe the number of other food stores

operating within a given market area (2.6 square miles). Analyzing average food prices with respect to the number of close rivals competing within a localized market produced the following results.

Comparisons Between Strata. T-tests were used to analyze mean strata prices with respect to the number close rivals. The tests compared the average price for each stratum with the mean stratum price of the other strata, for all three brands. T-tests indicated that BRAND1 prices and BRAND3 prices were significantly lower when there were no other competing food stores close by ($p \leq .05$).

Contrary to expectations, stores with 3 close rivals (STRATUM 4) charged more for the national (BRAND1) market basket than any other strata. BRAND2 prices differed nominally, but not statistically with number of rivals, and nominal prices were highest when only two stores were competing (STRATUM 2). BRAND3 prices were highest when more than four food stores were competing, but these differences were not statistically significant (Table 5.6).

Comparisons Within Stratum. Looking within the different strata levels over time resulted in the following conclusions.

STRATUM 1 consisted of food stores with no competitors within the same 2.6 square mile area. It is comprised of

Table 5.6
Average Market Basket Totals by Strata (Number of Close Rivals[c]

(No. close rivals)		BRAND1	BRAND2	BRAND3
STRATUM 1	(0)	26.60[b**]	22.71[b]	20.66[b**]
Store 14		26.55	22.77	20.73
Store 23		26.66	22.66	20.60
STRATUM 2	(1)	28.66	23.17[a]	21.92
Store 12		29.13	23.14	22.12
Store 13		28.29	23.46	21.79
Store 19		29.29	23.53	21.71
Store 20		26.79	22.60	20.79
Store 21		27.81	24.16	22.20
Store 22		30.70	22.15	22.93
STRATUM 3	(2)	27.53	23.12	21.92
Store 9		28.65	23.03	21.92
Store 10		27.69	24.22	22.87
Store 11		26.26	22.13	20.99
STRATUM 4	(3)	29.02[a]	22.79	21.97
Store 1		26.64	22.08	21.90
Store 2		29.37	23.63	23.07
Store 3		28.32	23.02	23.40
Store 4		28.06	24.04	23.16
Store 15		31.58	22.22	21.49
Store 16		32.50	22.35	20.87
Store 17		26.42	20.45	17.91
Store 18		29.24	24.60	23.16
STRATUM 5	(4)	27.44	22.92	22.19[a]
Store 6		28.06	23.97	23.16
Store 7		26.83	21.87	21.23

[a] highest strata average for each BRAND.
[b] lowest strata average for each BRAND.
[c] T-test show that the means are significantly different. The significance levels are indicated as follows: ** represents $p \leq .01$ and * represents $p \leq .05$.

Store 14 and Store 23. Since these stores had no close rivals, the strata averages are the same as the store average.

STRATUM 2 was comprised of food stores with only one major food competitor within the same market area. Stores 12, 13, 19, 20, 21, and 22 were included in this stratum (Appendix G). Comparing weekly market basket ratios ($Store_i/Stratum_j$ average) of all stores included in STRATUM 2 showed that each store priced BRAND1 consistently over the 16 week period. The one exception occurred between weeks 14 and 16 when all stores showed an extraordinarily large change in the price of BRAND1 from the previous weeks. The largest weekly changes in the BRAND1 price were found in Stores 21 and 19. In Store 21 prices fell from about 11% above the stratum average, in week 14, to nearly 5% below the stratum average in week 15. Prices in Store 19 rose from less than 1% above STRATUM 2 average, in week 15, to 10% above the average in week 16.

The prices of the BRAND2 market baskets were very volatile in STRATUM 2. The weekly BRAND2 totals were quite dissimilar and prices tended to fluctuate above and below the stratum average. This may suggest a higher degree of price competition for house brand items (BRAND2), than for the national brand items. However, similar to BRAND1, the

greatest deviations were found between weeks 14 and 16. Store 19 showed the greatest increase (20%) between consecutive weeks and Store 21 showed the largest decrease (7%) from a preceding week. BRAND3 prices showed tremendous amounts of variability from week to week.

STRATUM 3 contained food stores with two close rivals. Stores 9, 10 and 11 were represented in this stratum. The highest deviation from the stratum mean for BRAND1 occurred in week 13, when prices were about 9% above the average. The lowest price for BRAND1 was found in week 16 (Appendix H).

Weekly BRAND1 basket totals tended to exceed the STRATUM 3 mean price in Store 9, and were priced consistently below the stratum average in Store 11. Store 10, on the other hand, priced BRAND1 rather arbitrarily. Weekly pricing patterns tended to be somewhat similar to those found with the BRAND2 prices found in STRATUM2. Across time, prices randomly moved above and below the stratum average. Store 11 (with weekly prices always below the stratum mean) exhibited a pattern of decreasing prices over the 16 week period of the study. Store 10's prices tended to increase.

BRAND2 prices also showed a steady increase for Store 10, and a steady decrease for Store 11 during the

study. However, BRAND2 prices in general, deviated from the STRATUM 3 mean a great deal from week to week. The largest deviations were found between weeks 7 and 9. Variations from the preceding week were 7%, 5%, and 7.5% for Stores 9, 10 and 11, respectively.

BRAND3 totals were most volatile. The largest weekly price variation (between 2 consecutive weeks) was found in Store 9 between weeks 13 and 14, with prices as much as 11% lower than in the preceding week. In general prices rose 10% between WEEKs 13 and 14 in Store 10.

STRATUM 4 consisted of stores with 3 other food stores competing in the same market, and included Stores 1, 2, 3, 4, 15, 16, 17, and 18. BRAND1 prices were most consistent (Appendix I) across time in Store 18. Store 18's prices were nearly identical week after week. Store 15 showed the most weekly variability. The largest STRATUM 4 deviation for the BRAND1 market basket was found in Store 16, with prices averaging 12% above the stratum mean, over the 16 weeks. The lowest variations were found in Store 18. Prices ranged from less than 2% below the stratum average, to no more than .5% above the stratum average. BRAND1 totals were generally priced above the mean in independent stores, yet priced below the average in chain operations (of which the warehouse store was included).

Weeks 5 and 11 showed drastic changes in prices for BRAND2. Chains' prices increased by as much as 6% during the 5th week, while independents reduced their prices by as much as 9.5%. In contrast, week 11 brought lower BRAND2 prices for the chains (10%) and higher prices for the independent operations (22%).

For BRAND2 the largest deviations from the mean was found in Store 17, where prices always fell below the average for the stratum. Prices held rather consistently around 8% below average. Again Store 18 had the smallest differentials from the STRATUM4 average. Prices averaged less than 1% above the mean.

Although BRAND3 weekly prices were not as volatile as the BRAND2 prices. STRATUM4's BRAND3 prices showed the greatest deviations from the stratum mean each week. Independents tended to price BRAND3 lower than the average, while chains tended to over price the average. The highest deviation was found in Store 2, with prices as much as 12% higher than the average. The lowest BRAND3 prices were found in Store 17. Prices ranged from 12% to 24% below the stratum average.

Originally, Stratum 5 consisted of neighborhoods where four or more stores were competing, of which only four stores were surveyed. However, because of the limited

number of house brands available in two of the stores, these stores were deleted early.

The remaining two stores' prices were averaged and STRATUM 5 showed higher nominal prices for BRAND3 than any other strata. This implies that the more food stores in the area the higher the prices for the cheapest brand. The national brand was found to have one of the lowest prices. STRATUM 5 stores were located in the center of the city, and lower BRAND3 prices might be a result of their location. However, the higher BRAND1 prices contradict the previous zone analysis.

5.2.3 Price with respect to Chain Affiliation

Brand totals were also analyzed across and within their respective chain affiliations with the following results.

Comparisons Between Chains. Store averages (for all three BRANDs) were grouped according to their chain affiliations, and t-tests were performed to determine any significant mean price differences between chains. In addition to comparing one chain against the others aggregated, t-tests were executed on pairs of chains. That is, Chain I and Chain II were compared, Chain I and Chain III were compared, Chain II and Chain III were compared, etc.

Table 5.7 groups the averages for all three baskets by chain affiliation. It shows that, on average, the lowest prices for BRAND1, BRAND2, and BRAND3 were found in Chain II stores. The highest prices for BRAND1 are shown in Chain IV stores. But the prices for BRANDs 2 and 3 were highest in Chain I. T-tests confirmed these results. Chain II charged statistically significantly less than other chains for BRAND1 ($p \leq .01$), BRAND2 ($p \leq .01$), and BRAND3 ($p \leq .05$). Prices in Chain I (for BRAND1) were significantly higher than Chain II's ($p \leq .02$), but lower than Chain IV's ($p \leq .02$). Table 5.7 also shows Chain I units had lower prices than Chain III, but with less certainty ($p \leq .10$). In addition t-tests showed Chain II to be cheaper than Chain III ($p \leq .05$) and Chain IV ($p \leq .001$).

BRANDS 2 and 3 exhibited statistically significant relationships between Chain I and Chain II only ($p \leq .05$).

Comparisons within chains. Weekly BRAND totals were graphed over time, by chain affiliation, to examine weekly variations of stores within the same chain.

Chain I. Stores 4, 6, 10, and 21 were affiliated with Chain I (Appendix J). Each store operated in one of four distinct geographical areas (e.g. north, central, east, and south). Average prices between stores in this chain differed by as much as 8% (for the BRAND2 basket). Prices

Table 5.7
Average Market Basket Totals by Chain Affiliation (if any)[c]

	BRAND1	BRAND2	BRAND3
(CHAIN 1)	27.90	23.61[a]	22.90[a]
Store 4	28.06	24.11	23.40
Store 6	28.07	23.93	23.16
Store 10	27.69	24.22	22.87
Store 21	27.81	22.20	22.20
(CHAIN II)	26.69[b**]	22.35[b**]	21.04[b**]
Store 1	26.64	22.08	21.90
Store 7	26.83	21.87	21.23
Store 11	26.67	22.13	20.99
Store 14	26.55	22.82	20.73
Store 20	26.79	22.65	20.79
Store 23	26.66	22.66	20.60
(CHAIN III)	28.30	23.24	22.33
Store 3	28.32	23.02	22.89
Store 13	28.29	23.46	21.79
(CHAIN VI)	29.29[a]	23.38	22.30
Store 2	29.37	23.63	23.07
Store 12	29.13	23.14	22.12
Store 19	29.25	23.53	21.71
(CHAIN VI)	28.65	23.03	21.92*
Store 9	28.65	23.03	21.92

[a] highest chain average for each BRAND.
[b] lowest chain average for each BRAND.
[c] T-test show that the means are significantly different. The significance levels are indicated as follows: ** represents $p \leq .01$ and * represents $p \leq .05$.

for BRAND1 and BRAND3 differed by 1% and 2%, respectively, which t-tests found to be insignificant. T-tests did however, show the difference between the highest priced store (Store 6) and the lowest priced store (Store 10) to be more than chance 90% of the time for BRAND2 averages ($p \leq .10$).

The store located in the center of the city (Store 6) showed the highest weekly prices, and the greatest weekly deviations from the BRAND1 basket (national brands) chain mean. In contrast the store on the east side of Tucson (Store 10) showed the lowest weekly deviations from the chain averages for BRAND1. Weekly prices for BRAND2 were usually greater than the chain average in central Tucson (Store 6), and less than the chain average on the south side of town (Store 21). Prices fluctuated considerably from week to week in all four stores.

In general BRAND3 prices were more volatile than BRAND2 prices. Store 21 showed the least weekly variability for the cheapest brand (BRAND3) basket.

Chain II. Stores 1, 7, 11, 14, 20, and 23 are associated with this chain, and were scattered fairly evenly across the city. Prices were quite similar for BRAND1, with less than a $.30 difference between the highest and lowest priced baskets (Appendix K). Store 7, located in central

Tucson, had the highest prices on average; and Store 14, located on the east side of town, offered the lowest. On the other hand, the differences between the highest and the lowest priced BRAND2 and BRAND3 baskets were $.90 and $1.24 respectively, and statistically significant ($p < .001$).

BRAND1 prices in Stores 7 and 1 (the north side of town) showed slightly more variations from the Chain II mean, than did any other store associated with this chain, but in general, the prices of BRAND1 in Chain II stores were quite similar.

Totals for the BRAND2 basket were usually priced above the Chain II average on the north side (Store 1), and typically priced below the chain average in Store 14 (east Tucson). This is an interesting point because when examining geographical zones and stratum classifications, Stratum 1 (which included Store 14) and Zone 4 (which included Store 14) were both found to consistently price below their respective averages, but Store 14 offered the highest Chain II prices (for BRAND2). This indicates that the other stores in Stratum 1 in Zone 4 had prices lower than average price of Chain II stores. The lowest BRAND2 prices, when grouping stores by chain affiliation, were found in Store 7 (central Tucson).

Chain III. Chain III was comprised of Stores 3 and 13. Store 3 was located on Tucson's north side and Store 13 operated on the east side. Price differences between the most and least expensive priced baskets in Chain III ranged from 3 cents, for the national brand, to 80 cents for the cheapest brand basket (Appendix L). A statistically significant difference in price was found between the two stores in Chain III for BRANDS 2 and 3 ($p < .02$).

Chain IV. Three sample stores belonged to Chain IV: Store 2, located on the north side of Tucson; Store 12, located on the east side; and Store 19, operated on Tucson's south side. The highest average price for BRAND1, in Chain IV was found on the north side of town, and the lowest average price was found on the east side (Store 12), although prices in general were quite similar (Appendix M). Looking at BRAND1 there was less than a $.25 difference in prices between the three stores' prices for BRAND1. However, t-tests did show that the stores within this chain, had statistically different prices for BRAND2 and BRAND3 at the .02 and .001 levels of significance, respectively.

Weekly prices for BRAND1 were similar with small deviations from the chain mean. However, while Store 12 usually priced BRAND1 items below the chain average, Store 2 typically overpriced the chain mean.

Store 19 (the south side) showed the greatest differential for the BRAND2 basket, but in general the weekly prices found in Store 19 were very volatile. Prices regularly reached as high as 6% above the chain mean, but they also dipped as much as 9% below the average.

Weekly BRAND3 prices were more stable than the weekly prices of BRAND2. The weekly variations were at least as drastic as those found in BRAND2, but varied less frequently. In accordance with earlier findings BRAND3, the cheapest basket of food items, was priced highest on the north side of town (the most affluent area of town), and lowest were on the south side of town (areas with higher proportions of minorities and non-high school graduates). Store 2, the north side store, offered prices as great as 9.5% higher than the Chain IV average and prices fell as low as 7% below the mean in Store 12.

5.2.4 Prices with respect to Time

Prices were examined across time to determine if they were influenced by the week of the month. Family assistance is issued during the first two weeks of the month, and the question in this study asked is, "Do retailers offer higher prices at the beginning of the month than at the end of the month?" Therefore, monthly prices were graphed weekly to determine if prices decreased over

the course of the month. This was done for each store and BRAND. Secondly t-tests were performed on the nominal differences to determine if these differences were statistically significant.

Nominal Differences. Over the 4 month period less than one-half of the sampled stores had nominal prices for BRAND1 higher during the first two weeks than the last two weeks of the month for the BRAND1 basket. The stores that exhibited such a pattern were all associated with chain operations (Appendix N). Three-fourths of the Chain I operations and 50% of the Chain II stores followed a pattern of decreasing prices as the month progressed (Appendix N).

BRAND2 prices were unpredictable. Where patterns of decreasing prices over the month were detected, they were inconsistent. Prices decreased in only 3 of the 4 months of the study. No stores showed higher prices in both of the first two weeks of the month. However, six stores priced consistently higher during the first or second weeks of the month than in the other weeks of the month.

The prices of BRAND3 baskets were higher in the first week than in subsequent weeks in two stores both belonged to Chain I. In two other stores BRAND3 baskets were priced highest in either weeks 1 or 2. These stores belonged to Chain IV.

Results of the t-tests. The t-tests indicated statistically significant relationships between WEEK2 and the other weeks ($p \leq .07$) and between WEEK3 and other weeks ($p \leq .08$) for BRAND1 only. This suggests that on average, prices did drop between the second and the third week of the month. Prices were statistically higher in WEEK2 than any other week of the month and statistically lower than the rest of the month during the third week of the month for BRAND1 (Table 5.8). Interestingly though, when each week's prices were compared individually with the following week's prices the only statistical differences were found in the BRAND2 basket where WEEK1 was higher than WEEK2 ($p \leq .05$); WEEK4 was higher than WEEK5 ($p \leq .01$) and WEEK1 was higher than WEEK5 ($p \leq .001$). These differences imply that the price of house brand items do fluctuate with the weeks of the month.

Table 5.8
Average Weekly Prices

WEEK	BRAND1	BRAND2	BRAND3
Week 1	28.39	22.63	21.34
Week 2	28.26	23.06	22.02
Week 3	28.36	23.36	22.16
Week 4	28.38	23.40	22.11
Week 5	28.19	22.75	21.99

* Statistically significant at $p \leq .10$.
** Statistically significant at $p \leq .05$.

Weekly Prices by Zones. Table 5.9 shows average prices by zone and by the week of the month. Looking at Table 5.9 three distinct pricing patterns were detected when comparing average market basket totals by geographical zones. In general BRAND1 prices appear to be lowest during the middle of the month, BRAND2 prices tend to be lowest at the beginning of the month and BRAND3 prices are lower at the end of the month, although there are some exceptions.

Table 5.9
Average Weekly by Zone

	BRAND1	BRAND2	BRAND3
Zone 1			
Week 1	28.65	23.05	23.15*
Week 2	28.19	23.44	23.11
Week 3	27.83	23.26	22.51
Week 4	27.92	23.03	22.70
Week 5	28.19	22.75	21.99
Zone 3			
Week 1	27.88	22.40**	21.35
Week 2	27.73	23.31	21.77
Week 3	27.28	24.10	21.59
Week 4	27.44	23.35	21.61
Week 5	28.08	24.08	21.06
Zone 4			
Week 1	27.78	24.05	21.54
Week 2	27.88	25.11	21.64
Week 3	27.63	25.03	21.56
Week 4	27.37	24.77	21.73
Week 5	27.68	25.78	20.91
Zone 5			
Week 1	29.74	22.96**	21.12
Week 2	29.93	22.80	21.76
Week 3	29.69	23.25	22.13
Week 4	29.75	22.99	21.71
Week 5	29.68	24.33**	21.23

* Statistically significant at $p \leq .10$.
** Statistically significant at $p \leq .05$.

Significant differences were found in Zone 1 (for BRAND3), and Zones 3 and 5 (for BRAND2).

BRAND1 prices were not significantly different when aggregated by zones. They were similar over the month, regardless of the zone. Mean prices were lowest during WEEKS 3 and 4 for all zones except Zone 5, where the lowest BRAND1 prices were offered during the last week of the month. Price differences ranged from $.06, between WEEKS 4 and 5 in Zone 5 (southern Tucson) to $.64, between the same two weeks in Zone 3 (central Tucson), but t-tests established that these differences were not significant. However, t-tests confirmed that prices in the fifth week of both Zones 3 and 5 (for BRAND2) were statistically significantly higher than the prices in WEEK 4 ($p \leq .05$). Also in Zone 3 prices increased approximately 7% over the course of the month and differences were found to be statistically significant between WEEKs 1 and 5, at the .05 level of significance. BRAND3 prices were also shown to be statistically different between WEEKs 1 and 5 (from the first of the month to the end of the month) ($p \leq .10$). However, where BRAND2's prices increased over the month, typically BRAND3 prices tended to decrease as the month progressed.

Weekly Prices by Stratum. Stratum averages were less predictable. Comparing average weekly prices by stratum showed that weekly BRAND3 prices were similar in STRATUM 4 (stores with three close rivals). However, prices were lower the last week of the month for BRAND1 and higher the last of the month for BRAND2. Both STRATUM 4 and STRATUM 5 stores begin the month with rather high prices . (higher than the other strata), and STRATUM 4 ends the month with lower prices. STRATUM 5 BRAND1 prices decrease then increase again.

BRAND2 prices in general tended to increase over the course of the month in STRATA 1 and 2 only. Significant differences were found between WEEKs 4 and 5 (in stratum 2), WEEKs 1 and 5 (in stratum 3) and WEEKs 1 and 5 (in stratum 5). significance. BRAND3 prices (aggregated by strata) showed prices increased between WEEK1 and WEEK2, although these differences were not statistically significant (Table 5.10).

Weekly Prices by Chain Affiliation. Table 5.11 presents the results when studying weekly prices by chain affiliation. The two largest chains (Chain I and Chain II) displayed prices that varied by week of the month. Chain I exhibited a pattern of lower prices at the end of the month

Table 5.10
Average Weekly Prices by Stratum

	BRAND1	BRAND2	BRAND3
Stratum 1			
Week 1	26.73	22.30	19.82
Week 2	27.01	23.22	20.96
Week 3	26.46	24.07	21.09
Week 4	27.15	23.09	21.02
Week 5	27.53	24.10	19.90
Stratum 2			
Week 1	28.72	23.01	21.74
Week 2	28.76	23.15	22.07
Week 3	28.64	23.36	22.12
Week 4	28.53	22.96	21.92
Week 5	28.74	23.91*	21.38
Stratum 3			
Week 1	27.85	22.74	22.08
Week 2	27.88	23.38	21.73
Week 3	27.57	23.46	21.94
Week 4	27.41	23.45	22.14
Week 5	27.55	24.95*	21.26
Stratum 4			
Week 1	29.04	22.71	21.86
Week 2	29.09	23.26	22.07
Week 3	28.89	23.63	22.02
Week 4	29.06	23.03	21.94
Week 5	26.64**	23.99**	21.68
Stratum 5			
Week 1	28.06	22.56	22.18
Week 2	27.79	23.54	22.75
Week 3	26.63	23.22	21.88
Week 4	26.71	23.89	22.70
Week 5	27.83	22.99	21.15

** Statistically significant at $p \leq .05$.
* Statistically significant at $p \leq .10$.

for BRAND1 and BRAND3. In contrast, Chain II showed higher prices as the month progressed for BRAND1 and BRAND2.

However, an interesting observation is that between WEEKs 2 and 3 prices decreased significantly in both chains (for the national brand), at the .05 and .01 levels of significance (for Chain I and Chain II, respectively). The remaining

Table 5.11
Average Weekly Prices by Chain Affiliation

	BRAND1	BRAND2	BRAND3
Chain I			
Week 1	28.46**	23.69	22.82**
Week 2	28.15	24.16	23.31
Week 3	27.34**	24.44	22.75
Week 4	27.76	24.32	23.11
Week 5	27.55	23.76	21.52
Chain II			
Week 1	26.83*	22.19***	20.68
Week 2	26.95	22.76**	21.55
Week 3	26.48***	22.88	21.17
Week 4	26.38	22.70	21.23
Week 5	27.21**	23.59	20.59
Chain III			
Week 1	28.48	22.83	22.59
Week 2	28.28	23.86	22.88
Week 3	28.37	23.19	21.51
Week 4	28.12	23.08	22.47
Week 5	28.28	23.70	22.05
Chain IV			
Week 1	29.34	22.95	22.81
Week 2	29.30	23.34	22.08
Week 3	29.29	23.87	22.36
Week 4	29.28	22.98	22.22
Week 5	29.13	23.74	21.18
Chain V			
Week 1	28.68	23.14	21.61
Week 2	28.88	23.73	21.56
Week 3	28.46	23.20	22.12
Week 4	28.63	23.46	22.60
Week 5	28.38	24.42	21.08

* Statistically significant at $p \leq .10$.
** Statistically significant at $p \leq .05$.
*** Statistically significant at $p \leq .01$.

BRAND1 chain averages were priced quite consistently from week to week.

BRAND2 prices were higher during the middle of the week in Chain I and higher at the end of the month in Chain II. Both patterns suggest cheaper prices at the beginning of the month.

In contrast, BRAND3 showed higher prices during the middle of the month (weeks 3 and 4) for Chain II, with cheaper prices during WEEKs 1 and 5. However, statistically, only Chain I showed price differences for the BRAND3 basket. WEEK 1 prices were statistically higher than WEEK 5's prices at the .05 level of significance.

5.3 Correlational Analyses

This section presents the results of analyses done with Pearson correlation coefficients. Graphic illustrations were examined to determine the direction of any relationships existing between market basket prices (BRAND1, BRAND2 and BRAND3); t-tests were used to determine if the differences were significant; and the Pearson correlation coefficient (r) was utilized to analyze the strength and direction of relationships. Simple correlation coefficients and their associated probabilities were calculated for all pairs of dependent and independent variables.

5.3.1 Correlations Between Dependent and Independent Variables

The dependent variable, price of BRAND1, showed clear linear relationships with many of the independent variables (Table 5.12). The strongest associations were with the following independent variables: 1) PHYSIZE ($r = -.59$); 2) REGSIZE ($r = -.60$); 3) NUMSHOP ($r = -.60$); 4) ETHNIC ($r = .56$) and 5) SCHOOL ($r = .64$). Slightly weaker, but still significant relationships were found between BRAND1's price and SERVICES ($r = -.40$). In contrast, the price of BRAND2 showed linear relationships only with STAMPS ($r = .50$). The price of BRAND3 was not statistically related to any of the other independent variables. Because of the lack of relationships between BRANDS 2 and 3 and the Table 5.12 independent variables further analysis focuses on BRAND1 prices. Interestingly, the prices of BRAND2 and BRAND3 were highly correlated ($r = 0.757$). Weekly store visits showed that the cheapest brand was generally the house brand, which was priced just below the national brand which was on sale that week.

5.3.2 Correlations Among Independent Variables

To determine the extent of collinearity between the independent variables, variables were regressed against each other. PHYSIZE and NUMSHOP were found to be correlated with

Table 5.8
PEARSON CORRELATION COEFFICIENTS/Probability > |R| / n = 21

	BRAND1	BRAND2	BRAND3	INCOME	PHYSIZE	REGSIZE	NUMSHOP	RIVALS	CENTRAL	POP1	POP2	ELDERLY	YOUNG	ETHNIC	SCHOOL	SERVICES	STAMPS
BRAND1	1.0000 0.0000																
BRAND2	0.1383 0.5499	1.0000 0.0000															
BRAND3	0.4041 0.0693	0.7571 0.0001	1.0000 0.0000														
INCOME	-0.2653 0.2452	0.1020 0.6297	0.1511 0.5066	1.0000 0.0000													
PHYSIZE	-0.5897 0.0049	0.2081 0.3845	-0.0948 0.6826	0.2756 0.2266	1.0000 0.0000												
REGSIZE	-0.6807 0.0948	0.0928 0.6891	-0.1192 0.6069	0.4120 0.0635	0.7810 0.0001	1.0000 0.0000											
NUMSHOP	-0.5968 0.0044	0.2278 0.3287	0.0638 0.7835	0.6149 0.0030	0.5712 0.0068	0.6245 0.0025	1.0000 0.0000										
RIVALS	0.2321 0.3113	-0.0783 0.7360	0.0319 0.8909	-0.4932 0.0231	-0.0987 0.6705	-0.2381 0.2986	-0.2332 0.3090	1.0000 0.0000									
CENTRAL	-0.2859 0.3705	-0.1078 0.6445	-0.2108 0.0471	-0.4388 0.4723	-0.1659 0.3016	-0.2367 0.0979	-0.3709 0.0979	0.6537 0.0388	1.0000 0.0000								
POP1	0.0829 0.7208	0.0121 0.9619	-0.1186 0.6085	0.0669 0.7732	0.1964 0.3934	0.1719 0.4561	-0.0168 0.9423	0.3568 0.1124	0.0231 0.9287	1.0000 0.0000							
POP2	-0.1940 0.3975	0.0572 0.8054	0.1455 0.5291	0.4277 0.0531	-0.0755 0.7450	-0.0750 0.7466	0.1978 0.3901	-0.6614 0.0011	-0.3430 0.1288	-0.6742 0.0008	1.0000 0.0000						
ELDERLY	-0.1163 0.6217	0.1482 0.5215	-0.0824 0.7227	-0.0273 0.9065	0.4330 0.0499	0.3204 0.1568	-0.0386 0.8662	-0.3487 0.1213	-0.1928 0.4024	0.0627 0.7870	0.0135 0.9539	1.0000 0.0000					
YOUNG	-0.1143 0.6183	0.1482 0.4836	-0.0826 0.5044	-0.0273 0.7621	-0.4387 0.0466	-0.3837 0.1051	-0.0338 0.0886	0.2824 0.2148	-0.1079 0.6416	0.1388 0.5485	-0.0458 0.8439	-0.8445 0.0001	1.0000 0.0000				
ETHNIC	0.5643 0.0077	-0.1368 0.5563	0.0280 0.9042	-0.4496 0.0400	-0.6534 0.0013	-0.7501 0.0001	-0.5570 0.0087	0.1536 0.5060	0.1733 0.4526	-0.0625 0.7877	0.0046 0.9842	-0.3902 0.0884	0.5951 0.0048	1.0000 0.0000			
SCHOOL	0.6414 0.0017	-0.0803 0.7294	0.0360 0.8869	-0.6859 0.0036	-0.5802 0.0058	-0.6398 0.0018	-0.5918 0.0047	0.1160 0.6165	0.0476 0.8376	-0.0867 0.7086	-0.1295 0.5760	-0.0620 0.7896	0.3256 0.1497	0.6508 0.0001	1.0000 0.0000		
SERVICES	-0.4017 0.0711	0.1382 0.5730	0.1181 0.6100	0.5388 0.0117	0.5968 0.0043	0.5456 0.0105	0.5494 0.0099	0.1678 0.4807	-0.1900 0.4098	0.1494 0.5181	1.0000 0.0000	0.0824 0.7226	-0.1893 0.4111	-0.7786 0.0001	-0.8394 0.0001	1.0000 0.0000	
STAMPS	-0.1350 0.5596	0.4966 0.0220	0.3157 0.3157	0.2805 0.3834	0.7466 0.0001	0.4654 0.0335	0.4258 0.0524	-0.1236 0.5936	-0.3380 0.1461	-0.0668 0.7738	0.1214 0.6001	0.4616 0.0352	-0.3629 0.1281	-0.3807 0.1307	-0.2010 0.3826	0.3432 0.1278	1.0000 0.0000

nine of the other variables examined. The coefficients of the related independent variables ranged from r = .43 ($p \leq .05$), for ELDERLY, to r = .78 ($p \leq .001$), for REGSIZE. PHYSIZE and NUMSHOP was also highly related to STAMPS (r = .75 and r = .43 respectively). The strongest relationships that existed for NUMSHOP were with INCOME and REGSIZE, where r =.62 (for both) and $p \leq .003$ and .0025 respectively. Table 5.12 also shows some unexpectedly strong relationships between ETHNIC and REGSIZE (r = -.75) and between ETHNIC and SERVICES (r = -.79). These relationships suggest that as the number of minorities in a neighborhood increase, the number of services as well as the number of cash registers operating in the store, decrease. That is, stores in these neighborhoods are smaller than stores in neighborhoods with a lower percent of minorities. The remaining relationships had coefficients less than .60. Due to this extensive multicollinearity with PHYSIZE, it was excluded from further analyses.

5.4 Regression Results

In an effort to minimize the efficiency losses due to multicollinearity, the regression analyses involved a four step process. Step one estimated the effects of the size variables on price; step two estimated the effects of the competition variables; step three concentrated on the

socioeconomic variables and lastly, step four estimated the final equation. This final equation included the explanatory variables estimated to define each of the three major characteristics. Highly correlated variables, and those shown (by the Pearson coefficient) to be unrelated to the price of BRAND1 were deleted from the final equation.

The final regression results show that the size variable did not influence the price of the market basket. They do however, suggest that there is some advantage to agglomeration. Prices were lower in central Tucson and in the larger shopping centers. Higher population density was also associated with lower prices (Table 5.16). None of the SES variables significantly influenced the price of the BRAND1 basket.

5.4.1 Cross-sectional Analyses

As stated earlier, initially several variables were used to measure a common characteristic. For example, size was defined by physical size, the number of cash registers and the number of services offered. PHYSIZE was eliminated from further consideration due to high mulitcollinearity. Therefore, the first step of the regression analysis was used to determine the appropriate size measure to incorporate into the final equation. Each equation included one of the two remaining size measures. The equations followed the

form:

$$BRAND_i = b_0 + b_1SIZEVAR_i + b_2RIVALS_i + b_3CENTRAL_i + U_i \quad (8)$$

Where i = the observation, and SIZEVAR denotes either REGSIZE or SERVICES.

Based on the results of these estimations, REGSIZE was selected as the best measure of store size and used in the final regression equation. The results, summarized in Table 5.13, show that an extra cash register operating within the store reduced the price of the national brand basket by $.48. On the other hand, the change in price associated with a change in the number of services offered was neither statistically nor practically significant.

The competition measures (RIVALS, NUMSHOP and CENTRAL) were investigated next. Because REGSIZE was so highly correlated with the competitive measures (especially NUMSHOP), it was omitted from this section of the analysis. On the other hand, because INCOME was so highly correlated to many of the socioeconomic status (SES) variables, it was used as a proxy for them in this section of the analysis. Additionally, RIVALS and CENTRAL were correlated and therefore, not included in the same equation. The model used to determine which competitive measures to include into the final equation was:

Table 5.13
Parameter Estimates for the Size Regression Models (t-statistic in parenthesis), N = 21, Dependent variable = BRAND1

Independent Variables	Equation 1 Coefficients	Equation 2 Coefficients
REGSIZE	-0.4774 (-3.86)***	----
SERVICES	-----	-0.1107 (-1.06)
RIVALS	0.47 (1.66)	0.65 (1.75)*
CENTRAL	-2.10 (-2.72)**	-2.01 (-1.89)*
F-Value	7.23	1.66
R^2	0.56	0.23
CONSTANT	31.19 (25.57)***	27.98 (17.28)***

* Significant at the .10 level.
** Significant at the .02 level.
*** Significant at the .001 level.

$$BRAND1_i = b_0 + b_1NUMSHOP_i + b_2COMP_i + b_3INCOME_i + U_i \quad (9)$$

where i = observation number and COMP = the competitive measures (RIVALS or CENTRAL). The results are summarized in Table 5.14. NUMSHOP was found to significantly influence the price of the national market basket in both equations, however the decrease in price attributed to the addition of another shop in the shopping center was less than 1% of the

total price ($.16). CENTRAL was also found to be significant ($p \leq .02$). On average, the price of the BRAND1 basket decreased by $2.10 when purchased from stores located in the center of the city. Contrary to expectations, RIVALS influenced price positively (Table 5.14, eq. 2). As the number of close rivals increased, prices tended to increase. However, this relationship was not significant. Therefore, RIVALS was omitted from the final regression equation, while NUMSHOP and CENTRAL were retained.

Table 5.14
Parameter Estimates for the Competition Regression Models (t-statistic in parenthesis), N = 21, Dependent variable = BRAND1

Independent Variables	Equation 1 Coefficients	Equation 2 Coefficient
NUMSHOP	-0.16 (-3.80)**	-0.15 (-3.01)**
RIVALS	----- (0.93)	0.31
CENTRAL	-2.10 (-2.77)*	-----
INCOME	0.0000 (-0.02)	0.00007 (1.03)
F-Value	7.41	3.81
R^2	0.57	0.40
CONSTANT	31.11 (25.71)	28.50 (19.93)

* Significant at the .05 level.
** Significant at the .01 level.
*** Significant at the .001 level.

Table 5.14 shows that the variable INCOME was unstable. Equation 1 estimated INCOME to negatively influence price, while equation 2 showed a positive relationship between INCOME and the price of BRAND1. However, neither was statistically significant.

Once the size characteristic and competitive measures were confirmed, attention was turned to the SES variables. Step three involved the estimation of a series of regression equations to determine which socioeconomic variables should be used in the final regression model. One by one each SES variable was incorporated into the equation:

$$BRAND1_i = b_0 + b_1NUMSHOP_i + b_2CENTRAL_i + \\ + b_4SES_i + U_i \qquad (10)$$

where SES_i are the socioeconomic variables (entered one at a time into the equation), and i = the observation number. REGSIZE was highly correlated to NUMSHOP and many of the SES variables and therefore, was omitted from this step of the analysis. YOUNG, ETHNIC and SCHOOL were the only SES variables found to be statistically significant ($p \leq .10$) in determining the price of BRAND1 (Table 5.15). Neighborhoods with a higher percentage of high school non-graduates paid more for a basket of items than neighborhoods with more high

Table 5.15
Parameter Estimates for the SES Regression Models
(t-statistic in parenthesis), N = 21, Dependent variable = BRAND1

Independent Variables	EQ1	EQ2	EQ3	EQ4	EQ5	EQ6	EQ7
NUMSHOP	-0.16 (-3.8)*	-0.16 (-4.57)*	-0.16 (-4.69)*	-0.17 (-5.01)*	-0.16 (-4.87)*	-0.13 (-3.20)*	-0.11 (-2.78)*
CENTRAL	-2.10 (2.77)**	-2.10 (-2.91)*	-2.41 (-3.37)*	-2.35 (-3.4)*	-1.92 (-2.92)**	-2.04 (3.06)*	-1.81 (2.64)**
INCOME	-0.000 (-0.98)	----	----	----	----	----	----
POP1	----	0.27 (0.51)	----	----	----	----	----
POP2	----	----	-0.84 (-1.50)	----	----	----	----
ELDERLY	----	----	----	-3.35 (-1.66)	----	----	----
YOUNG	----	----	----	----	5.47 (2.01)***	----	----
ETHNIC	----	----	----	----	----	1.78 (1.78)***	----
SCHOOL	----	----	----	----	----	----	3.40 (1.77)***
STAMPS	----	----	----	----	----	----	----
F-Value	7.41	7.61	9.13	9.54	10.53	9.83	9.17
R^2	0.57	0.50	0.55	0.56	0.59	0.57	0.50
CNSTNT	31.10 (30.87)	30.96 (45.24)	31.37 (49.69)	31.82 (43.04)	29.63 (32.00	29.95 (34.29)	31.28 (42.27)

* Significant at the .01 level.
** Significant at the .05 level.
*** Significant at the .10 level.

school graduates. The variable YOUNG influenced the price of the market basket the most. A one percent increase in the number of children under 19 in a neighborhood increased prices by $5.47. Also according to Table 5.15, a one percent increase in the number of nonwhite residents in the neighborhood increased the price of the market basket by $1.82.

To better understand the joint effects of all three factors (size, competition level and socioeconomic characteristics), REGSIZE and each SES variable were examined. POP2 was significant. With a population density between 4 and 7 people per acre (as opposed to less than 4 people per acre or more than 7 people per acre), food prices were lower by 4% ($1.24).

NUMSHOP was omitted in the next series of equations as it was highly correlated with many of the SES variables. When NUMSHOP was omitted STAMPS contributed to the price of the basket. However, the direction of its contribution was opposite expectation and opposite other results from previous equations.

Both REGSIZE and NUMSHOP were omitted in the last series of equations. The results showed significant influences on price attributed to ETHNIC ($p \leq .01$), SCHOOL ($p \leq .01$), and STAMPS ($p \leq .01$).

The resulting final regression equation was estimated:

$$BRAND1=b_{0j} + b_1REGSIZE_j + b_2NUMSHOP_j + b_3CENTRAL_j + b_4POP2_j + b_5YOUNG_j + b_6ETHNIC_j + b_7SCHOOL_j + U_i \quad (11)$$

This equation was also estimated without INCOME. The results are presented in Table 5.16. NUMSHOP ($p \leq .05$) and CENTRAL ($p \leq .01$) and POP2 ($p \leq .05$) were the only variables shown to significantly influence price.

Table 5.16
Parameter Estimates for the Final Regression Equations (t-statistics in parentheses), n = 21, Dependent variable=BRAND1

Independent Variable	Equation 1 Coefficient
REGSIZE	-0.27
	(-1.60)
NUMSHOP	-0.09
	(-2.20)**
CENTRAL	-2.36
	(-3.19)*
INCOME	----
YOUNG	3.75
	(1.21)
ETHNIC	0.83
	(0.47)
SCHOOL	1.71
	(0.45)
STAMPS	0.28
	(0.66)
POP2	-0.96
	(-1.48)
F-VALUE	5.14
R^2	0.77
CONSTANT	30.73

* Significant at the .01 level.
** Significant at the .05 level.
*** Significant at the .10 level.

5.4.2 Weekly Regression Models

Weekly basket totals were aggregated over all stores with respect to the week of the month. Average BRAND prices were examined to determine the influence of the week of the month on the prices of the three market baskets. Regression equations were estimated for week-specific dummy variables. Since food stamps and family assistance payments are received the first two weeks of the month, two equation were estimated. The first equation omitted the first week and the second equation deleted the second week.

The results show that prices were lower in the third week of the month than in weeks 1 or 2 for BRAND1 (Tables 5.17 and 5.18).

Prices of BRANDs 2 and 3, on the other hand, did not vary over the month for prices aggregated by stores.

When looking at the stores individually, however, several of them clearly showed significant differences in price from week to week. The results are summarized in Tables 5.19 - 5.24.

Table 5.17
Parameter Estimates of the Weekly Regression Equation for the Sample Aggregated (t-statistics in parentheses)
n = 21 (omitting week 1)

Independent Variables	BRAND1 Equation	BRAND2 Equation	BRAND3 Equation
WEEK2	0.04	-0.07	0.28
	(0.26)	(-0.26)	(0.99)
WEEK3	-0.27 ***	0.16	0.22
	(-1.88) ***	(0.59)	(0.76)
WEEK4	-0.24	-0.07	0.21
	(-1.67)	(-0.25)	(0.73)
WEEK5	-0.05	-0.01	-0.38
	(-0.21)	(-0.30)	(-0.84)
F-VALUE	1.88	0.24	0.72
R^2	0.38	0.08	0.20
CONSTANT	28.46	22.95	21.69
	(277.83)	(122.02)	(107.05)

*** Significant at the .10 level.

Table 5.18
Parameter Estimates of the Weekly Regression Equation for the Sample Aggregated (t-statistics in parentheses)
n = 21 (omitting week 2)

Independent Variables	BRAND1 Equation	BRAND2 Equation	BRAND3 Equation
WEEK1	-0.04	0.07	-0.28
	(-0.26)	(0.26)	(-0.99)
WEEK3	-0.31 **	0.23	-0.07
	(-2.14) **	(0.86)	(-0.23)
WEEK4	-0.28 ***	0.0025	-0.07
	(-1.93) ***	(0.009)	(-0.25)
WEEK5	-0.09	0.06	-0.67
	(-0.37)	(0.14)	(-1.47)
F-VALUE	1.88	0.24	0.72
R^2	0.38	0.08	0.20
CONSTANT	28.50	22.88	21.98
	(278.20)	(121.65)	(108.44)

*** Significant at the .10 level.
** Significant at the .05 level.

BRAND1. Five chain stores showed distinct pricing patterns influenced by the week of the month. Stores 2, 7, and 21 were affiliated with Chain I, and Stores 4 and 6 were affiliated with Chain II. BRAND1 prices were shown to decrease over the month for all these stores. The greatest differences were found in the Chain II stores. The unit operating in the center of town charged as much as $2.05 more during the 2nd week of the month, and as much as $1.51 at the end of the month. On the other hand, Chain I stores only showed savings of $.50 to $.79 by not shopping during the first or second week of the month respectively.

Also for all stores, the second week was the highest priced week of the month, suggesting that prices do not decrease systematically over the month. Prices start relatively low in the first week, increase in the second week, then decrease during the remainder of the month.

BRAND2. For BRAND2 the stores showing observable price differences between the second week and other weeks were Stores 2, 9, and 17 (Tables 5.19 - 5.20). These stores also belonged to chain operations. The stores affiliated with the larger chains (Stores 2 and 9) had the third and fourth weeks than the second week.

However Chain V, a warehouse chain (Store 17) showed offered higher prices at the end of the month (WEEK5). This

store's prices do not appear to reflect decreasing demands over the month.

In contrast, the first week tended to be cheaper than any other week of the month for Stores 19 and 22. One dollar and fifteen cents could be saved by shopping during the first week, than in the second week (in Store 22), and $1.13 could be saved by shopping during the third week, over the second week in Store 19 for the house branded items. Both these stores were located on the south side of Tucson.

Table 5.19
Parameter Estimates of the Weekly Regression Equation for BRAND1, (t-statistics in parentheses), n=21 (omitting WEEK2)

Independent Variables	STORE2 Equation	STORE4 Equation	STORE6 Equation	STORE7 Equation	STORE21 Equation
WEEK1	-0.19	-0.33	-0.54	-0.01	-0.32
	(-0.75)	(-0.87)	(-1.27)	(-0.02)	(-0.91)
WEEK3	-0.32	-1.07 **	-2.05 *	-0.79 ***	-0.84 **
	(-1.24)	(2.80)	(-4.84)	(1.80)	(2.39)
WEEK4	-0.50 ***	-0.43	-0.89 **	-0.79 ***	-0.75 **
	(1.97)	(-1.18)	(2.12)	(1.80)	(2.12)
WEEK5	-0.37	-0.98	-0.92	0.46	-0.83
	(-0.92)	(-1.61)	(-1.37)	(0.66)	(-1.48)
F-VALUE	1.05	2.28	6.31	2.04	1.97
R^2	0.26	0.43	0.68	0.41	0.40
CONSTANT	29.63	28.55	28.90	27.18	28.31

* Significant at the .01 level.
** Significant at the .05 level.
*** Significant at the .10 level.

Table 5.20
Parameter Estimates of the Weekly Regression Equation for BRAND1 (t-statistics in parentheses), n = 21 (omitting WEEK1)

Independent Variables	STORE4 Equation	STORE6 Equation	STORE7 Equation
WEEK2	0.33	0.54	0.01
	(0.87)	(1.27)	(0.02)
WEEK3	-0.74	-1.51	-0.79
	(1.93)***	(-3.57)*	(1.78)***
WEEK4	-0.09	-0.35	-0.79
	(-2.48)**	(-0.83)	(-1.78)***
WEEK5	-0.64	-0.38	0.46
	(-1.06)	(-0.57)	(0.67)
F-VALUE	2.28	6.31	2.04
R^2	0.43	0.68	0.41
CONSTANT	28.21	28.40	27.18

* Significant at the .01 level.
** Significant at the .05 level.
*** Significant at the .10 level.

BRAND3. The price of BRAND3 was related to the week of the month in more stores than the price of the other two brands. Similar to BRAND1 prices, Store 4 showed the first week with the highest prices over the month for BRAND3, with prices at the end of the month (WEEK5) close to $3.00 lower than in the first week. This store showed clear patterns of decreasing prices over the month for the cheapest brand. It was located on the north side of town, and was the only

Chain I store to exhibit such a pattern for BRAND3. Chain II (Store 7) also showed an observable pattern of decreasing prices over the month for BRAND3. The remaining stores, 13, 16, and 19, offered lower prices at the end of the month. Store 11, however, had the lowest prices during the second week and in fifth week.

Table 5.21
Parameter Estimates of the Weekly Regression Equation for BRAND2, (t-statistics in parentheses), n = 21, (omitting WEEK2)

Independent Variables	STORE2 Equation	STORE9 Equation	STORE17 Equation
WEEK1	-0.06	-0.30	-0.04
	(-0.22)	(-0.58)	(-0.06)
WEEK3	-0.28	-0.90	-0.16
	(-0.99)	(-2.09)***	(-0.28)
WEEK4	-0.71	-0.20	-0.27
	(-2.56)**	(-0.46)	(-0.28)
WEEK5	-0.58	-0.31	1.75
	(-1.33)	(-0.45)	(1.90)***
F-VALUE	0.62	0.53	0.57
R^2	0.17	0.15	0.16
CONSTANT	23.94	22.17	22.41

** Significant at the .05 level.
*** Significant at the .10 level.

Table 5.22
Parameter Estimates of the Weekly Regression Equation for BRAND2, (t-statistics in parentheses), n = 21, (omitting WEEK1

Independent Variables	STORE2 Equation	STORE19 Equation	STORE22 Equation
WEEK2	-0.06	-0.78	-1.15
	(-0.22)	(-1.23)	(-2.16)**
WEEK3	-0.28	-0.25	-0.75
	(-0.99)	(-0.39)	(1.40)
WEEK4	-0.71	-1.13	-0.65
	(-2.56)**	(-1.78)***	(-1.22)
WEEK5	-0.58	-1.15	1.24
	(-1.33)	(-1.14)	(1.47)
F-VALUE	0.62	0.53	0.57
R^2	0.17	0.15	0.16
CONSTANT	23.80	23.29	20.16

** Significant at the .05 level.
*** Significant at the .10 level.

When looking at average city prices, with respect to the time of the month, a slight relationship was found for BRAND1 only, with a savings of $.27 if shopping any other week than the second week. However, examining each store individually showed several stores where prices do decrease as the month progressed. Price savings ranged from less than 1% to nearly 10% of the market basket. This pattern was found more in chain store operations than in independent operations, it occurred more often with the BRAND3 basket than the other two.

Table 5.23
Parameter Estimates of the Weekly Regression Equation for BRAND3, (t-statistics in parentheses), n = 21, (omitting (WEEK2)

Independent Variables	STORE4 Equation	STORE7 Equation	STORE11 Equation	STORE13 Equation	STORE19 Equation
WEEK1	0.20	-0.59	0.87 ***	-0.34	1.10 *
	(0.30)	(-1.39)	(1.94)	(-0.31)	(2.98)
WEEK3	-1.23 ***	-0.90 **	0.14	-2.01 ***	0.52
	(-1.84)	(-2.12)	(0.32)	(-1.85)	(1.42)
WEEK4	-1.31 ***	-0.74 ***	0.14	-0.45	0.19
	(-1.96)	(-1.74)	(0.31)	(-0.41)	(0.51)
WEEK5	-2.58 **	-1.24 ***	-0.55	-0.88	-1.62 **
	(-2.44)	(-1.85)	(-0.76)	(-0.51)	(2.78)
F-VALUE	3.18	1.98	1.55	1.02	6.29
R^2	0.51	0.35	0.34	0.25	0.68
CONSTANT	24.10	21.83	20.76	22.50	21.38

* Significant at the .01 level.
** Significant at the .05 level.
*** Significant at the .10 level.

Table 5.24
Parameter Estimates of the Weekly Regression Equation for BRAND3, (t-statistics in parentheses), n = 21, (omitting (WEEK1)

Independent Variables	STORE4 Equation	STORE11 Equation	STORE16 Equation	STORE19 Equation
WEEK2	-0.20	-0.87 ***	0.64	-1.10 *
	(-0.30)	(-1.94)	(0.77)	(-2.98)
WEEK3	-1.43 **	-0.73	1.11	-0.58
	(-2.14)	(-1.61)	(1.44)	(-1.57)
WEEK4	-1.51 **	-0.74	0.54	-0.91 **
	(-2.26)	(-1.63)	(0.69)	(-2.47)
WEEK5	-2.78 **	-1.42 ***	2.21 ***	-2.72 *
	(-2.63)	(-1.98)	(1.80)	(-4.67)
F-VALUE	3.18	1.55	1.05	6.29
R^2	0.51	0.34	0.26	0.68
CONSTANT	24.30	21.63	20.22	22.58

* Significant at the .01 level.
** Significant at the .05 level.
*** Significant at the .10 level.

CHAPTER SIX

CONCLUSIONS AND IMPLICATIONS

6.1 Conclusions

The purpose of this study was to analyze food price variations across Tucson. Regression equations were used in conjunction with plots and t-tests to determine the significance of three major characteristics (firm, competition and neighborhood) believed to influence the price of a market basket. Furthermore, since it is common knowledge that brand choice also influences the price of the market basket, analyses involved the examination of three alternative brand choices. However, because the prices of the two cheapest brands (the private label and the label that happened to be the lowest priced during that week) showed little or no relationship to any of the major character-istics they were omitted from the regression analysis. Finally, average prices were examined over time.

6.1.1 Summary of the Cross-sectional Analyses

Question 1 referred to interbrand price differences. "Do food stores in Tucson follow pricing strategies for national brand items that are similar to pricing strategies for equivalently-sized alternative brands?" As expected, brand preference plays a major role in determining the price of the market basket. Studies have confirmed that consumers can save substantially when purchasing the private label

alternatives instead of the nationally branded items, and Tucson is no exception. On average, prices of the national brand basket ranged from 14% to 31% above the house or privately labeled brand, and house brand prices exceeded those of the cheapest brand by approximately 3%. Of more significance is the extent of these interbrand differences. The price variations across the city were very brand specific. Additional savings could be realized for example, if the brand of choice was the cheapest brand (BRAND3), and the consumer purchased this brand on the east side or in central Tucson, compared to purchasing this basket on the north side of town (one of the most affluent areas). However, if the customer preferred the national brand basket (BRAND1), she/he would have paid the highest prices on the south side of town, where median incomes and percentages of high school graduates were lower. The south side of Tucson also contained the highest percentage of non-whites.

The second question asked, "Are prices in smaller food stores higher than those in larger stores?" To answer this question the number of cash registers operating in the store was used as the size variable. Examination of the Pearson correlation coefficients, clearly revealed that REGSIZE was negatively related to the price of BRAND1. However, in combination with the other explanatory

variables, the size had no statistically significant effect on price.

Question 2.2 looked at the relationship between price and location. "Are prices within the center of the city lower than prices in other areas of the city?" To answer this question t-tests were performed to compare average prices across geographic zones. BRAND1 and BRAND3 (the national brand and the cheapest brand, respectively) were unmistakably cheaper in the center of town. Regression estimates confirmed the results for the BRAND1 basket (regressions were not run on the BRAND2 and BRAND3 baskets). Approximately 7% of the basket total could be saved shopping in the center of the city. Interestingly, the BRAND2 basket was priced rather comparably, implying that grocers may be competing more heavily with the house brand basket than they do for the national and/or cheapest brand in the store.

Question 2.3 examines the effect of the competition level on prices, competition with all other stores (as in a shopping center) as well as competition with other food stores (close rivals). Although t-tests showed that those stores competing with no other food stores priced BRAND1 and BRAND3 significantly lower than stores competing with 1 or more stores, regression results detected no significant influence on price from this variable. However, regression

estimates showed that as the number of shops within the same shopping center increased, prices decreased. Shopping at a large shopping center with 20 to 30 shops could save the consumer 12% and 18%, respectively, off the total food bill on the BRAND1 basket.

Question 2.4 was answered with t-tests. "Do stores affiliated with the same chain follow similar pricing patterns across neighborhoods?" Since brand prices appear to be neighborhood specific, stores belonging to the same chain priced according to the neighborhood's brand choice. Therefore, where one store might charge differently across neighborhoods for BRAND1, BRANDS 2 and 3 were priced similarly from neighborhood to neighborhood. The exception was that there were observable differences between the highest priced unit and the lowest priced unit. On average, the answer to this question is that none of the chains followed pricing patterns for BRAND 1 like they did for BRANDs 2 and 3 across neighborhoods.

Questions 2.5 and 2.6 examined the extent of certain socioeconomic status variables on the price of the BRAND1 market basket. "Are prices higher in neighborhoods where high proportions of minorities, elderly and high school non-graduates reside?" The answer was yes. On average, as the percentage of non-whites and non-graduates increased the

price of the market basket also increased.

Question 2.6 asked, "Did prices decrease as the number of children in the neighborhood increase?" These results were unexpected and quite significant. Regression equations estimated a $5.51 increase in the price of BRAND1 with a 1 percent increase in the number of children under age 19 in the neighborhood. Including this variable with the other significant explanatory variables (in the final regression equation) however, showed no influence.

Question 3 looked at average weekly prices to determine if the week in which a customer shopped had any bearing on the price of the market basket. "Are prices higher during the first and/or second week of the month compared to the other weeks of the month?" In general, BRAND1 did exhibit such a pattern. However, the price of the house brand tended to decrease as the month progressed and the prices of the cheapest brand were rather consistent from week to week. Examining weeks with respect to the zones in which the stores operated showed that stores on the east and south sides of town increased prices over the month for the national brands. Contrary to expectations the south side of town exhibited similar results, but for the house branded basket.

Classifying stores by the number of close rivals also showed that weekly prices increased over the month for stores competing with 3 other food stores, implying the first and second weeks were cheapest for the house brand basket. On the other hand, for the national brand, prices decreased (as hypothesized) over the month when there were 3 rivals within the same area for the national brand.

Looking at chain affiliation, very few operated in central or South Tucson during the time of the study. The chain operations that were located in these areas tended to overprice the national brand items, while pricing the alternative brands either below the average or at least comparably to other stores within the chain. Chain I was the only chain store found in central and southern Tucson, and weekly prices in these areas did tend to fluctuate significantly over the month. Observable patterns of decreasing BRAND1 prices were found over the month, implying that consumers who prefer the national brand, could buy the national brand basket at lower prices at the end of the month in this chain.

6.1.2 Summary of the Time-Series Analysis

Chain II also showed significant differences in price on the first of the month compared with the end of the month. However, this pattern was found only for the

cheapest brand items. The price of the BRAND3 basket was higher at the end of the month, implying lower prices at the beginning of the month. In addition, purchasing the cheapest brand from this chain during the first week of the month would increase the consumer's purchasing power. The other chains showed no significant differences over the month.

Regression equations were used to estimate the influence of the weekly variable on the average price of each of the three baskets aggregated by store. As the t-tests suggested, BRAND1 was the only brand for which the week of the month influenced price when the stores were aggregated. But there was less than 1% difference between the cheapest week (WEEK3) and the first two weeks of the month.

However, when regressions were performed over the five weeks for each store individually, the week greatly influenced the price of the market basket in 11 of the 21 stores. Thus these 11 stores followed a systematic pattern of pricing by the week. Prices tended to increase over the month. These results were opposite those expected, and could be insignificant.

The fact that WEEK2 offered the highest prices of the month, does not suggest that prices decrease to reflect

the decrease in demand over the month. Depending on the store, neighborhood, and the brand, some prices decreased over the month, whereas others increased.

6.2 Implications of the Study

Food retailing units in the United States have been under scrutiny for years. Questions have been raised concerning the price of a given market basket in relation to many factors. Most of those studies have shown little distinction between national brand items and equivalently-sized alternative brands. Incorporating the importance of brands into the decision of where to shop, enhances the understanding of food pricing patterns. However, as shown here, the brand choice of the neighborhood residents plays a major role in determining the price of that basket.

In Tucson, food retailers did not price their house brands with the pricing strategies which were used for the national brands. That is, there were areas of town (low-income, high ethnicity, and high non-graduates) in which best prices were offered for the privately labeled brands, and the national brand were priced less expensively elsewhere. This implies that managers were able to identify which brand was favored by her/his customers and then change price to reflect those preferences. Specifically, if

consumers actually prefer the national brands, they would be paying significantly more for them if purchased on the south side of the city. Furthermore, if consumers receiving food stamps purchase national brand items on the south side, the purchasing power of the food stamps is reduced, implying an overpayment of food to all taxpayers.

The most obvious results indicated that prices were lower where grocery stores were able to maximize the number of potential customers. The more shops in the shopping center and the more central (with higher population densities) the lower the prices. Apparently, the high cost of the larger shopping centers is not passed on to the consumers. The increased traffic (increased demand) does not increase prices. Therefore, it can be stated that agglomeration of shops saves the consumer money and time, in addition to increasing sales for the stores within the center. Since prices were shown to be cheaper in the larger shopping centers, prices may reflect the unit savings resulting from the higher volume, which may outweigh the higher costs of operations in the shopping center.

This may also give cause to question a theory of grocery store operation. Spatial economic theory seems to apply. As the number of close rivals increased prices tended to increase, implying that when only one food store

was operating in a localized area, the firm did not price as a spatial monopoly. The elimination (or decrease) of the uncertainty in a rival's response to price changes thus allowed prices to increase when there was more than one food store operating in the area. Also since it was shown that as the number of close rivals increased, so did prices; which might suggest that there is a cost associated with competition. Furthermore, this additional cost is passed on to consumers in the form of higher prices.

Finally, the SES variables used in this study were highly correlated to each other and the regression estimates showed none of these variables influenced the price of the national brand basket. Additionally none of the SES variables was related to the alternative two baskets. However, when looking at price variations with respect to the zone (which implied different socioeconomic situations), there was a clear significant difference in prices from one zone to another. This might suggest one of three things: 1) the geographical zone variable actually reflected the location of the stores, not necessarily the demographics of the neighborhood; 2) that these SES variables examined were too strongly correlated to isolate the effects on price in the regression equation; or 3) that these SES variables were really unrelated to the price of the baskets, and therefore do not influence price.

6.3 Recommendations for Future Research

Although this study did confirm that food prices were influenced by such factors as the percentage of young school age children in the neighborhood, the ethnicity of the neighborhood and the competition level of the firm with in the neighborhood, the results were inconsistent. Further research is needed to understand the pricing strategies of food stores. Perhaps additional studies should focus on the actual competitive behavior of the firm. Does the firm that is competing with 3 other food stores respond to the actions of its nearest competitor? This could best be accomplished by taking price surveys on a daily (as opposed to a weekly) basis over an extended period of time, enabling the researcher to analyze price movements and competition.

Secondly, it appears that prices on the house brands tended to be cheaper in the low income areas, as well as in areas where higher percentages of minorities live, and where the number of high school graduates is low. However, it is not necessarily true that these individuals purchase the house branded labels. A study which actually surveys these consumers' preferences would greatly increase the ability to determine if these consumers do pay more for their groceries.

Another issue of interest is the competitive nature of the private or house brands. As this study progressed, individual stores stocked house brands on an incremental basis. That is, it became obvious that as the weeks passed certain stores stocked more and more house brands. Also since this study showed little or no relationship between the explanatory variables and the prices of the house brands or the cheapest brands, other variables are needed to explain the variations in prices of these two market baskets.

APPENDIX A

LIST OF SAMPLE STORES

1. Lucky Food Centers
   3900 W. Ina Road
2. A. J. Bayless
   3688 W. Orange Grove
3. Fry's Food Stores
   3770 W. Ina Road
4. Safeway Stores, Inc.
   3749 W. Ina Road
5. Coronado Grocery & Market*
   3125 N. Stone
6. Safeway Stores, Inc.
   855 E. Grant Road
7. Lucky Food Stores
   719 E. Fort Lowell
8. Grantstone Market*
   8 W. Grant Road
9. Alpha Beta
   4624 E. Speedway
10. Safeway Stores, Inc.
    5548 E. Grant Road
11. Lucky Food Center
    5667 E. Speedway Blvd
12. A. J. Bayless
    7025 E. Tanque Verde
13. Fry's Food Center
    7850 E. Speedway
14. Lucky Food Centers
    8975 E. Tanque Verde
15. United Market
    2400 S. 6th Avenue
16. El Grande
    805 E. 36th Street
17. Warehouse Foods
    345 S. Campbell
18. Rays Market
    3030 E. 22nd Street
19. A. J. Bayless
    1775 W. Ajo Way
20. Lucky Food Centers
    1740 W. Ajo Way
21. Safeway Stores, Inc.
    2940 W. Valencia
22. Fairmart
    2700 W. Valencia
23. Lucky Food Stores
    2520 S. Harrison

* These stores were later deleted because of the limited number of house brands.

APPENDIX B

LIST OF ITEMS SURVEYED AND INCLUDED IN MARKET BASKET

		SIZE
A.	CEREAL/BAKERY	
1.	Kelloggs corn flakes	18 oz.
2.	Quaker instant oatmeal	12 oz.
3.	Rainbow white bread-thin*	16 oz.
4.	Keebler soft batch cookies	16 oz.
5.	Premium saltine crackers*	16 oz.
6.	La Suprema flour tortillas	1 dozen
B.	MEATS/POULTRY	
1.	ground beef-premium	16 oz.
2.	Oscar Meyer bologna	16 oz.
3.	pork chops-center loin	16 oz.
4.	round steak-top	16 oz.
5.	fryer-cut	16 oz.
6.	fryer-whole*	16 oz.
7.	Farmer John bacon*	16 oz.
C.	DAIRY/EGGS	
1.	grade AA medium eggs	1 dozen
2.	2% low fat milk	.5 gal.
3.	skim milk	.5 gal.
4.	whole milk	.5 gal.
5.	Kraft American singles*	12 oz.
6.	Blue Bonnet margarine-quarters*	16 oz.
7.	Bryers ice cream-vanilla	.5 gal.
D.	CANNED/PACKAGED	
1.	Picsweet mixed vegetables	16 oz.
2.	Green Giant corn- whole kernel	17 oz.
3.	Folgers coffee-regular ground	16 oz.
4.	Minute Maid orange juice	64 oz.
5.	Ragu spaghetti sauce*	32 oz.
6.	Carnation instant cocoa	12 oz.
7.	Old El Paso taco shells	1 dozen
8.	Pace Picante sauce	16 oz.
9.	Coke-canned	6-pack
10.	Jiff peanut butter*	18 oz.
11.	Smuckers grape jelly	18 oz.
12.	Rosarita refried beans	30 oz.
13.	Starkist tuna-oil*	6.5 oz.
14.	Budweiser beer	6-pack
15.	Miller beer	6-pack
E.	FRESH PRODUCE	
1.	lettuce*	each
2.	carrots*	1 lb.
3.	tomatoes-large*	1 lb.
4.	potatoes*	5 lb.
5.	yellow onions*	1 lb

APPENDIX B - continued

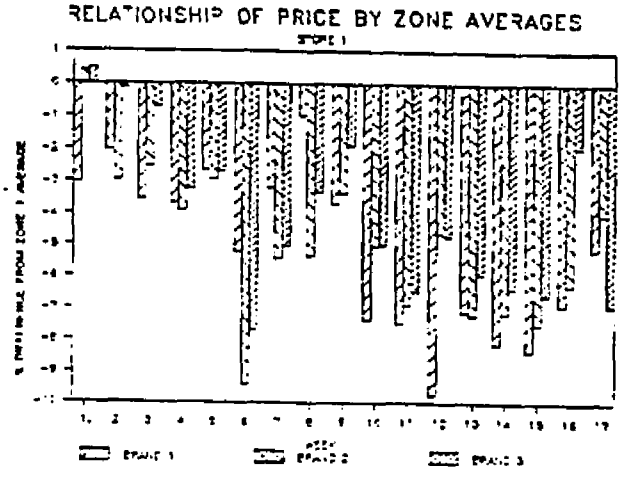
LIST OF ITEMS SURVEYED IN MARKET BASKET

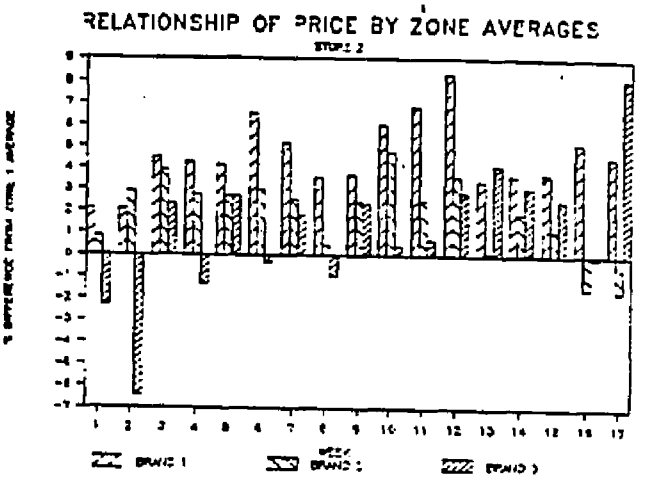
F.	NON-FOOD	
1.	Crest toothpaste	6.4 oz.
2.	Tide laundry detergent*	42 oz.
3.	Ivory shampoo	16 oz.
4.	Pampers-ultra*	48 count

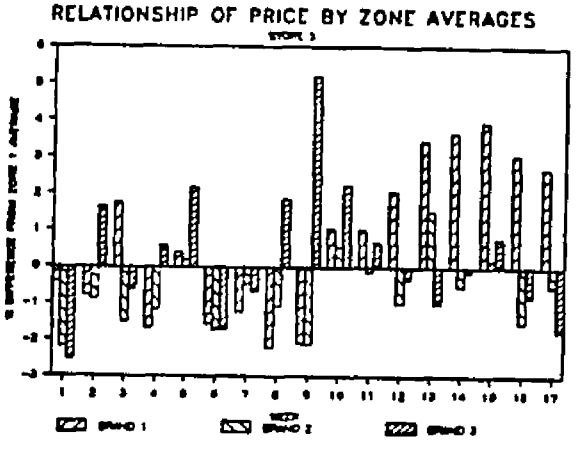
* Items included in the market basket for this study.

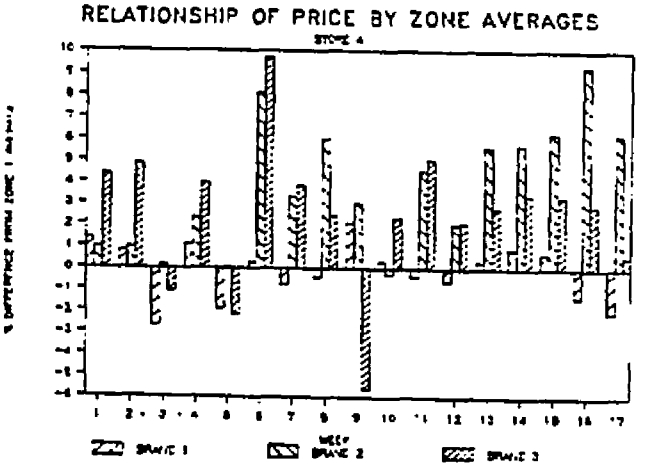
APPENDIX C

PRICES WITH RESPECT TO THE ZONE 1 AVERAGE



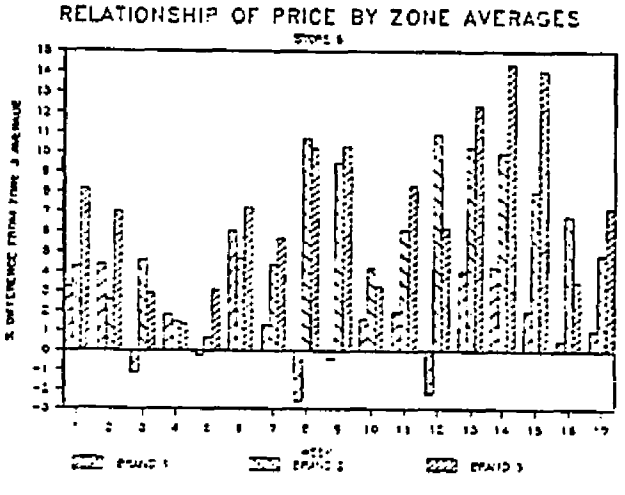


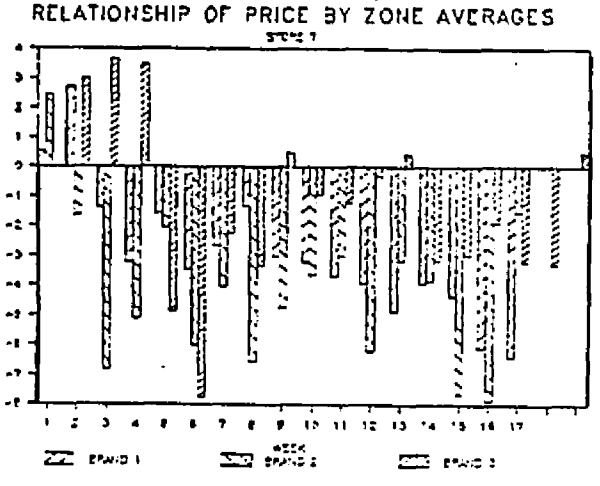


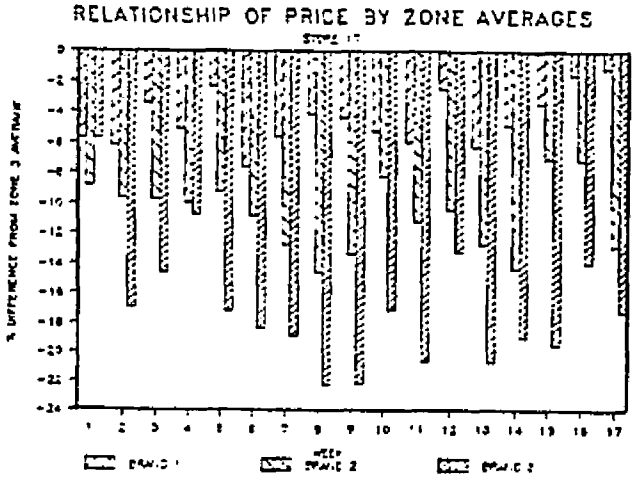


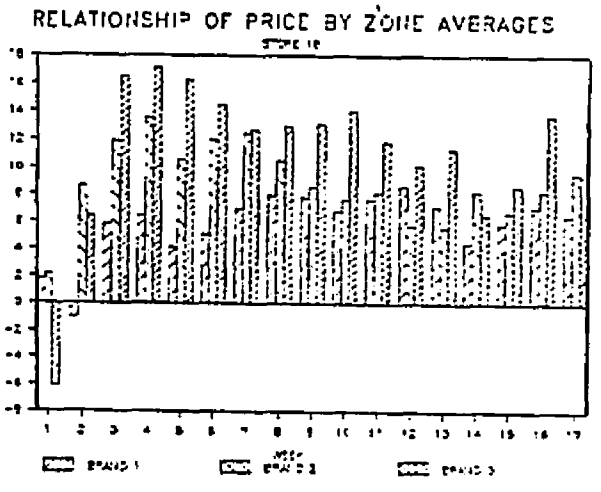
APPENDIX D

PRICES WITH RESPECT TO THE ZONE 3 AVERAGE



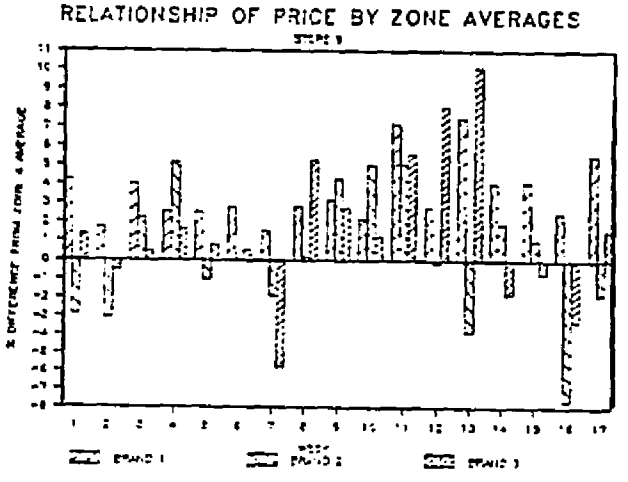


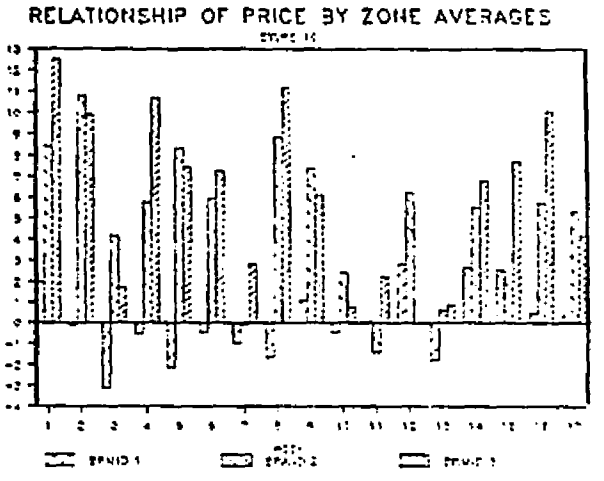


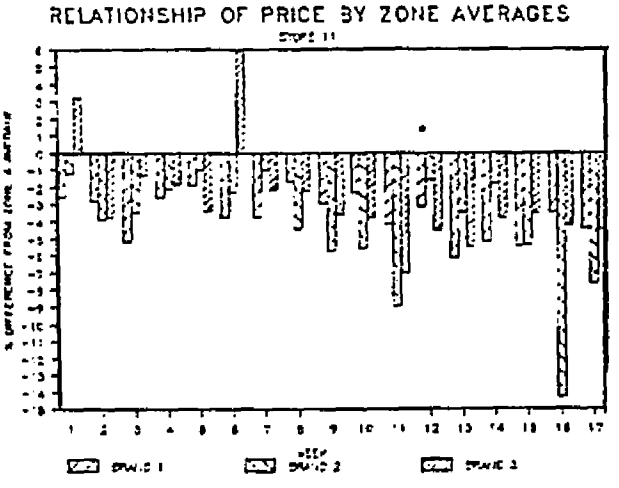


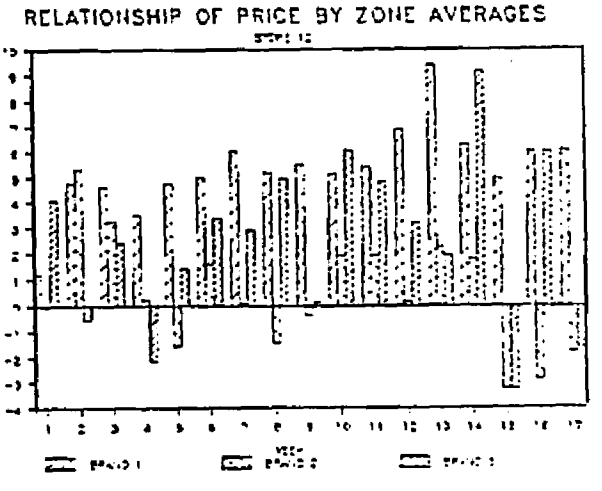
APPENDIX E

PRICES WITH RESPECT TO ZONE 4 AVERAGE



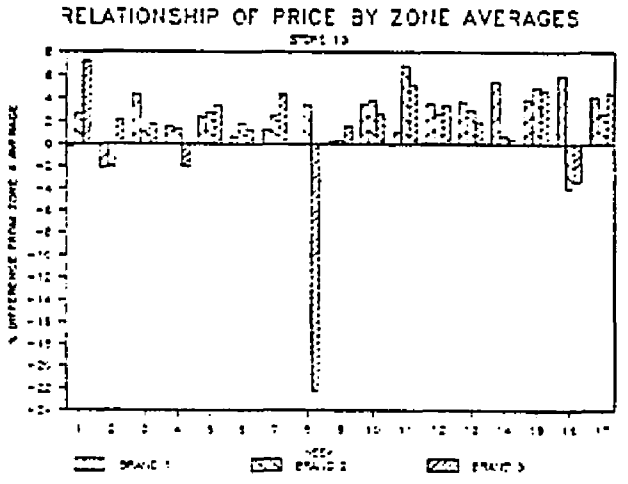


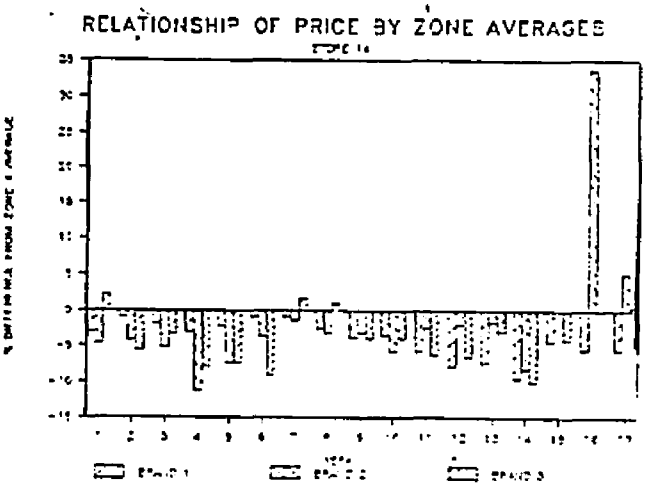


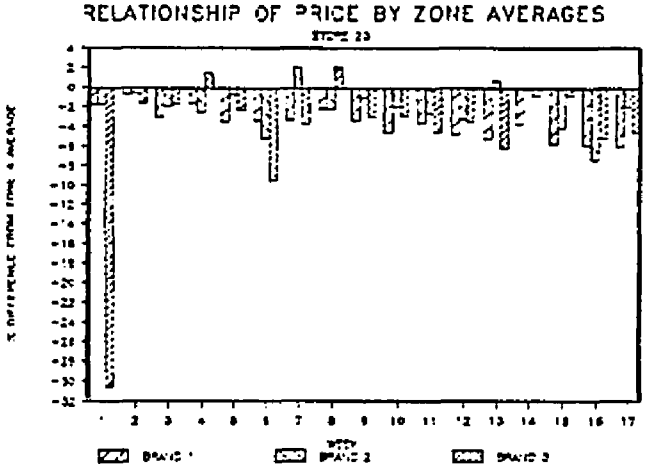


APPENDIX E -- continued

PRICES WITH RESPECT TO ZONE 4 AVERAGE

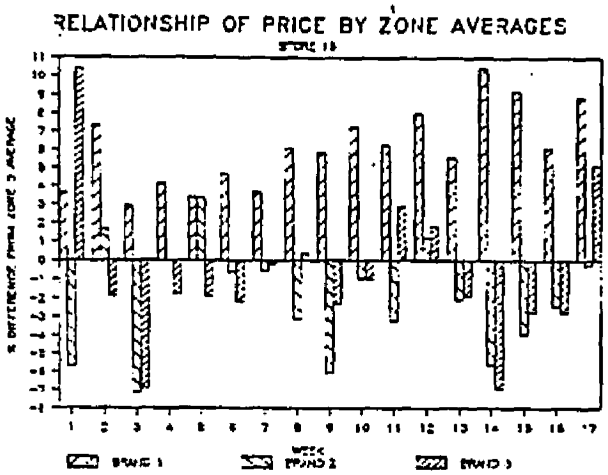


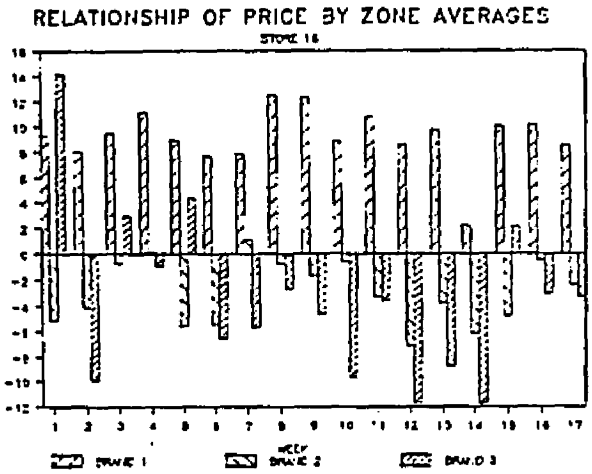


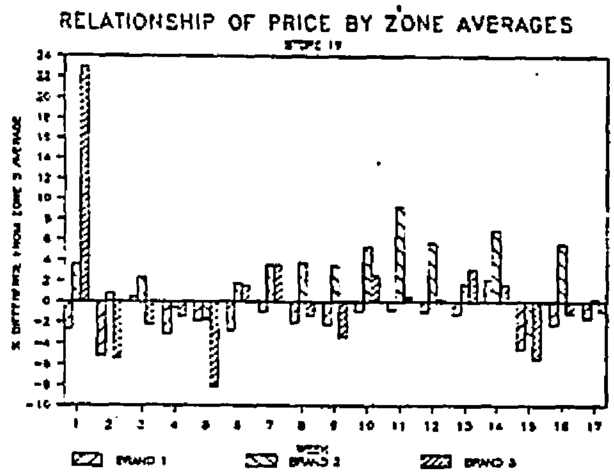


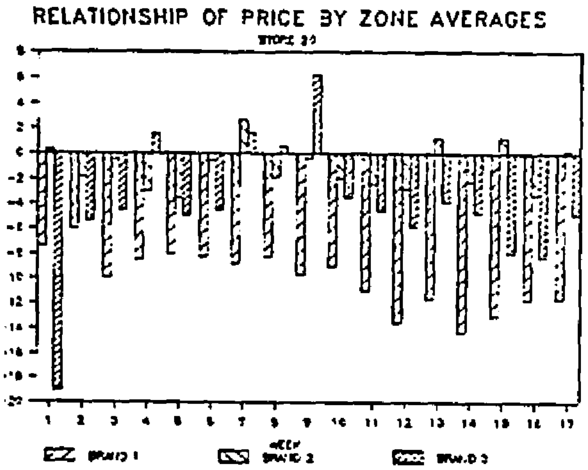
APPENDIX F

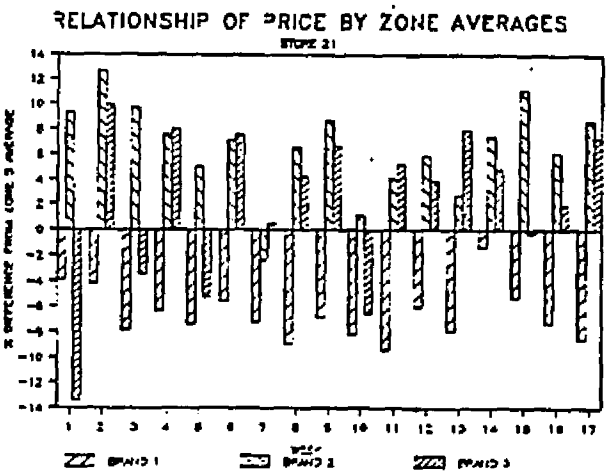
PRICES WITH RESPECT TO ZONE 5 AVERAGE

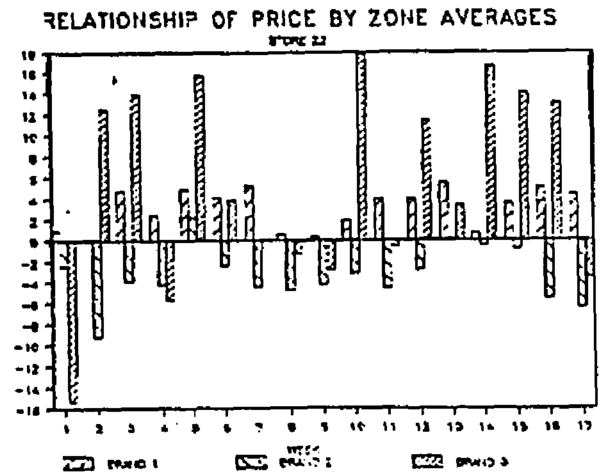






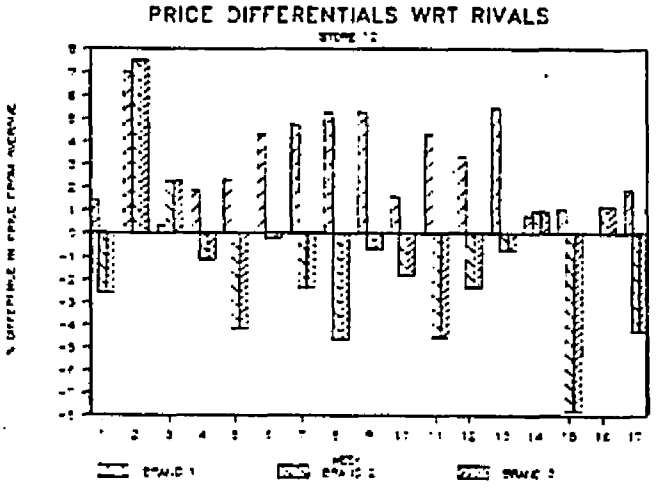


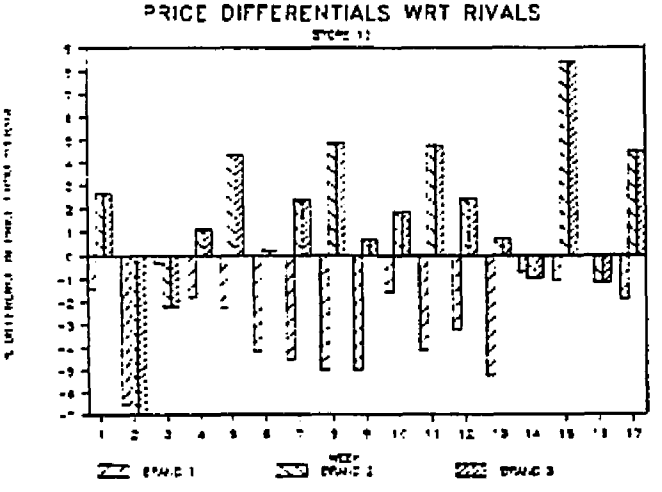




APPENDIX G

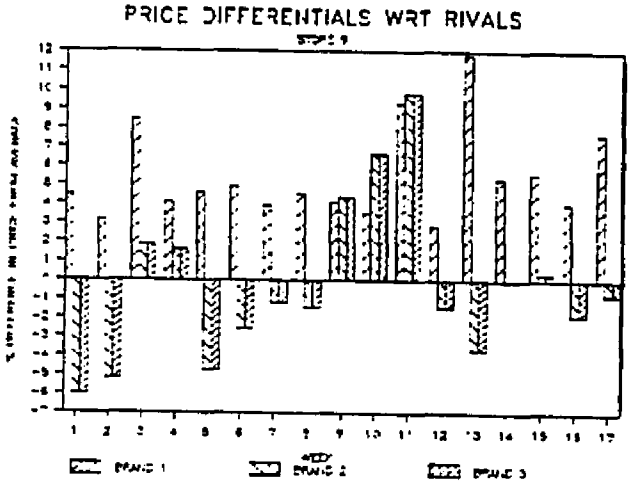
PRICES WITH RESPECT TO STRATUM 2 AVERAGE

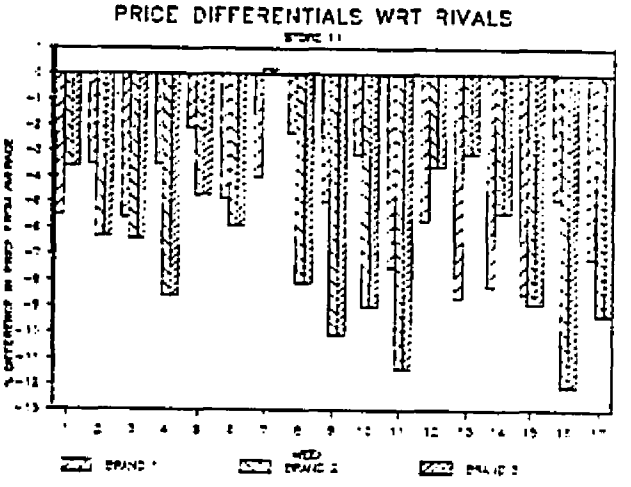


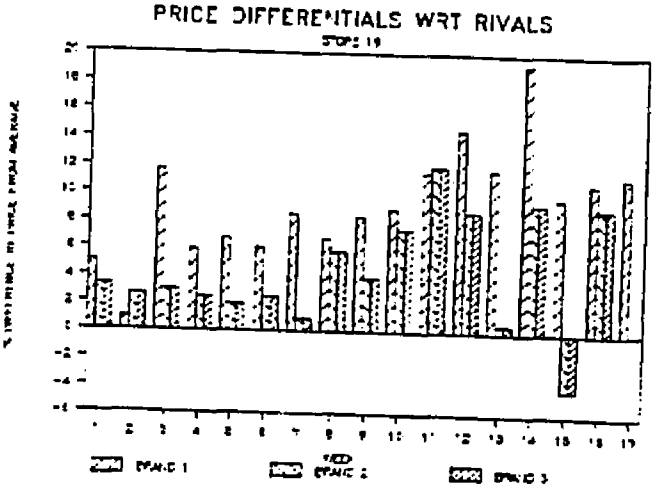


APPENDIX H

PRICES WITH RESPECT TO STRATUM 3 AVERAGE

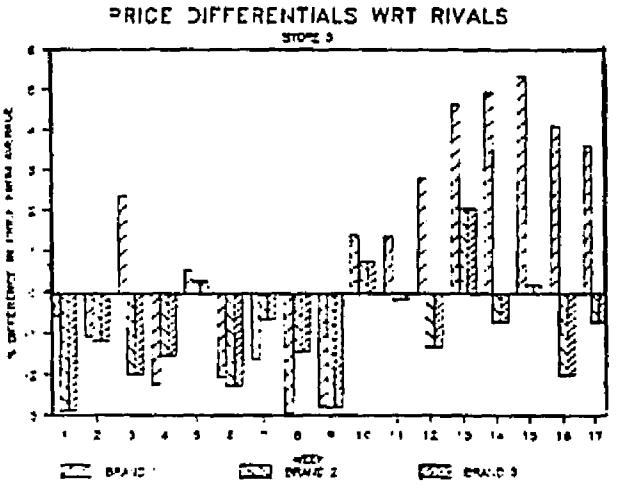


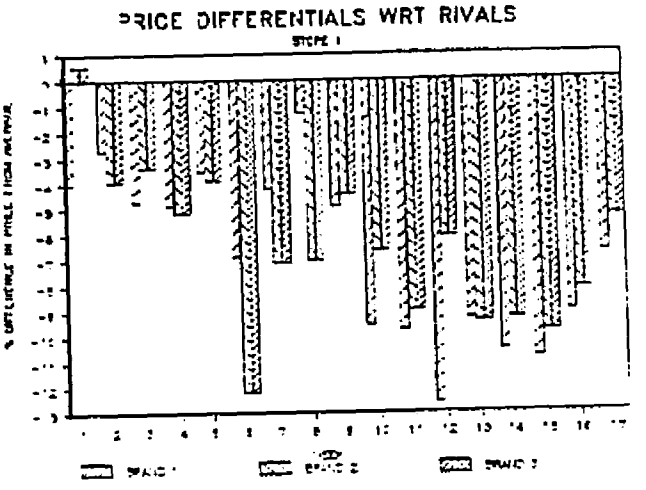


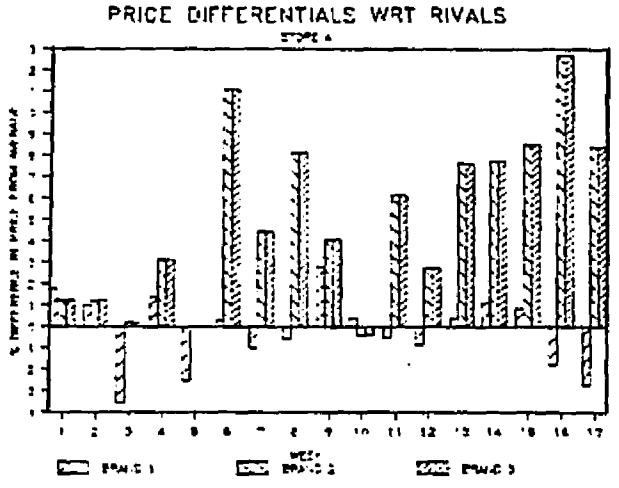


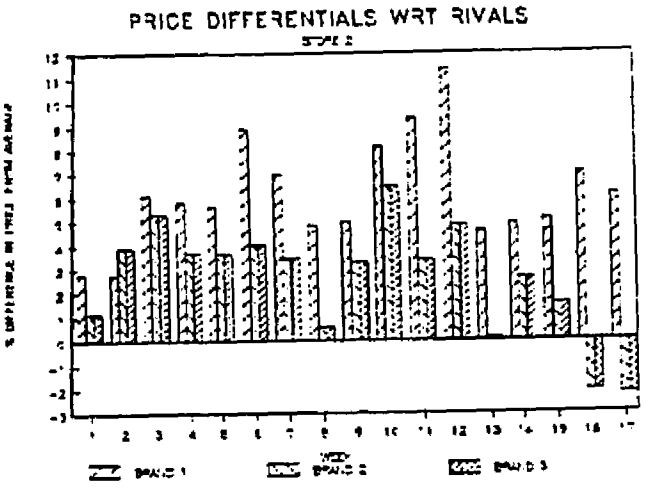
APPENDIX I

PRICES WITH RESPECT TO STRATUM 4 AVERAGE



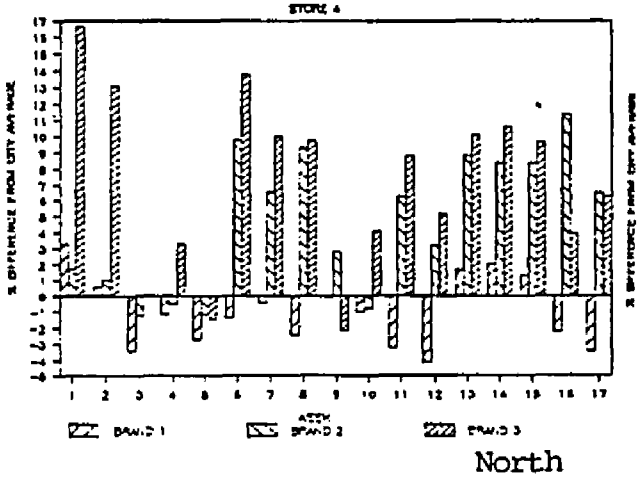




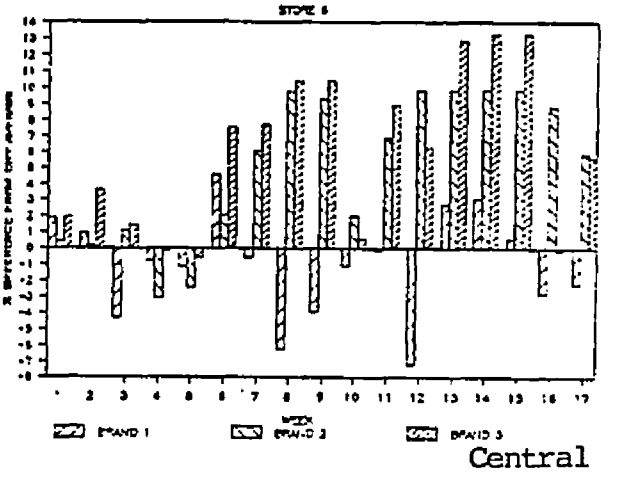


APPENDIX J

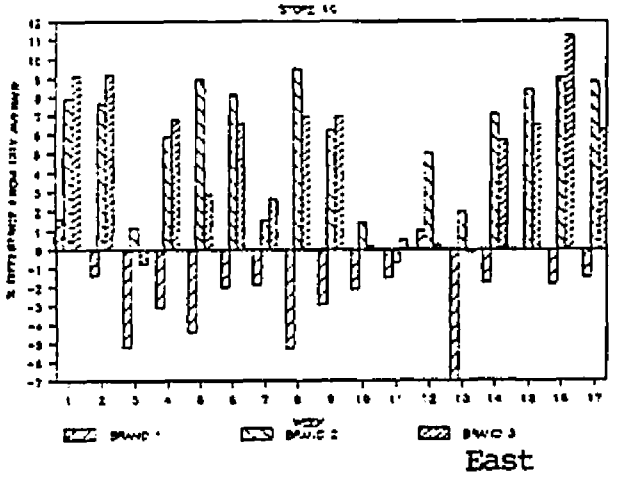
PRICES WITH RESPECT TO CHAIN 1 AVERAGE



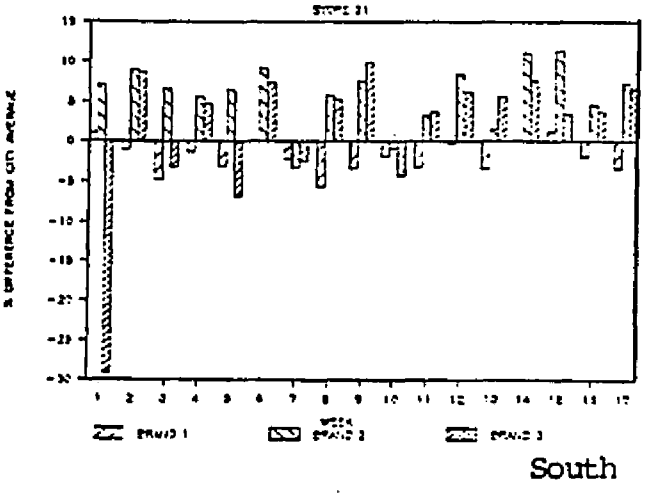
North



Central



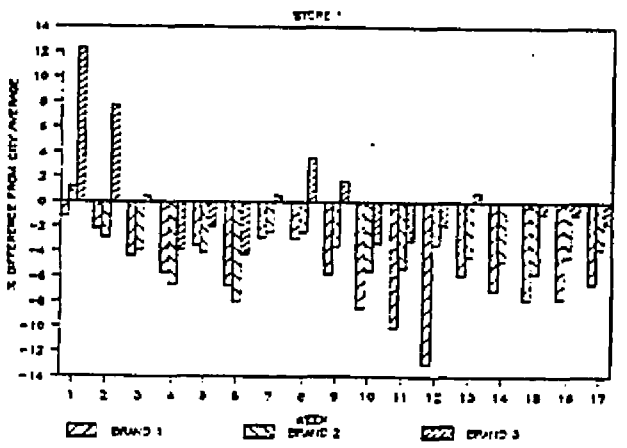
East

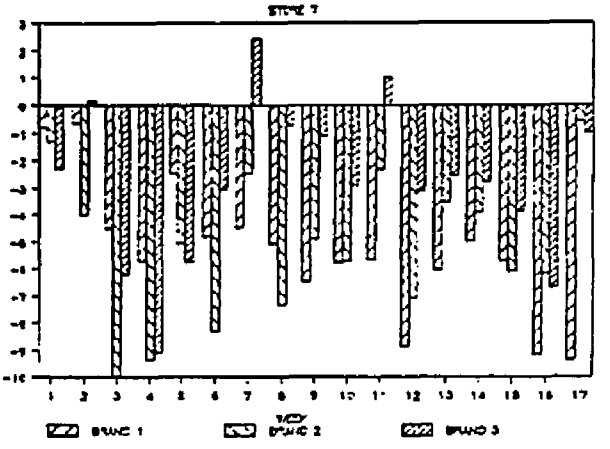


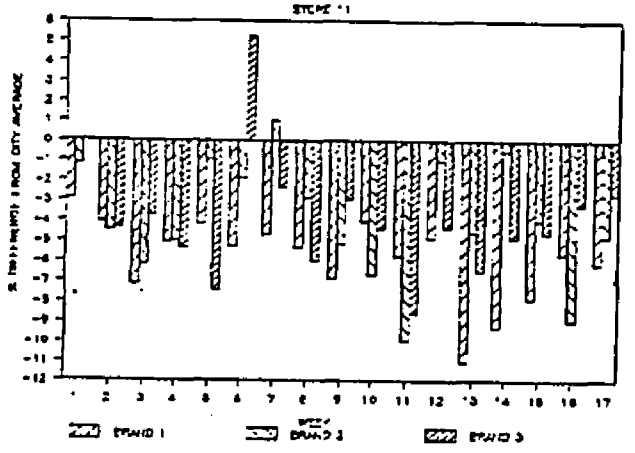
South

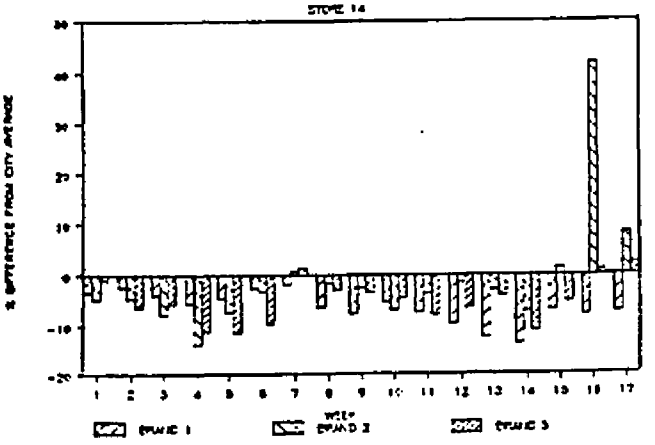
APPENDIX K

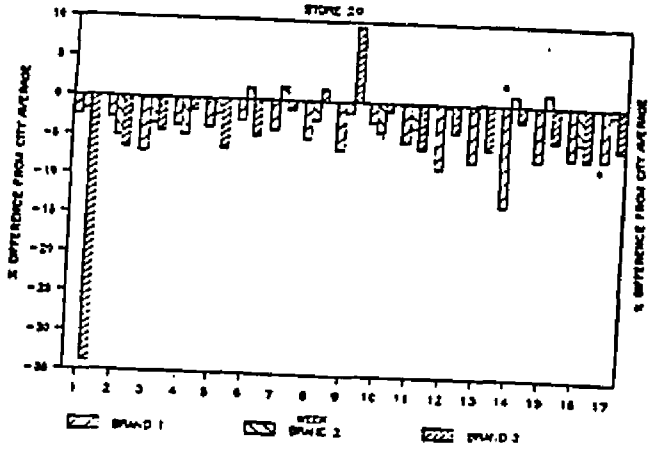
PRICES WITH RESPECT TO CHAIN II AVERAGE

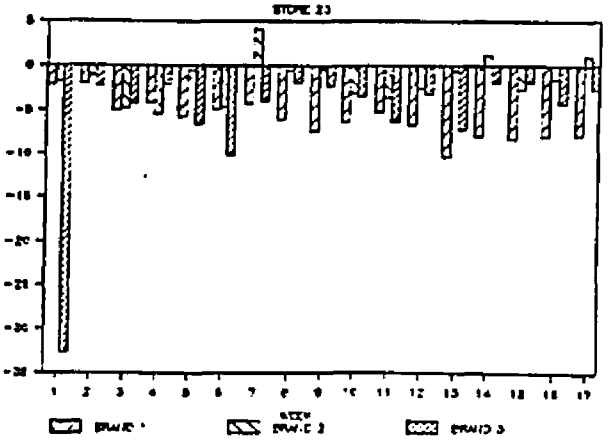






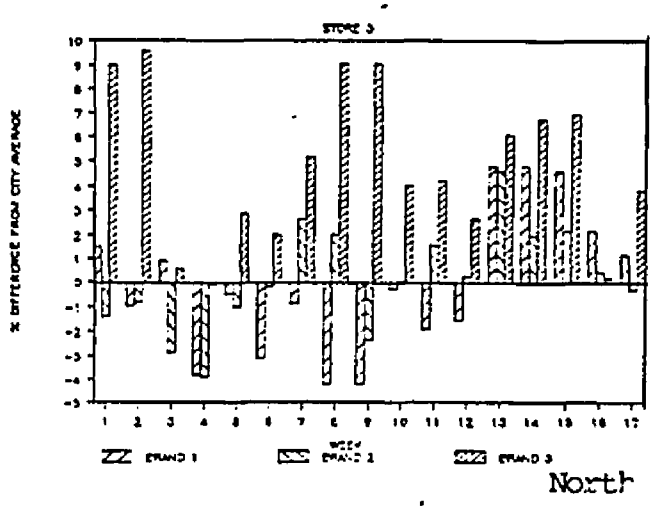




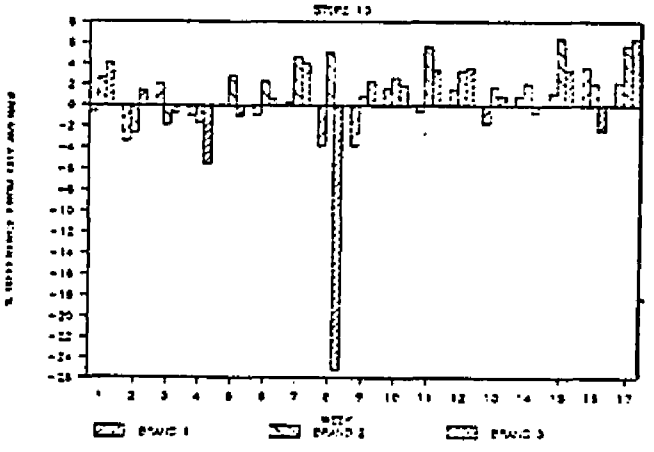


APPENDIX L

PRICES WITH RESPECT TO CHAIN III AVERAGE



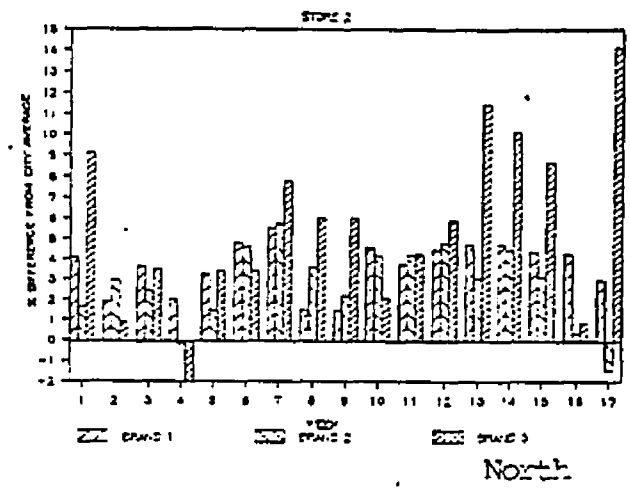
North



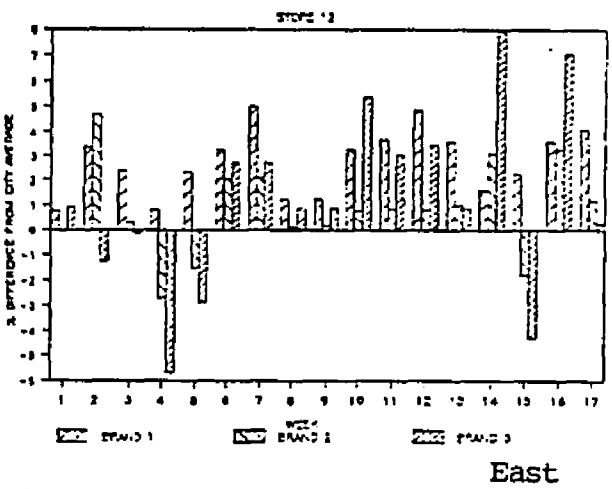
East

APPENDIX M

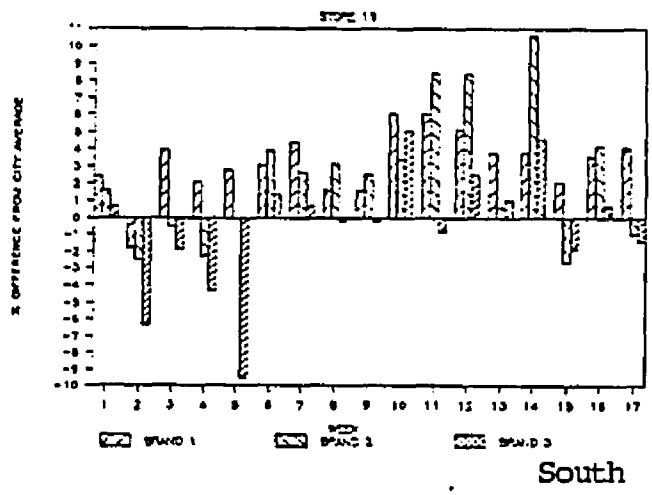
PRICES WITH RESPECT TO CHAIN IV AVERAGE



North



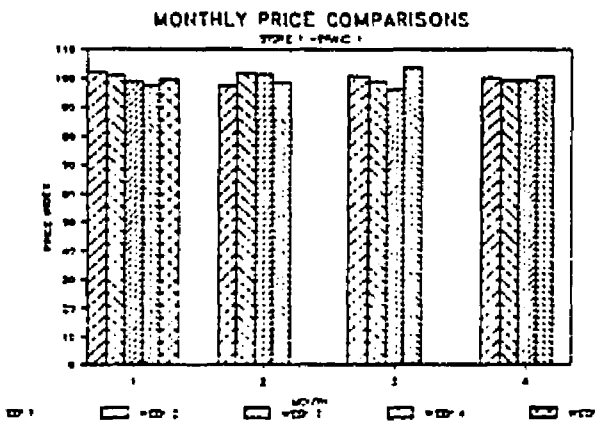
East

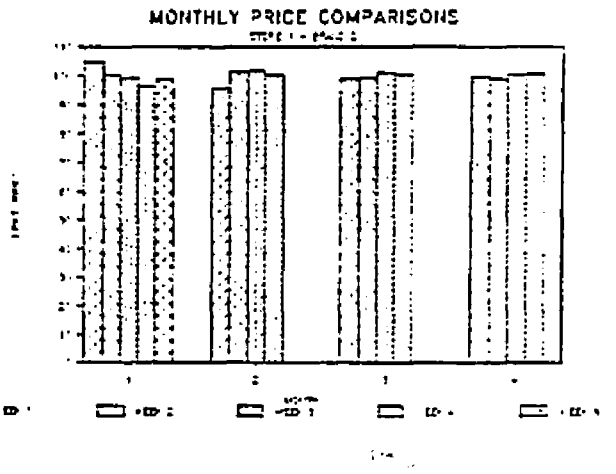


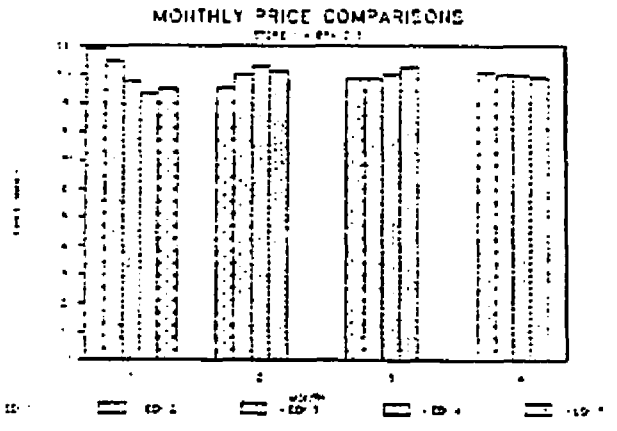
South

APPENDIX N

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 1

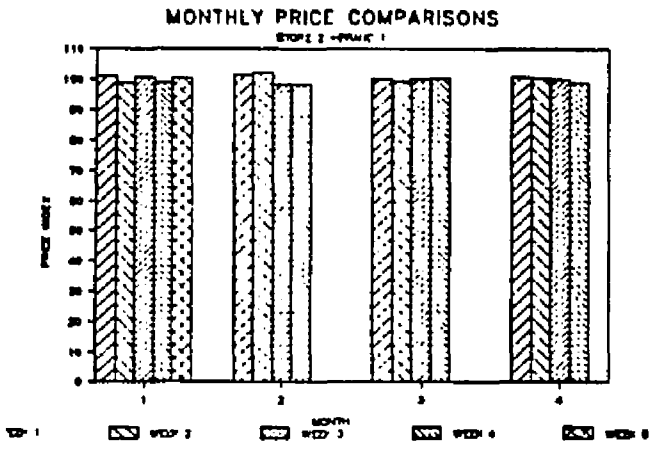


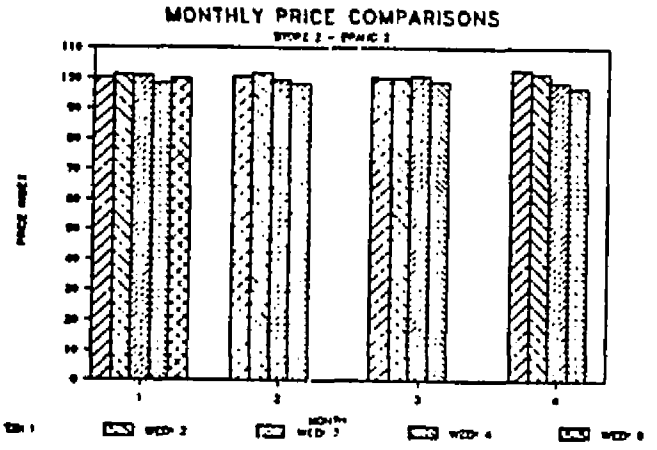


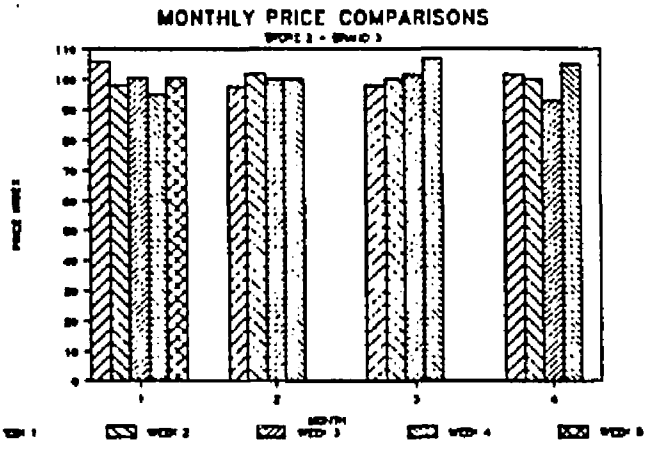


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 2

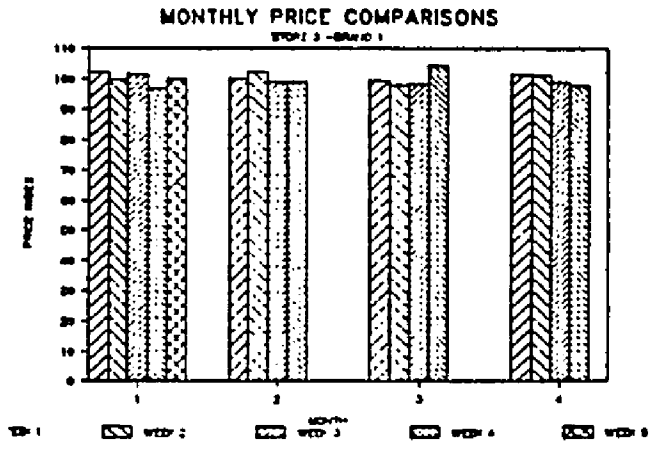


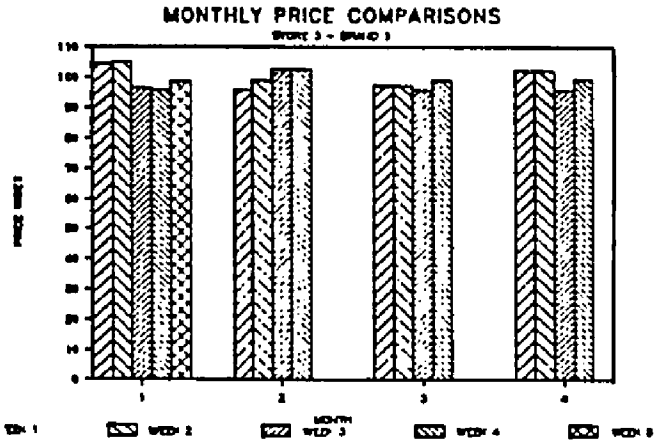


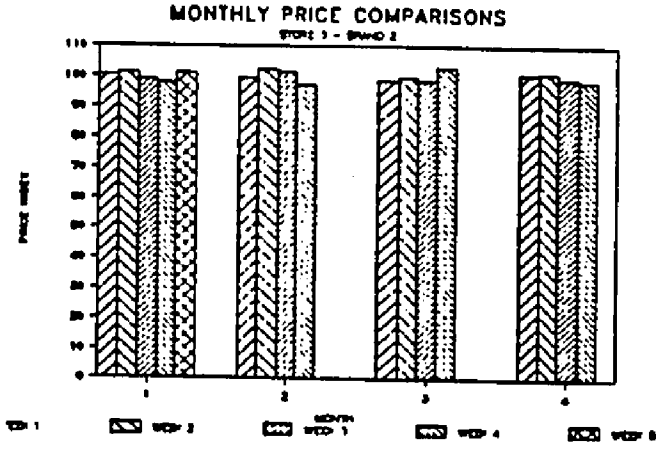


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 3

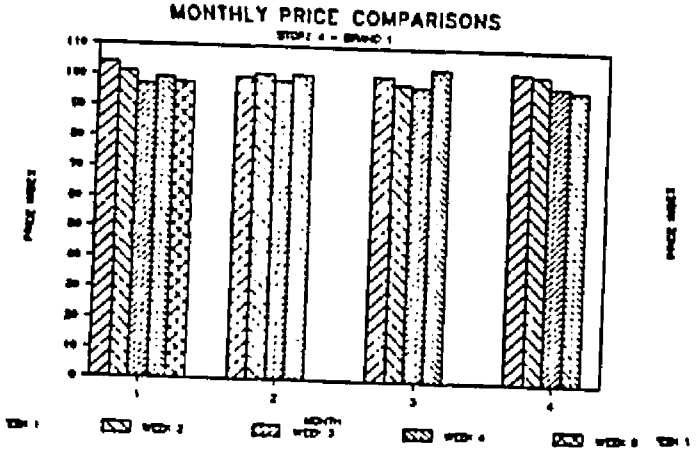


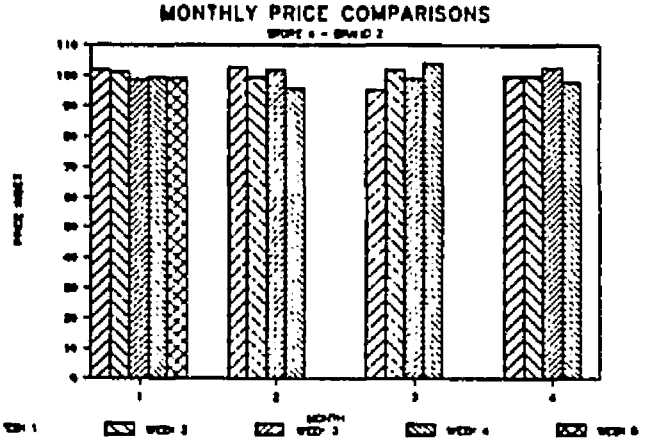


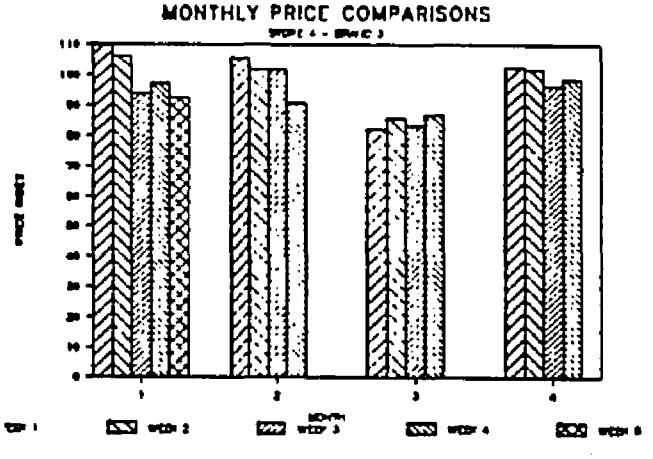


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 4

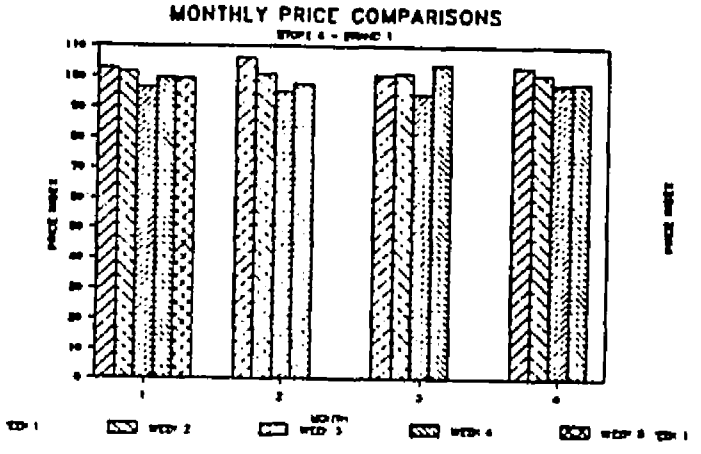


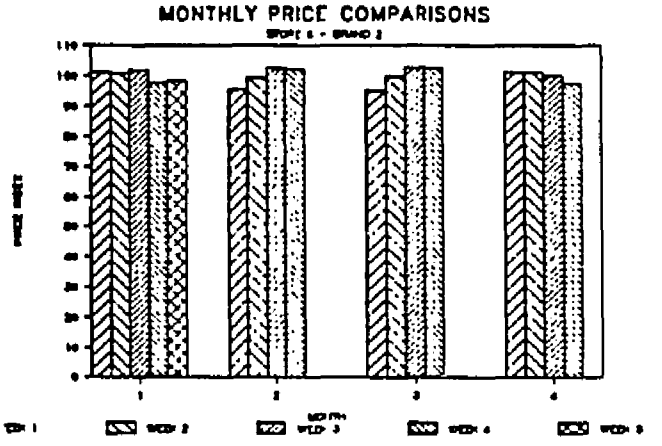


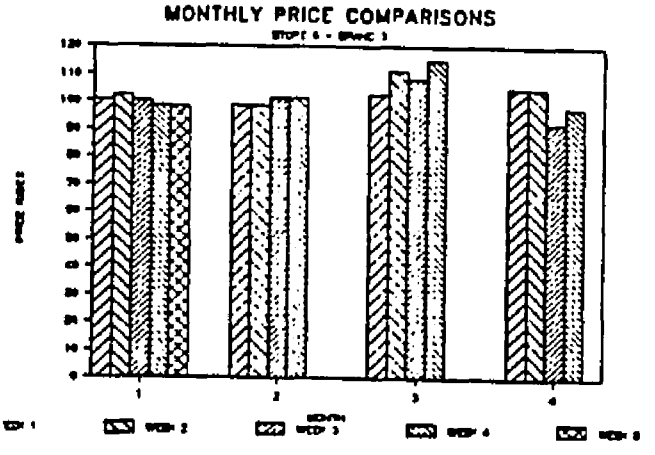


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 6

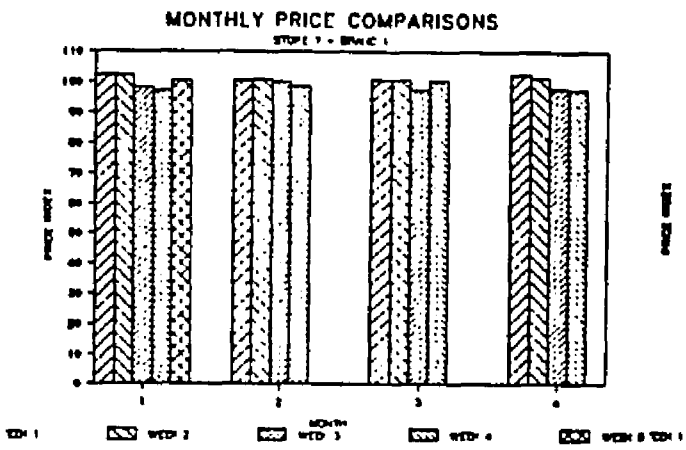


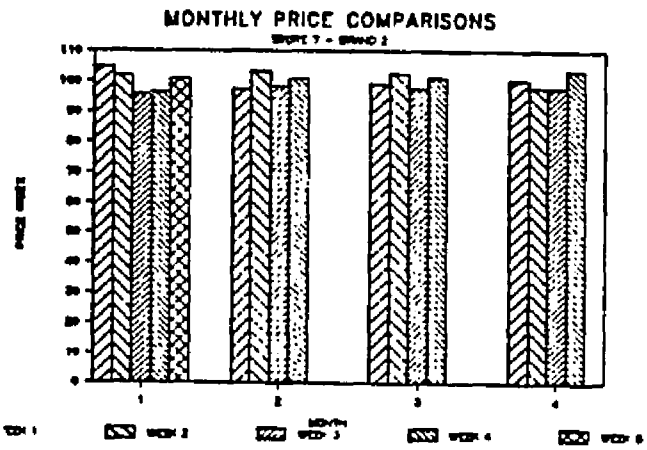


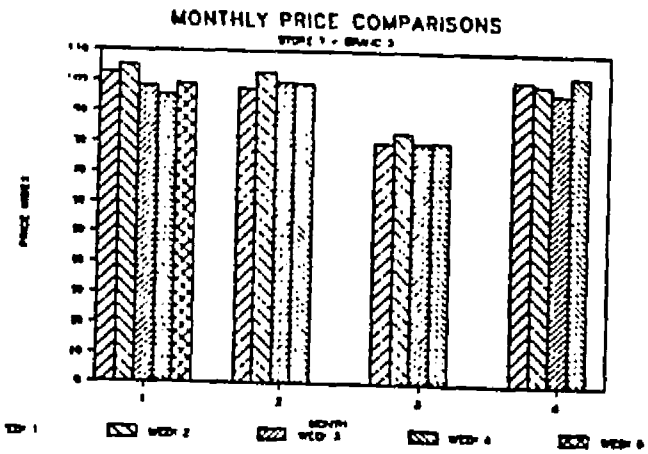


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 7

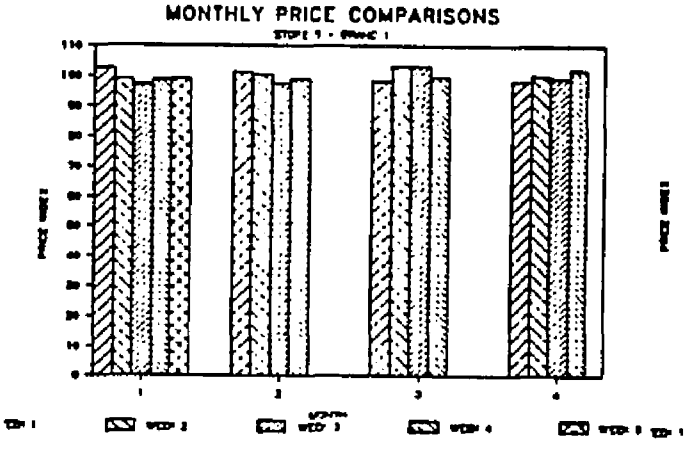


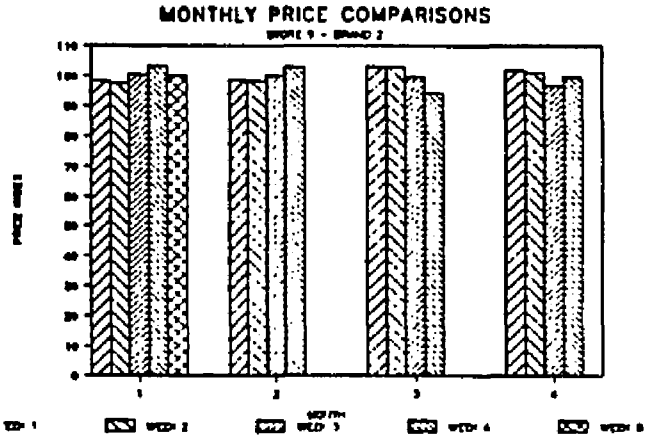


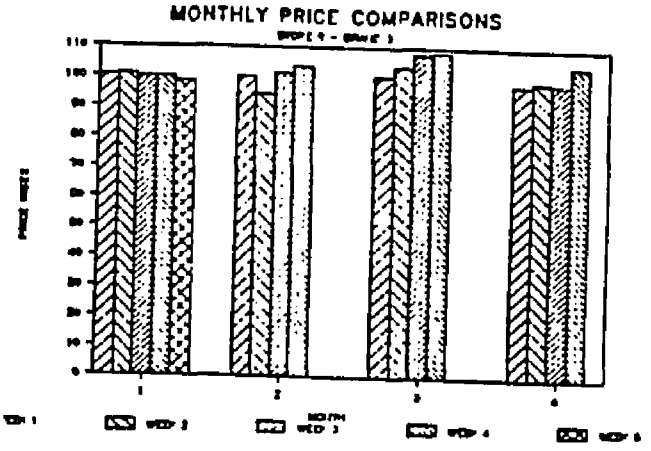


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 9

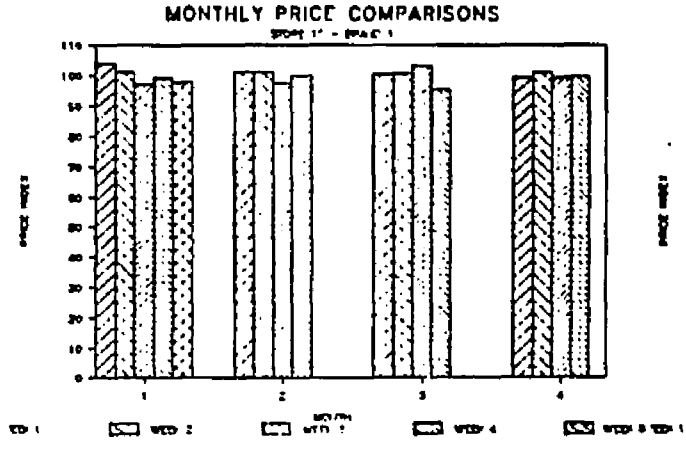


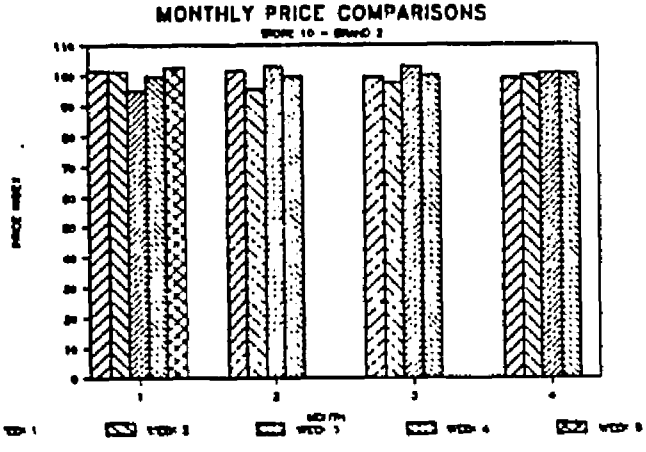


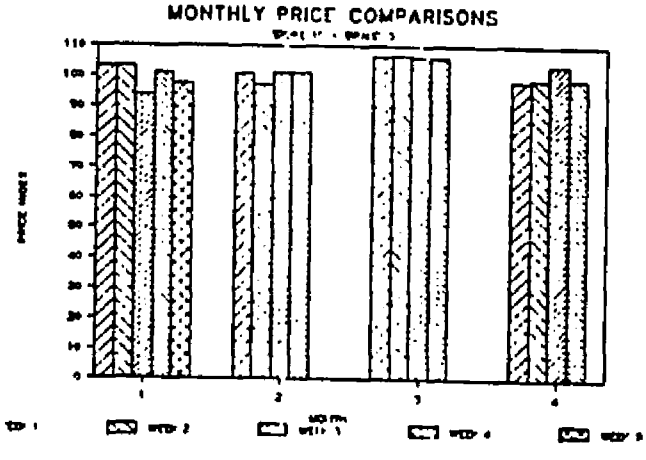


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 10

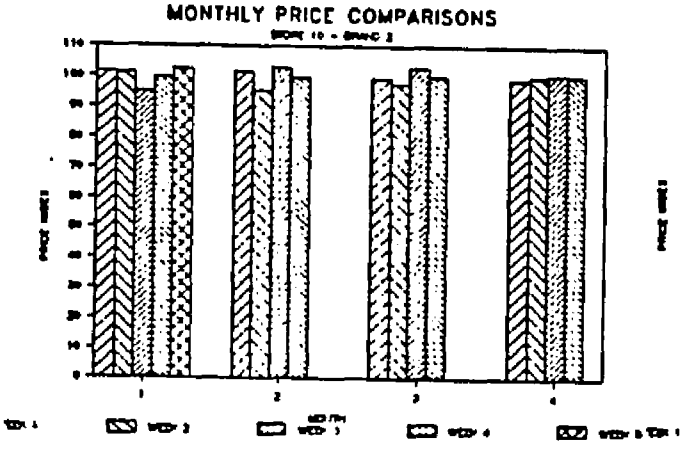


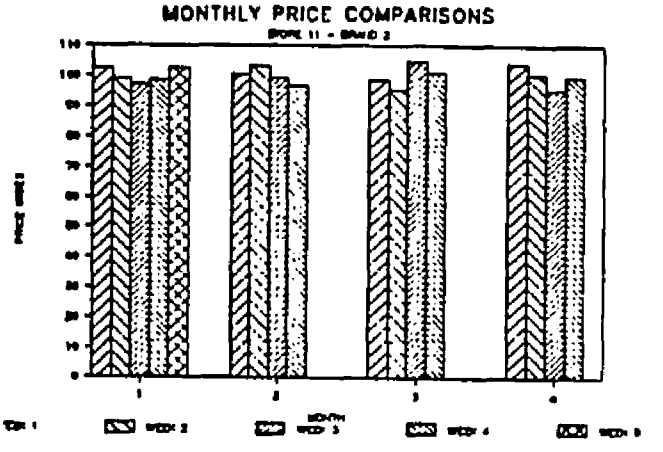


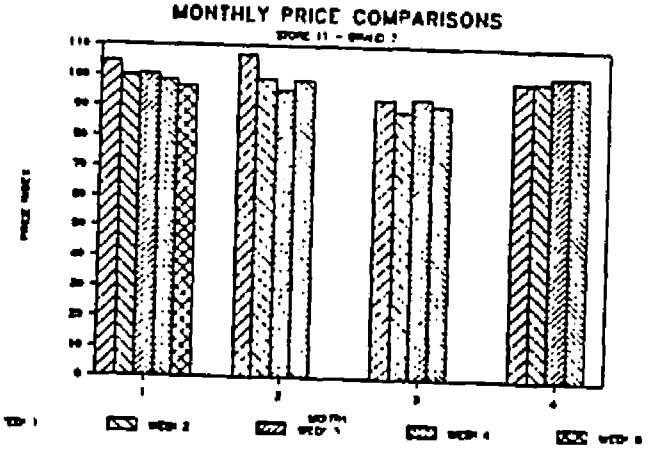


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 11

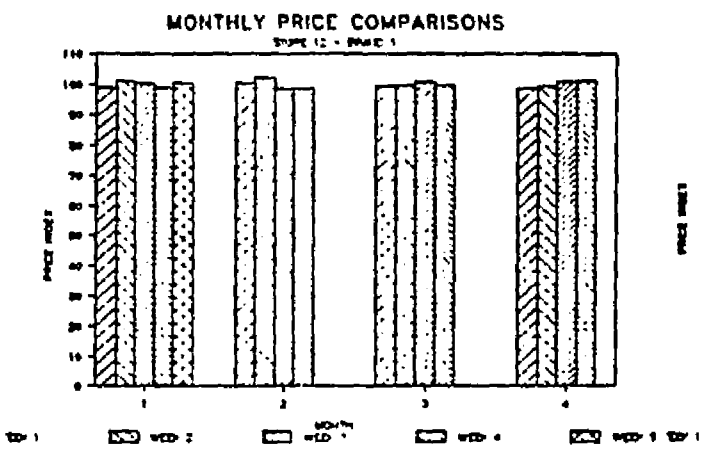


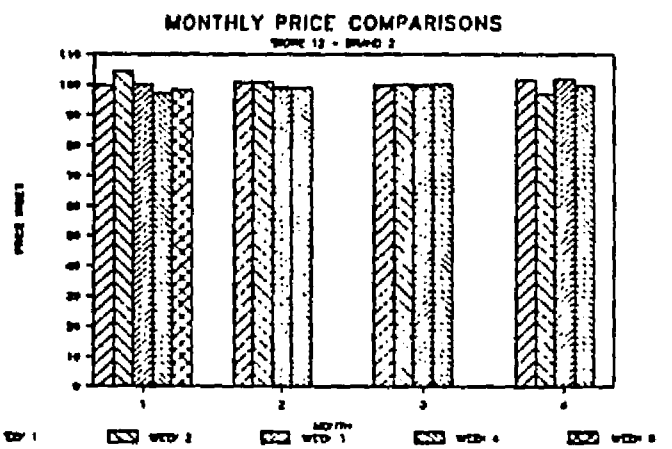


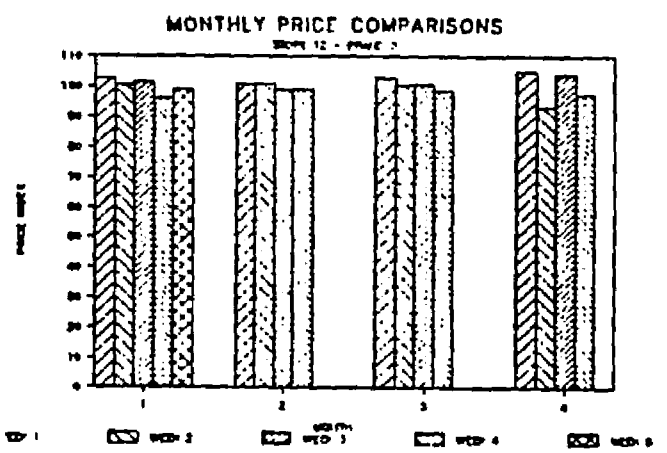


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 12

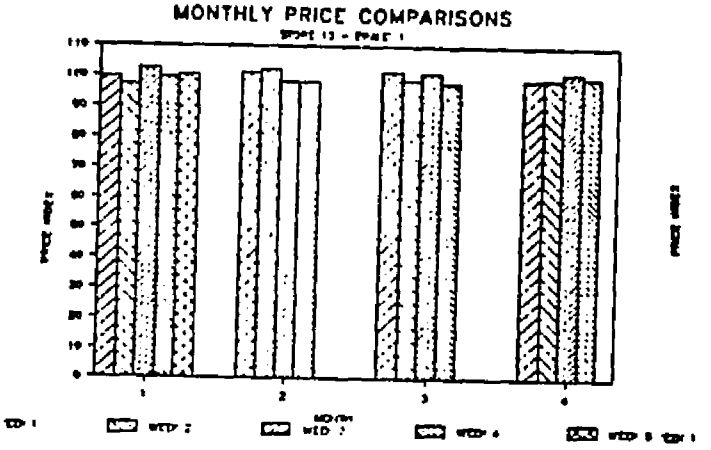


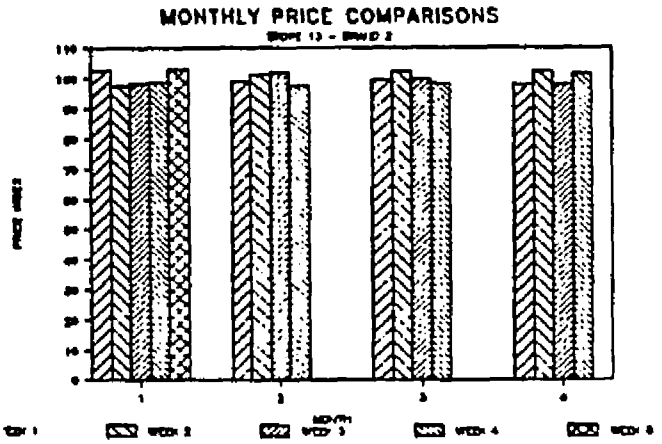


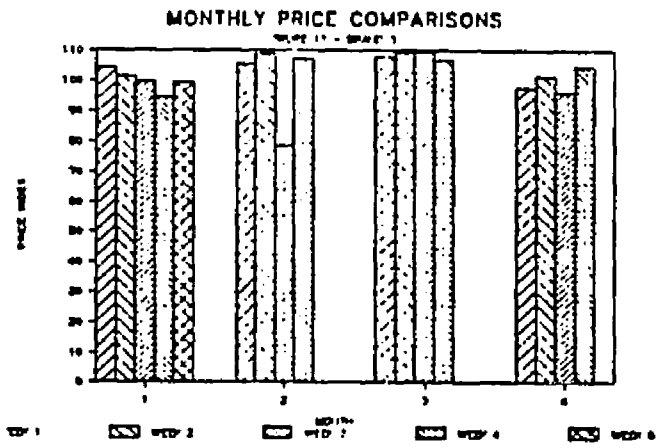


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 13

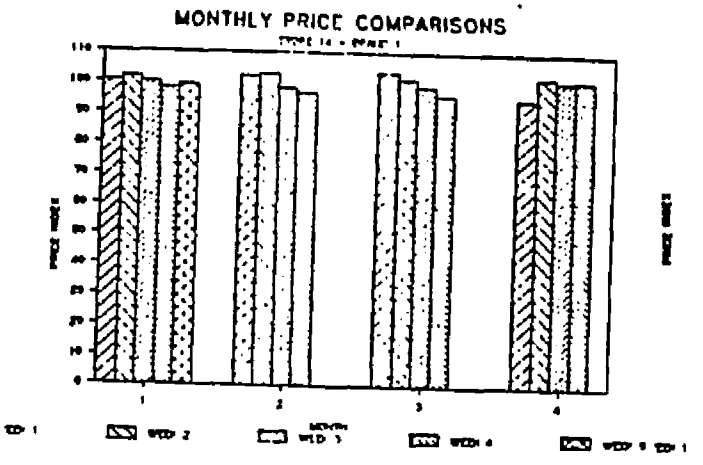


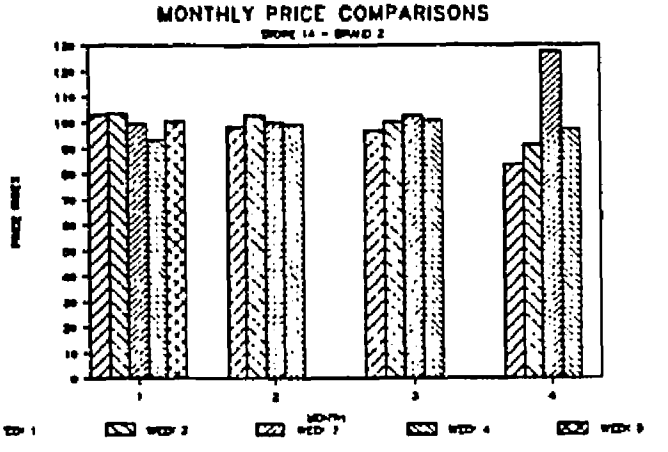


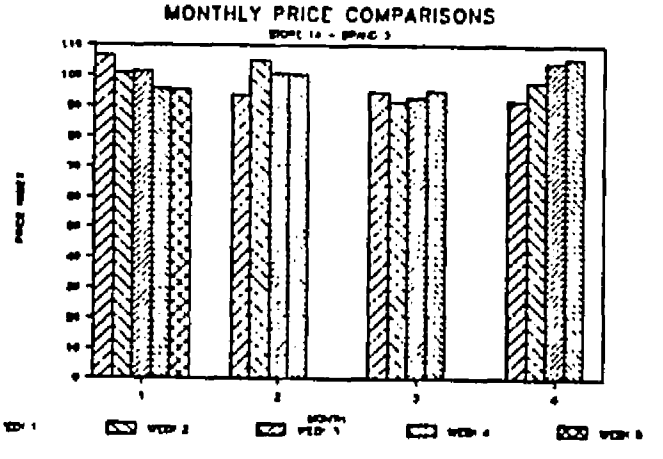


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 14

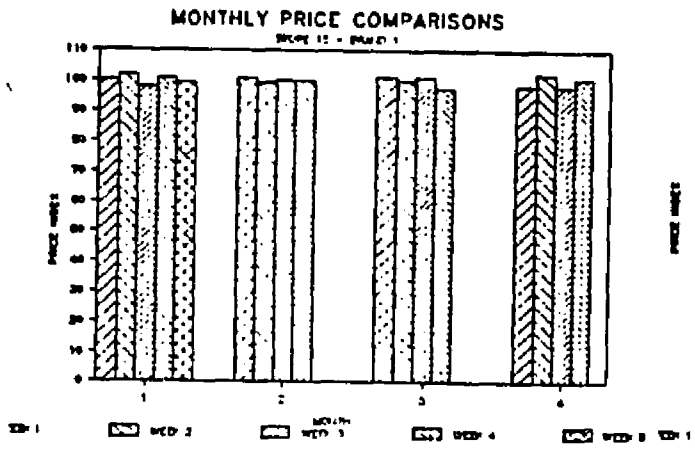


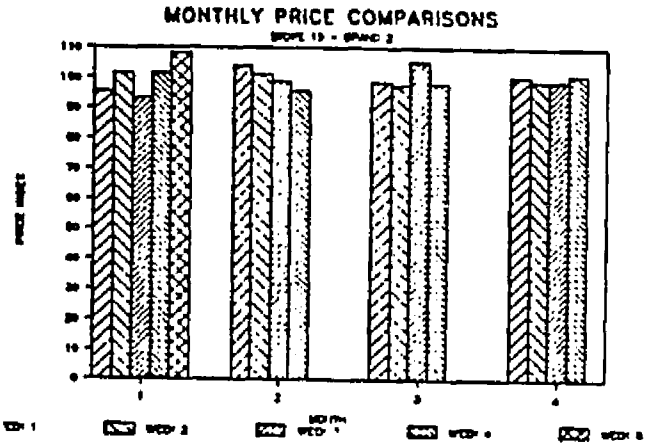


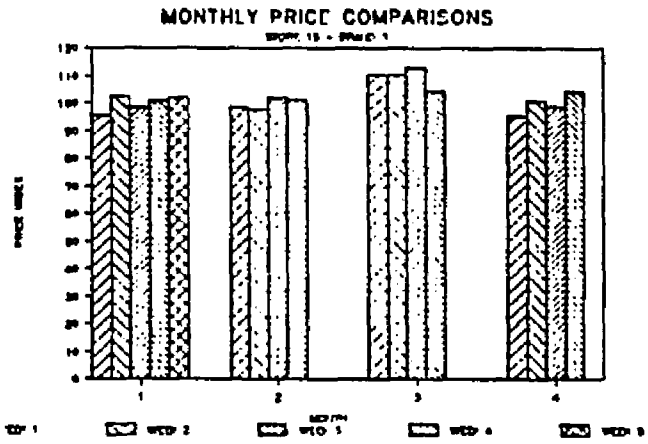


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 15

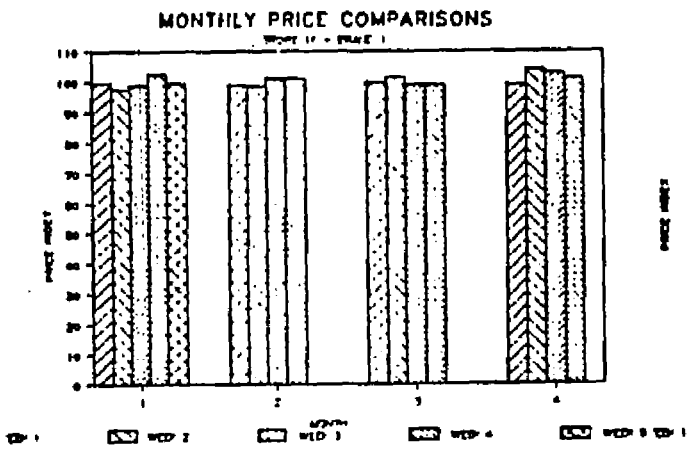


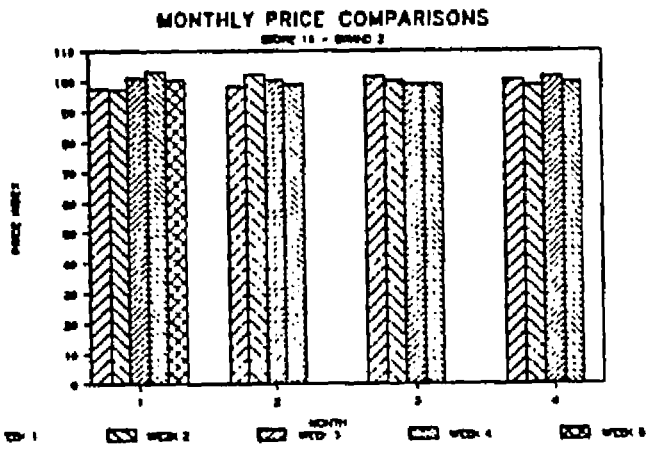


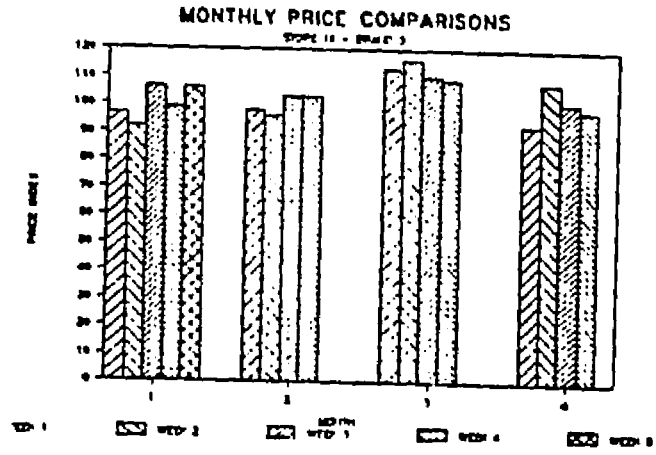


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 16

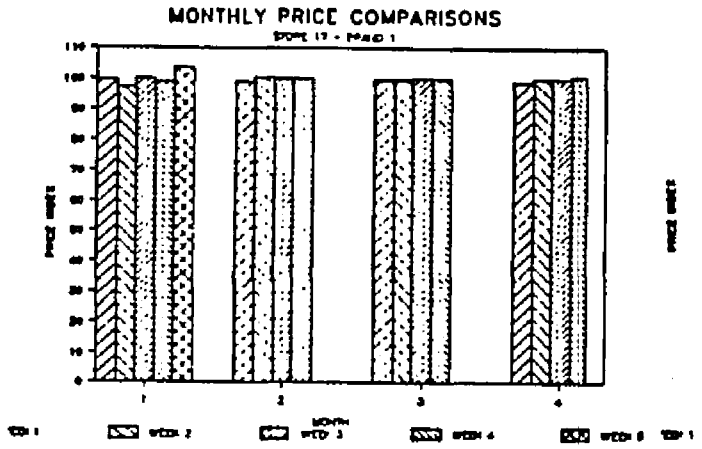


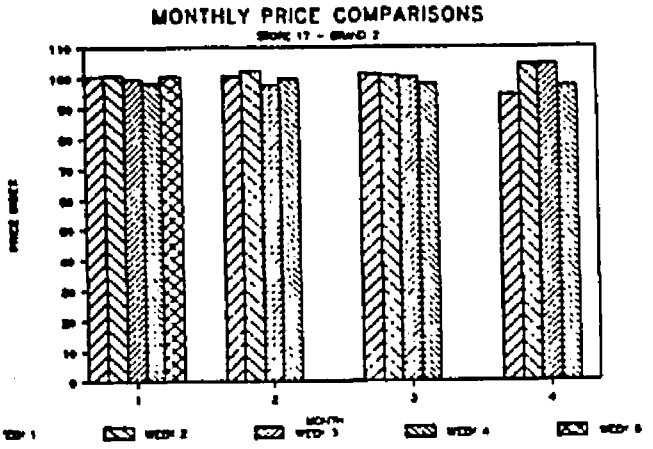


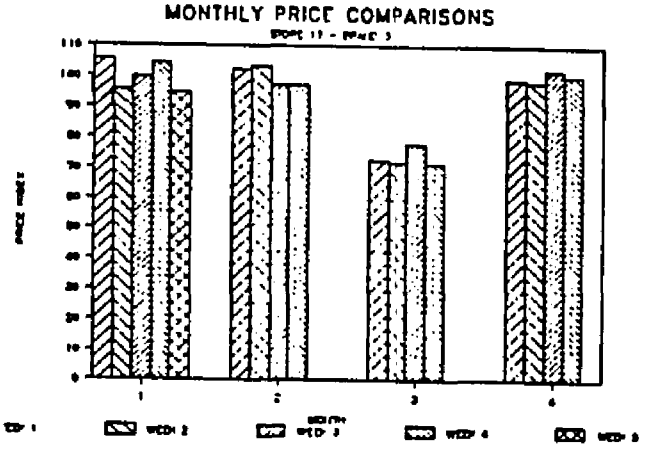


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 17

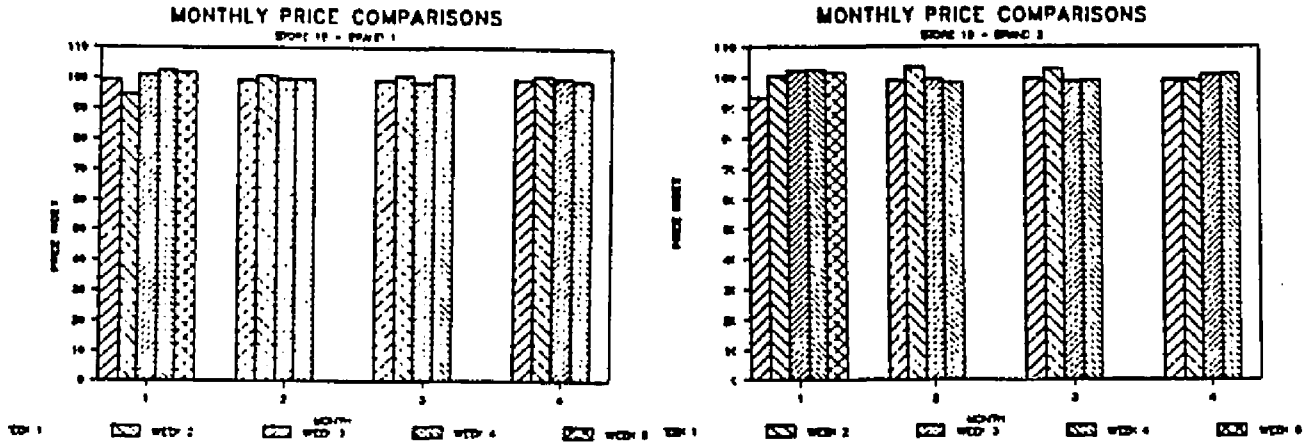


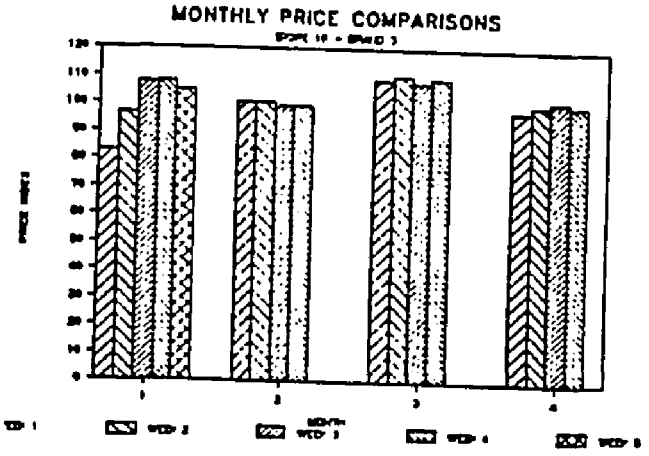




APPENDIX N -- continued

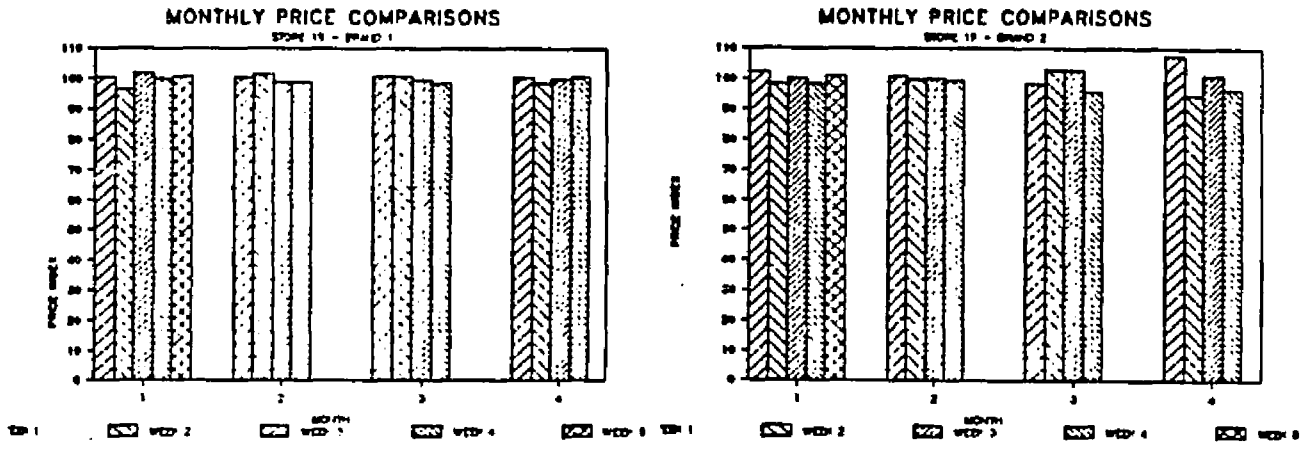
PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 18

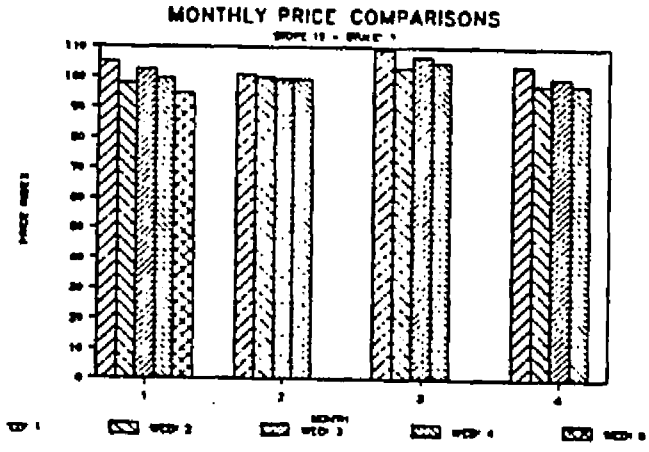




APPENDIX N -- continued

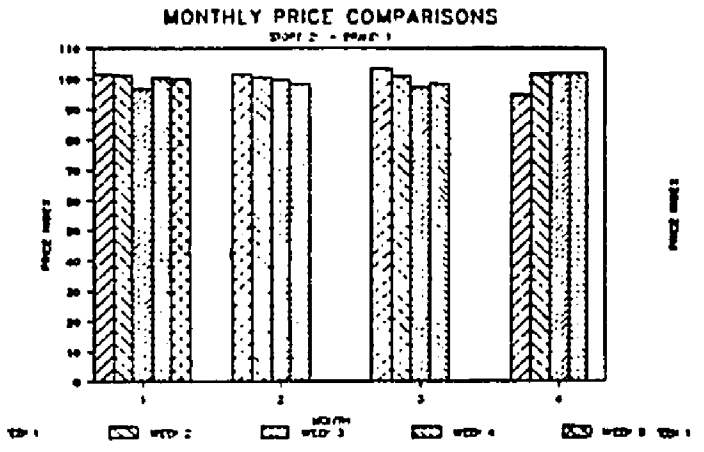
PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 19

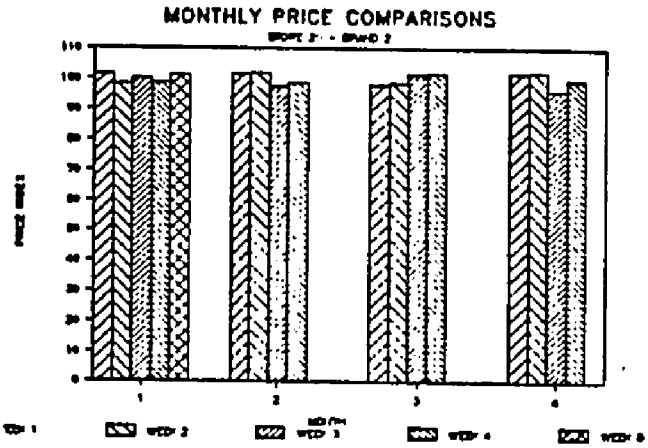


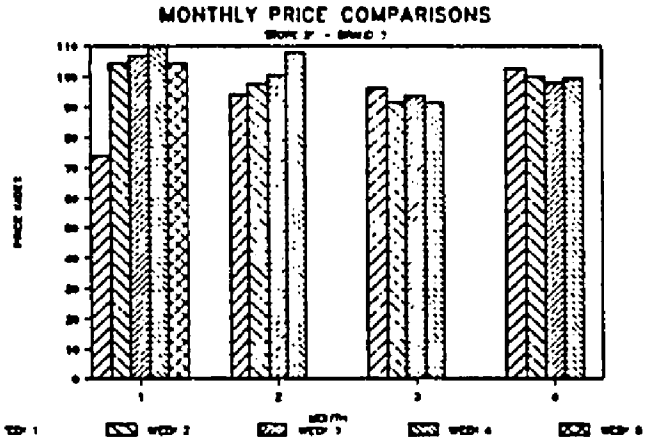


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 20

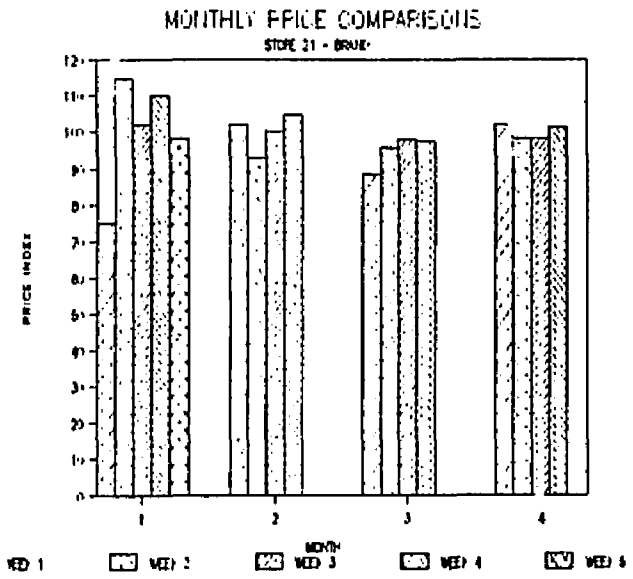


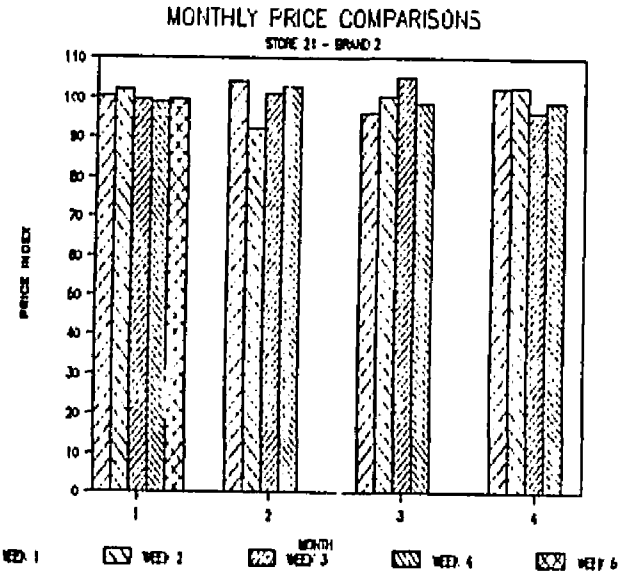


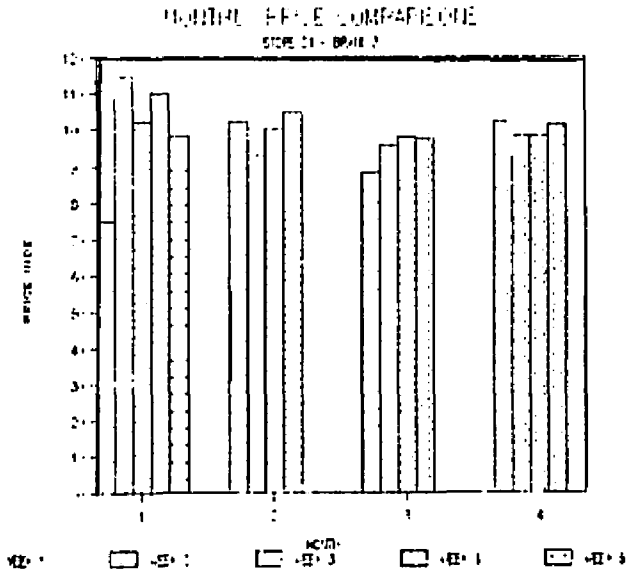


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 21

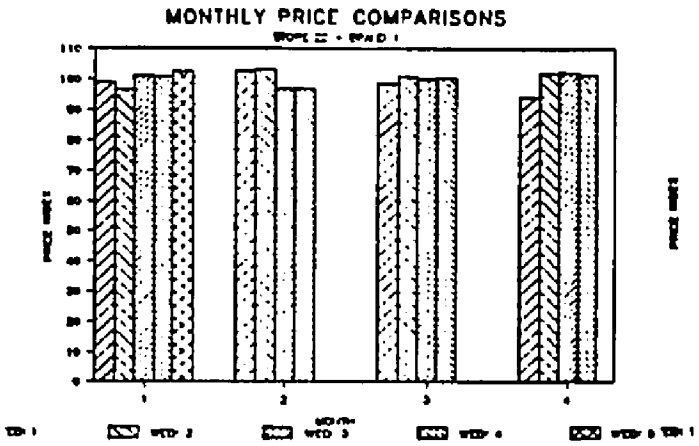


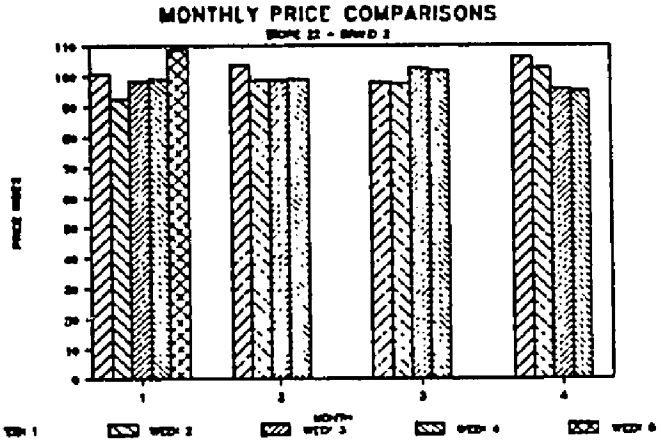


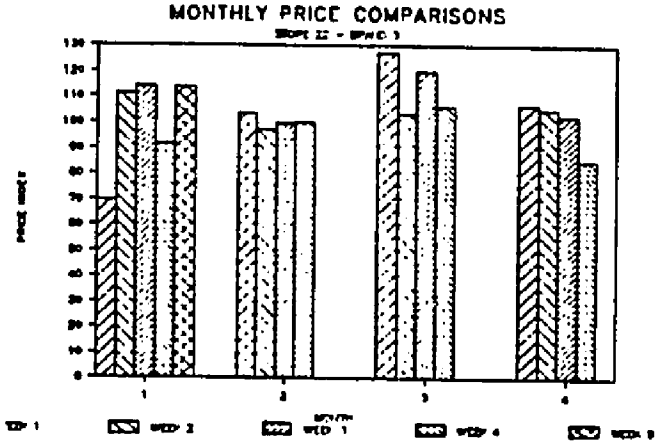


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 22

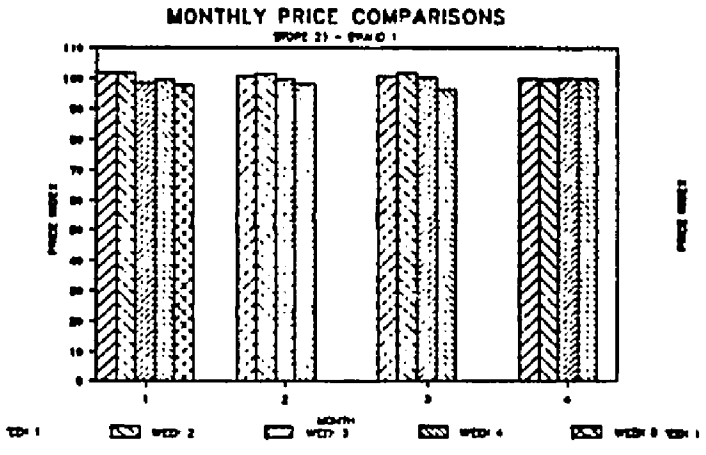


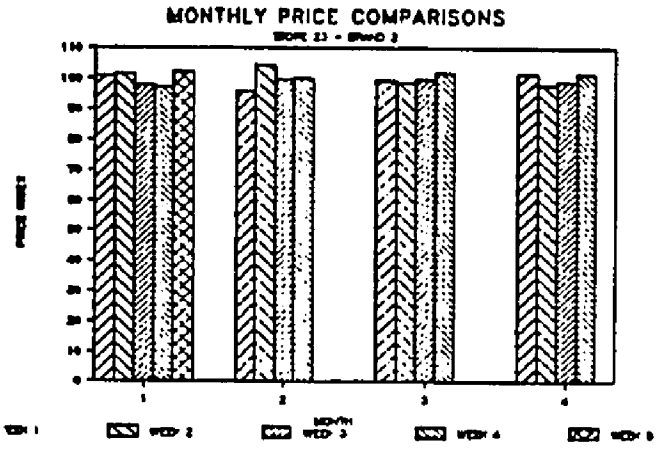


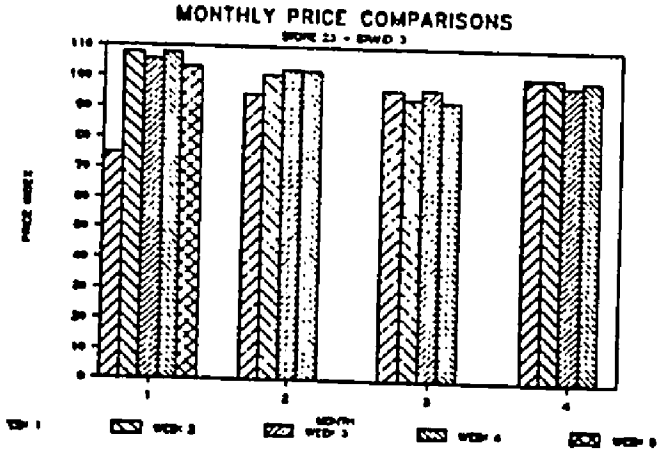


APPENDIX N -- continued

PRICES WITH RESPECT TO THE WEEK OF THE MONTH
Store 23







SELECTED BIBLIOGRAPHY

Alcaly, Roger E. and Alvin K. Klevorick, "Food Prices in Relation to Income Levels in New York City." Journal of Business, (1971):380-97.

Ambrose D. M., "Retail Grocery Pricing in Inner-City, Suburban and Rural Comparison." Journal of Business, 52(1979):95-102.

American Chamber of Commerce Researchers Association (ACCRA), Inter-city Cost of Living Index-232 Cities. Second Quarter 1985 sec.1 pp. 1-6. 1985.

Baumol, W.L., R.E. Quandt, and H.T. Shapiro, "OligopolyTheory and Retail Food Pricing." Journal of Business, 37(1964):346-63.

Benson, Bruce L. and Merle D. Faminow, "An Alternative View of Pricing in Retail Food Markets." American Journal of Agricultural Economics, 67(1985)296-306.

Boone, Louis E. and David L. Kurtz. Contemporary Business, The Dryden Press, Illinois, 1976.

Boynton, William C., Brian F. Blake, and Joe N. Uhl, "Retail Price Reporting Effects in Local Food Markets." American Journal of Agricultural Economics, 65(1983):20-29.

Campbell, W.J. and M. Chisholm, "Local Variations in Retail Grocery Prices." Urban Studies, 7(1970):76-81.

Capozza, Dennis R. and Robert Van Order, "A Generalized Model of Spatial Competition." The American Economic Review, No.5, 68(1978):896-908.

Carmen, Hoy F. and Enrique E. Fiqueroa, "An Analysis of Factors Associated with Weekly Food Store Sales Variations." Agribusiness, 2(1986):375-90.

Chatterjee, Samprit, and Bertram Price, Regression Analysis by Example, John Wiley and Sons, New York, 1977. Chapters 3, 7, and 9.

Cohen, Saul B., Store Location Research for the Food Industry, National American Wholesale Grocers Association Special report, New York, 1962.

Conner, John M., "Food Product Proliferation: A Market Structure Analysis." American Journal of Agricultural Economics, (1981)607-17.

de Gennaro, Nat, "The Tucson Consumer Price Index: Evolution and Recent Trends." Arizona Review 34(1986):1-12.

Department of Commerce. 1980 Census of Population and Housing. Census Tracts, Tucson, Arizona. Government Printing Office, Washington, D.C. 1980.

Department of Commerce. Special Census of Pima County--Arizona, as of 1 April 1985.

Devine, Grant D. and Bruce W. Marion, "The Influence of Consumer Price Information on Retail Pricing and Consumer Behavior." American Journal of Agricultural Economics. 61(1979):228-37.

Dixon, "Do Inner-City Poor Pay More?" The Economics and Business Bulletin. No. 3, 20(1968):6-12.

Donaldson, Loraine, and Raymond S. Strangways, "Can Ghetto Groceries Price Competitively and Make a Profit?" Journal of Business 46(1973):61-65.

Dunn, Edgars, Jr., Location of Agricultural Products. University of Florida Press, 1954.

US Department of Agriculture, Economic Research Service, "Determinants of Market Performance." From chapter 3 of Market Performance: Concepts and Measures. Agricultural Economic Report No. 244., US Government Printing Office, Washington, D.C. 1973.

Faminow, M. and B. Benson, "On the Implications of Reporting Retail Food Prices Over Extended Periods." Working Paper No. 26, Department of Agricultural Economics, University of Arizona, 1985.

Flint, Jerry, "Take the High Ground." Forbes, (June 1987):228-233.

Gallo, Anthony E. and John M. Conner, "Advertising and American Food Consumption Patterns." National Food Review, 19(1982):

Garrod, Peter V. and Roland K. Roberts. "Prices as Proxies for Prices." American Journal of Agricultural Economics, (1986):626-33.

Goodman, C.S., "Do the Poor Pay More?" Journal of Marketing, 32(1968):18-24.

Greenhut, M.L. and H. Ohta. Theory of Spatial Pricing and Market Areas. Duke University Press, Durham, N.C., 1975.

Gray, Roger W. and Roice Anderson, "Advertised Specials and Local Competition Among Supermarkets." Food

Haas, Harold M., Social and Economic Aspects of the Chain Store Movement. Arno Press, New York, 1979.

Hall, Bruce F., "Neighborhood Differences in Retail Food Stores: Income versus Race and Age Population." Economic Geography, No. 3, 59(1984):282-95.

Handy, Charles R., "Surveying Private and National Brand Prices." National Food Review, 29(1985):28-35.

Handy, C.R. and D.I. Padberg, "A Model of Competitive Behavior in Food Industries." American Journal of Agricultural Economics, 53(1971):182-90.

Hawkins, M.H., A.A. Warrack, and W.S. Pattison, "Intercity Retail Food Price Behavior." Canadian Journal of Agricultural Economics, No. 2, 16(1963):41-51.

Hay, A.M. and R.J. Johnson, "Spatial Variations in Grocery Prices: Further Attempts at Modeling." Urban Geography, No. 3, 1(1980)189-203.

Heyne, Paul, and Thomas Johnson, Toward Economic Understanding, Science Research Associates, Inc., Chicago, 1976. Chapter 9.

Holdren, Bob R., "The Nature of Competition Among Food Retailers in Local Markets."

Hollander, Stanley C., "Price and Competitive Aspects of the Distributive Trades: Theoretical Implications of Empirical Research on Retail Pricing." American Economic Association

King, Ralph Jr., "Food Distributors." Forbes, (Jan. 1987):130-138.

Kolbe, Phillip T., 1980 Tucson Area Family of Four Budget Study, College of Business and Public Administration, University of Arizona for Valley National Bank, 1981.

Kunreuther, Howard, "Why the Poor May Pay More for Food: Theoretical and Empirical Evidence." Journal of Business 46(1973):368-83.

Marion, Donald R., "Toward Revitalizing Inner-City Food Retailing." National Food Review, 19(1982):22-5.

McCartney, Leslie K., "Consumer Information on distributor and Manufacturer Brands of Food." Canadian Journal of Agricultural Economics, 28(1980):86-92.

McCracken, Vicki A., Robert D. Boynton and Brian F. Blake, "The Impact of Comparative Food Price Information on Consumers and Grocery Retailers: Some Preliminary findings of a Field Experiment." Journal of Consumer Affairs, No. 12, 16(1982):224-39.

Mueller, Willard F. and Leon Garoian, Changes in the Market Structure of Grocery Retailing, University of Wisconsin Press, Madison, 1961.

National Commission on Food Marketing, Special Studies In Food Marketing. Technical Study No. 10.

Nelson, Paul Jr.,Comparative Market Basket Indexes: By Kinds-Locations of Supermarkets-Analysis of Observed Differences. National Economics Division; Economic Research Service; U.S. Department of Agriculture; Washington, D.C. No. AGES 830629, 1983.

O'Farrell, P.N. and M.A. Poole, "Retail Grocery Price Variation in Northern Ireland." Regional Studies, 6(1972):81-92.

Padberg, Daniel I., Economics of Food Retailing. Cornell University, New York, 1968)

Padberg, D. I., "Analysis of the Profit and Price Performance of Leading Food Chains, 1970-1974. Authors: Marion, Bruce, W.F. Mueller, R.W. Cotterill, Federick Geithman and John R. Schmeltzer."

Padberg, D.I., "Emerging Effectiveness of Competition and the Need for Consumer Protection." American Journal of Agricultural Economics, 57(1975):196-205.

Padberg, D.I., and R.E. Westgren, "Product competition and Consumer Behavior in the Food Industries." American Journal of Agricultural Economics, No.4 61 (1979):620-25.

Parker, Anthony J., "Inter-Urban Variations in Retail Grocery Prices." Economic and Social Review, 5(1974):393-403.

Popham, W. James and Kenneth A. Sirotnik, Educational Statistics: Use and Interpretation. (Harper and Row, Publishers, (1973).

Price, Charlene C. and Doris J. Newton, "Supermarket Characteristics: A Continual Evolution." National Food Review, 35(1986):20-22.

----------, "Market Scoop." Progressive Grocers - Data Bank of Supermarket Distribution 1986.

Sexton, Donald E. Jr, "Food Sales Mix and Profitability: Ghetto Supermarkets Revisited." Journal of Business, 47(1974): 538-42.

Sexton, Donald E. Jr., "Comparing the Cost of Food to Blacks and Whites--A survey." Journal of Marketing, 35(1971):40-46.

Stigler, G.D., "The Economics of Information." Journal of Political Economics, 69(1961):13-26.

Stigler, George J., "Perfect Competition: Historically Contemplated." Journal of Political Economy. 525(1957):

Stigler, George J. and James K. Kindahl. The Behavior of Industrial Prices. New York. National Bureau of Economic Research. 1970.

Tucson Economic Development Corporation. Enterprise Directory: Tucson, 1988.

, Tucson Trends. Valley National Bank and Tucson Newspaper, 1986.

Tucson, Trends, Valley National Bank and Tucson Newspaper, 1986.

Tucson, Trends, Valley National Bank and Tucson Newspaper, 1986.

Tucson Newspaper, Inc. Tucson Market Profile, 1987.

Urbany, Joel E., "An Experimental Examination of Economics of Information." Journal of Consumer Research, 13(1986)257-71.

US Bureau of the Census, Statistical Abstract of the United States: 1988 (108th edition). Washington, D.C. 1987.

USDA Economic Research Service, Agricultural Markets in Change, Agricultural Report No. 95, Marketing Economics Division, 1966.

USDA Department of Agriculture, Food Marketing. Agricultural Economic Report #549. Washington, D.C. US Government Printing Office. 1985.

USDA Department of Agriculture, Food Marketing. Agricultural Economic Report #565. Washington, D.C. US Government Printing Office.