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Do the poor pay more for healthy food? an empirical economic analysis

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DO THE POOR PAY MORE FOR HEALTHY FOOD? AN EMPIRICAL ECONOMIC ANALYSIS

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ABSTRACT

The economic question this study seeks to answer is why healthier food products are less expensive in some stores than in others and in some neighborhoods than others. The analysis builds upon the precedent of past retail food pricing studies that have been conducted in Southeastern Louisiana and in other parts of the country, by further examining disparities of retail food costs across store formats and neighborhoods with different demographic compositions. It utilizes a comparison of a general market basket of food items used in past studies and a "representative" market basket that is regionally specific to Southeastern Louisiana to see if the composition of a selected market basket of goods impacts results. Specifically, the objectives of this study are to:

1. Determine whether the cost of a market basket that is composed of more "representative" regional food items that meet the 2005 Dietary Guidelines for Americans (DGA) differs from that of a general market basket developed by Pennsylvania State University researchers to meet the Thrifty Food Plan menu based on the 1995 DGA.
2. Determine whether demographic characteristics of a neighborhood have an influence on the cost of a healthy market basket of foods in that neighborhood.
3. Determine whether demographic characteristics of a neighborhood have an influence on the competition of supermarkets in that neighborhood.
4. Determine whether store size, type, and competition influence the cost of a healthy market basket in Baton Rouge, LA.

The results of the study show that neither the TFP nor the 2005 DGA market basket of food items cost more, on average, at stores that are located in lower income areas in the Baton Rouge,

LA, metropolitan area. The composition of the market basket including more "representative," regionally-specific food items does not notably impact results. It can be concluded that food costs are significantly influenced by the management structure and store format, with chain stores and supercenters having the lowest market basket costs. A visual inspection of the distribution of large grocery stores suggests that some areas are more disadvantaged than others, especially rural areas.

CHAPTER 1: INTRODUCTION

The retail food industry has been of study interest in the field of economics because it encompasses many separate economic subjects within one elaborate and influential industry. In many ways, study of the retail food industry is fundamentally linked with one of the foundational subjects of economics: economic choice. Researchers of the retail food industry are able to assess the choices of producers, marketers, firms, and individual consumers, as well as how these choices interact and influence the industry as a whole. Production economists are able to assess the production decisions based on consumer demand and other factors, industrial organization economists analyze the choices firms make while marketing food throughout the retail food system, and behavioral economists are able to examine the choices made by individual consumers within grocery stores and supermarkets. These separate but interlinked areas of analysis make the retail food industry a subject of interest to a wide variety of economists.

Researchers in other fields have also identified the retail food industry as a subject of interest because of the extensive role of the retail food industry in the many choices people make throughout the course of each day. The decisions of which foods to buy, cook, and eat can influence individual diets, as well as individual health and nutrition. These individual choices can be aggregated and assessed on a local, state or national level. The sum of individual judgments becomes representative of the comprehensive overall nutritional, health and economic environments of our communities and nation. Therefore, local and comprehensive study of the dynamics of the food industry has implications for researchers, business leaders, health policy officials and policymakers across many separate subject areas.

The allocation of income on food impacts an immense number of interested parties. A government official may be interested in how best to maximize the purchasing power of

individuals or how to help the lowest income individuals achieve a nutritious diet. A health official is concerned with how the individual consumer decisions in terms of consuming food influence individual and societal health. The retail grocery firm seeks to meet the demand decisions of its patrons in the most efficient manner. The common theme that ties the interests of these separate parties together is the fundamental role of local, unique food environments in influencing these disparate decisions in distinctive ways. Moore and Diez Roux (2006) observe significant variation in the food environments of neighborhoods with different racial and socioeconomic characteristics in a number of different locations throughout the nation.

Achieving a greater understanding of the retail food industry and local food environments remains an important goal of researchers and policymakers because the broad scope of the industry impacts individual, local and national economic choices in profound ways. For example, Hayes (2000, 127) mentions that the composition of a local food environment can impact the purchasing power of individual consumers, including Supplementary Nutrition Assistance Program (SNAP; formerly the Food Stamps Program) benefit recipients. This single example of an economic decision regarding SNAP benefit appropriations has wide ranging effects on local and national government budgets, household income allocation decisions of recipients, and supply decisions of firms that accept SNAP benefits as payment.

The allocation of food resources through the SNAP program has particular pertinence in the Baton Rouge, LA, metropolitan area because the rates of poverty in the area are higher than the national average in many parts of the region. Statistics from the US Census Bureau show the average, for the nine parish Baton Rouge, LA, metropolitan area, of the percentage of persons below the poverty level in 2008 to be 17.8 percent. This level is above the 2008 national average in 2008 of 13.2 percent. The range for the percentages below the poverty level for the nine

parishes is 9.9 to 21.9 percent. The percentage of people below the poverty level in the city of Baton Rouge, LA, is substantially higher than the country average at 24 percent, although this statistic was constructed using data from 1999 (USA QuickFacts from the US Census Bureau). Therefore, the allocation of SNAP benefits and the food environments in which SNAP beneficiaries live and shop are of particular concern to policymakers and health policy officials in Baton Rouge, LA, and other parts of Southeastern Louisiana.

Food environments in Louisiana are pertinent for study because, in 2001, Louisiana was ranked eighth in the nation for both prevalence of obesity and diabetes (Mokdad et al., 2003). One of the identified goals of the 2005 Dietary Guidelines for Americans (2005 DGA), published jointly by the U.S. Department of Health and Human Services and the U.S. Department of Agriculture, is to encourage healthy eating habits to reduce the risk of chronic disease, such as diabetes, heart disease, and cancer. The essential role of individual diet on personal health, and the link between food consumption habits and personal nutrition, established by Hersey et al. (2001, S24), has inspired researchers to examine the features of local food environments in Louisiana that may influence dietary decisions.

Policymakers have recently expressed an interest in assessing the local food environments in the Baton Rouge, LA, metropolitan area to help ensure there is sufficient access to healthy foods. The Healthy Retail Food Act was sponsored State Senators Ann Duplessis and Michael J. Michot and State Representative Rosalind Jones with the goal of increasing access to fruits and vegetables in underserved areas. The Healthy Retail Food Act, State Senate Bill 299, was signed by Governor Jindal on July 1, 2009, and allows for the potential funding of grants or loans to healthy food providers in underserved areas (Louisiana Legislature).

Beyond the policy interest in analyzing the Baton Rouge, LA, metropolitan area food environment, academic research has also been conducted in this community. A number of studies have been conducted by graduate students in the Louisiana State University School of Human Ecology. Particularly applicable to the objective of this study, individual studies by Ms. Blair Buras, MS, and Ms. Laura Stewart, MS, explored whether the price of food was prohibitive for SNAP beneficiaries to obtain a nutritious diet. Buras (2006) examined the ability of low-income consumers in the Baton Rouge, LA, metropolitan area to afford the market basket of food included in the Thrifty Food Plan (TFP) menu, while Stewart (2006) analyzed whether a two-week menu that meets the 2005 DGA was obtainable for SNAP beneficiaries. Both studies were pioneering in their efforts to achieve a greater understanding of the Baton Rouge, LA, metropolitan area food environments.

In addition to these studies that were conducted in Baton Rouge, LA, researchers have also identified the New Orleans, LA, community as an area of interest for food retail industry research. Rose et al. (2009) studied the possible existence of "food deserts" in New Orleans, LA, and found that the existence of food deserts is highly influenced by the definition of what constitutes a food desert. The authors conclude that some areas of the city have less access to large supermarkets, but there are often smaller stores that may sell healthier food items in markets lacking supermarkets. Overall, the authors found that certain neighborhoods may be disadvantaged in terms of lack of access over others, but the extent of lack of access varied across neighborhoods.

This study builds upon the precedent of past studies that have been conducted in SE Louisiana by further examining cost disparities of retail food across store formats and neighborhoods with different demographic compositions. It utilizes a comparison of a general

market basket of food items used in other studies and a more "representative" market basket that is regionally specific to SE Louisiana to see if the composition of a market basket of goods used in analysis impacts results. Many nutritionists seek to know the answers to such questions as: Why do some consumers not purchase the recommended number of fruits and vegetables for their daily dietary needs? Why are healthier food products less expensive in some stores than in others and in some neighborhoods than others? This second question is the economic question that this study attempts to answer.

Specifically, this study seeks to assess the determining demographic and store specific factors that influence the cost of retail food. Price is an important factor that can influence the decision of where to shop and what to purchase, but it is not the only factor (Cude and Morgansky, 2001, 20). This study seeks to examine which factors are the most significant in determining retail food cost, and to explore whether the composition of the food environment of the Baton Rouge, LA, metropolitan area disadvantages low-income consumers. The general approach to this subject will be to create a useful econometric model based upon past research to assess how store-specific and neighborhood-specific demographic factors influence market basket costs. The significance or non-significance of these individual factors will allow for comparison in order to draw exploratory conclusions about the composition of the Baton Rouge, LA, metropolitan area food environment.

In summary, the objectives of this study are the following:

1. Determine whether the cost of a market basket that is composed of more "representative" regional food items that meet the 2005 DGA differs from that of a general market basket developed by Pennsylvania State University researchers to meet the Thrifty Food Plan menu based on the 1995 DGA.

2. Determine whether demographic characteristics of a neighborhood have an influence on the cost of a healthy market basket of foods in that neighborhood.
3. Determine whether demographic characteristics of a neighborhood have an influence on the competition of supermarkets in that neighborhood.
4. Determine whether store size, type, and competition influence the cost of a healthy market basket in Baton Rouge, LA.

In a similar way to Jetter, Crespi, and Cassady (2006), the format for the theory discussion of this study will distinguish between the different areas of economic theory that have been included in past analysis of the retail food industry. However, the organization of the different theories is different in nature and composition. Specifically, I have chosen to make a similar distinction to that made within the June 2009 Report to Congress by the United States Department of Agriculture Economic Research Service, entitled, "Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and Their Consequences." The Report makes a useful distinction between analyzing the demand-side and supply-side approaches of prominent industrial organization studies of the retail grocery market. The distinction between the supply-side and demand-side issues can be useful for providing a more comprehensive context from which to view the demand and supply relationships that interact within the retail food industry (Report to Congress, 2009, 83-84). The June 2009 USDA Report to Congress on food access focuses primarily on making a determination on whether Americans have sufficient access to various food items. Access will be a component of this study, but not the primary focus.

Following the examination of past theoretical studies that have been conducted in order to analyze the demand and supply approaches to food pricing research, a number of pertinent

exploratory food pricing studies will be discussed and analyzed to conclude the second section. The examination of the exploratory food pricing studies is supplemented by the assessment of health and nutrition oriented studies focusing on the costs of healthier food items. This background discussion of past theoretical and exploratory studies in Chapter 2 of this study will provide context for the development of an economic model specific to this study conducted in the Baton Rouge, LA, metropolitan area. Chapter 3 will outline economic theory pertinent to this study, a general economic model, a description of the dependent and independent variables included in the analysis, and a specific economic model. Chapter 4 will expound on the data sources and econometric methods utilized by this study, including specific transformations and substitutions for missing items that are unique to this study. Results for the analysis using the TFP market basket menu, results for the analysis using the regionally-specific "representative" menu that meets the 2005 DGA developed by Stewart (2006), and a comparison of the results from the two analyses is included in the fifth chapter. Chapter 6 will consist of some final conclusions drawn from the analyses.

CHAPTER 2: REVIEW OF THE LITERATURE

2.1 Food Retail Industry Organization: Supply Side Theoretical Overview

Research on the retail food industry has been conducted primarily at the firm level in order to analyze the factors that impact industry supply. Industrial organization theory, as described by Marion et al. (1979), states that the structure of a market can impact the number of firms and their performance. In particular, market structure determines the amount of competition in the market, the opportunity for entry into the market, and the extent of product differentiation that exists in the market (Marion et al., 1979, 56). Studies that are conducted within the industrial organization framework can be differentiated into two different segments. Lamm (1981, 68) explains that industrial organization researchers either examine the structure of entire industries on a national level, or analyze a particular industry on a regional, state, or local level. Due to data availability, many researchers examine specific industries from a regional or local level.

Some of the more recent studies, beginning with the seminal work of Marion et al. (1979) were undertaken in response to many of the changes in the structure of the retail grocery market that have occurred over the past half century. Marion et al. (1979, 19) describe the period of 1949-1975 as a distinct period of mergers and acquisitions within the retail food industry, which fundamentally altered the structure of the industry. In order to examine the impacts of this increased concentration within the retail food market, the Joint Economic Committee of the United States Congress subpoenaed data on operations from seventeen of the top retail food chains. This rich data source allowed the researchers to conduct in-depth analysis on the structure of the retail food market, and the impact of the changing structure on firm performance.

Marion et al. (1979) and other researchers have analyzed market power and the concentration of a large portion of the retail food market in a small number of firms as the central determinants of the competitive market environment in the retail food industry. Concentration within the market was analyzed by calculating the percentage of the market that was controlled by the top four firms within a market (Marion et al., 1979, 65). Kwoka, Jr. (1979) questions the efficacy of the four-firm concentration ratio in determining the concentration of a market and concludes that the magnitude of concentration among the top firms in a market can impact market performance. Specifically, he argues that performance of firms in a market is not influenced by concentration until one or two leading firms control 25% to 35% of the market (Kwoka, Jr., 1979, 108). Marion et al. (1979) found a positive relationship between a high four-firm concentration ratio and profits (Marion et al. 1979, 58), and Lamm (1981) confirmed the positive relationship in a national level study. Cotterill (1986, 386) also discovered a similar positive relationship between price levels and market concentration on retail food prices in his study of the retail food market in the State of Vermont.

These findings on the positive relationship between profits and highly concentrated markets have led researchers to analyze further the manner in which firms react to entry by competitors, and the impact of entry by competitors on market concentration. This area of research was inspired in part by the additional results by Marion et al. (1979, 132) that did not find support for the conjecture that lower costs in concentrated markets account for the higher profits among more concentrated firms. Researchers were next interested in defining whether an increase in competition and resulting change in concentration would impact retail food prices. Recent studies have concentrated on the more recent phenomenon of the entry of supercenters such as Wal-Mart and Target in a retail food market. Marion (1998) analyzes the impact of

warehouse store entry into a market and shows that retail food price increases were not as high in areas that experienced the entry of a warehouse type store in a market, but the magnitude of the negative price influence varied across regions.

Based on the findings that profits in the retail food industry appear to be positively associated with market concentration, researchers have attempted to determine why this relationship exists. Marion et al. (1979, 90) find higher profits of firms operating in a particular market to be determined by either the lower cost of operators or higher prices, and that the association of profits and operating costs is impacted by the particular market within which the firm operates. Cotterill and Haller (1992) also find that the dynamics for changing the composition of retail food markets are heterogeneous by region or local area and, therefore, specific findings cannot be said to apply to separate markets in other parts of the country. Each retail food market is unique in its economic and food environment composition within which suppliers operate.

Food market structures differ between regions and areas, but food environments can also vary within local regions and areas. The spatial nature of a retail food market makes it possible for firms operating within the market to experience different operating costs as well as differing levels of competition within the market. This can be verified not only by the existence of price dispersion in different areas of a market, but also with a more specific example of "zone pricing." Marion (1998, 382) defines zone pricing as geographic price discrimination, in which the same chain can have different prices in different geographic locations. Hoch et al. (1995) describe zone pricing as micromarketing, in which the same firm may price the same products differently in areas of varying demographic characteristics and competitive structure. Marion (1998) shows evidence of zone pricing by chains in response to entry by warehouse stores into a

market. Binkley and Connor (1998) found evidence of price discrimination within a market for perishable goods, and stated that there was no evidence that the price differences were attributable to differences in costs.

A pair of related studies was conducted in the Chicago area using a high quality data set provided to the researchers by a retail food firm in the region. One of the studies was conducted by Hoch et al. (1995) and was mentioned earlier as an example of micromarketing. The authors explain that in order for micromarketing to be an effective pricing strategy, there must be evidence of differing responses to price changes (Hoch et al., 1995, 17). The results of the study show that there exist differences in price elasticities among consumers of different demographics as well as less price elasticity in stores that are less spatially accessible (Hoch et al., 1995, 23, 27). Therefore, the authors conclude that price discrimination is possible for the firm in question due to the spatial nature of the market, as well as the socioeconomic composition of the consumers in the market and their varying price elasticities. A related study by Chintagunta, Dubé, and Singh (2003) utilize the same data set as Hoch et al. (1995) from a local supermarket chain in the Chicago area. The authors find zone pricing to be a strategy employed by the firm and rule out varying costs as a reason for the differing prices across zones due to the same wholesale prices (Chintagunta, Dubé, and Singh, 2003, 129). The authors state that zone pricing can therefore be attributed to price discrimination by the firm based on socioeconomic characteristics of the consumers rather than due to variations in costs or market competition (Chintagunta, Dubé, and Singh, 2003, 144).

Although costs for the particular firm in the studies mentioned previously remain consistent across the market, individual firm and industry-wide costs of production and operation differences remain essential aspects of overall retail food prices in the industry. Marion et al.

(1979), Cotterill (1986), Hoch et al. (1995), and Chintagunta, Dubé, and Singh (2003) were fortunate to have the cost data from retail firms to include in their analyses. Other studies have lacked such auspicious data sources, and thus, have had difficulty accounting for variations in cost. However, Anderson (1993) states that operating costs and quality of products offered by the firms must be accounted for in supply side studies intent on determining the factors that impact the retail prices set by firms. Lamm and Westcott (1981) examine input costs within the food industry and their relationship with retail food prices. The authors state that unexpected spikes in the prices of inputs (such as store labor or fuel for transportation) within the food production industry can impact retail food prices in the current quarter and the following quarter (Lamm and Westcott, 1981, 195). Therefore, in a time-series analysis, changes in the costs of inputs over time should be evaluated.

One difficulty researchers often run into with relation to operating costs is determining whether the differences in prices are due to discriminatory pricing or variation in input costs (Shepard, 1991, 31). Shepard (1991) states that researchers can often not make a causal distinction between the variation in prices due to costs because of a lack of quality cost data. A theme that is consistent throughout many of the above mentioned supply side food retail industry organization studies is their use of data sources that are inaccessible for most researchers in this subject area. Marion et al. (1979) acquired their rich data set on profits and performance of the seventeen leading nationwide firms through Congressional subpoena. Cotterill (1986) obtained part of the pricing data through a subpoena from the Attorney General of Vermont. Hoch et al. (1995) and Chintagunta, Dubé, and Singh (2003) acquired data from a leading regional food chain, while the researchers provided recommendations for possible opportunities to improve firm efficiency in the analyses. Most researchers do not have access to such extensive data sets,

and are therefore limited in their ability to make holistic contributions to the area of industrial organization theory using the retail food market as the industry of focus.

2.2 A Spatial Market: Demand Side Theoretical Overview

The economic theory that has focused on the demand side pertains primarily to the various costs consumers face when deciding at which supermarket to shop. Much of the literature is composed of studies that analyze transportation costs, information costs, and imperfect information theory. Stiglitz (1979) writes that a market with imperfect information naturally leads to a situation in which price dispersion exists within the market. Stiglitz states that if imperfect information exists, and the market in question is separated spatially but not "perfectly arbitraged," then variation in prices will exist in the market (Stiglitz, 1979, 340). The retail food market is not specifically identified by Stiglitz as being a market with imperfect information, but it does represent a spatial market with empirically noted price variability.

The idea of "perfect arbitrage" does not apply directly to the retail food pricing market due to various barriers of entry into the market. However, the non-existence of "perfect arbitrage" allows for a further discussion of the idea related to search costs, and their relation to variation in income among consumers. Even in a market that has perfect information and every consumer is aware of the stores with the lowest prices for various goods, there exist some additional costs for which consumers must account due to the market's spatial nature. Stiglitz (1979, 344) mentions a situation in which price information is passed through verbal conversation, and thus, does not cost the consumer anything monetarily to obtain. However, once the "free" information is obtained, a consumer must also account for the varying costs of going to and from a particular store, which can vary greatly in relative terms depending on the income level of the consumer or household.

Katz (1984) argues that the relative difference in the magnitude of a purchase in terms of income can vary greatly among consumers of varying income levels. He states that consumers who purchase a good that is relatively expensive will expend greater time and energy on searching for lower prices than consumers for whom the good is relatively cheap (Katz, 1984, 1455). Specific to the grocery market, a full market basket of grocery items would be a relatively more expensive purchase for a lower income household, and therefore, the lower income household would tolerate higher search costs in order to find the lowest prices. There is empirical evidence that supports this intuitive conclusion and shows that low-income consumers have lower per-unit costs for food than do higher income consumers (Kaufman et al. 1997, 11).

Along with the information costs of searching for lower prices for food items, travel costs must also be considered due to the spatial nature of the retail grocery market. Building upon past research on the subject of spatial markets, Capozza and Van Order (1978) argue that firms within a spatially separated market essentially acquire monopoly power solely from their geographic separation from competitors. Benson and Faminow (1985) also argue that the retail food industry should be characterized as a spatial market because the costs of individual consumers are not solely determined by each firm's food prices. Travel costs as well as the benefits of convenience associated with patronizing the supermarket that is closest in terms of distance and time traveled are both considered by consumers when deciding upon which store to patronize.

An intuitive study by Bell, Ho, and Tang (1998) makes a useful distinction between fixed costs and variable costs from the standpoint of the consumer. A summary of this article is provided by Cude and Morganosky (2001). Fixed costs are those such as better quality products, greater access to parking, etc., while variable costs are those such as lower food prices and member rewards (Bell, Ho, and Tang, 1998, 355). The consumer will make the decision of

which store to patronize based on the calculation of the total costs, and thus, will be expected to patronize the store with the lowest total costs for the consumer. Some of the fixed cost determinants are more difficult to quantify in terms of numerical cost calculations, but are important factors in each consumer's overall cost analysis in deciding which store to patronize.

Empirical studies have been conducted in order to test the hypothesis of whether the retail food industry can best be viewed as a spatially competitive industry. Fik (1988) argues based on the assessment of food prices for five supermarkets spatially dispersed in the Tucson, AZ, metropolitan area that food prices are impacted by the level of spatial distance from competitors. The distance from competitors is found to be positively related to the average mill price for an individual firm (Fik, 1988, 40). Zenk et al. (2005) analyze the retail food market in Detroit to determine if there is a difference in spatial distance to supermarkets across varying demographic groups. The results of the analysis show a greater average distance between supermarkets in neighborhoods with both large African American populations and high poverty rates, while average distances for higher income neighborhoods were smaller and similar (Zenk et al. 2005, 662). The distance disparities between consumers can impact the total cost calculations outlined by Bell, Ho, and Tang (1998) for patronizing stores that are not the most accessible by distance. Claycombe (1990, 306) argues that transportation costs of retail food consumption can be reduced to close to zero in analysis if the shopping is done during the commute to or from work (a trip that would not add any additional costs to the consumer since it is assumed to be part of any total cost calculations for working individuals). The spatial nature of the retail food industry makes each individual or household calculation unique, but the regional economic and food environment of the consumer or household is an integral part of the total cost calculations of retail store patronage.

2.3 Contemporary Exploratory and Related Studies

The demand side theoretical studies are not as limited by data restrictions as the supply side studies that attempt to account for all of the economic factors that impact retail food prices. However, numerous exploratory studies have been undertaken over the past four decades and many are limited by data issues because retail food prices are influenced by factors on both the demand and supply side simultaneously. Lamm (1981) identifies a comprehensive list of the factors influencing retail food prices. He states these factors to be "demand controls, marginal costs, market concentration, barriers to entry, and operational scale in any retail food market" (Lamm, 1981, 69). He also identifies data availability as a restricting factor for many researchers, especially with regard to profits and price cost margins (Lamm, 1981, 68). Due to data limitations, it remains a difficult task for researchers to distinguish between the identified factors that influence retail food prices.

Exploratory studies are inherently limited in their explanatory power. Exploratory analyses are described as studies that are not conducted in order to test specific hypotheses based on a developed theory, but rather involve the development of ideas through empirical investigation (Fotheringham, Brundson, and Charlton, 2000, 185). Many exploratory studies are conducted in economics because the economic theories developed by economists cannot be tested within the real world through empirical analysis due to data being unobtainable or unavailable. Below are a number of pertinent studies that have sought to analyze the structure of the retail food market from an exploratory level despite the aforementioned data restrictions.

Researchers have been conducting cross-sectional exploratory studies on the subject of price disparities for food markets across neighborhood and among different socioeconomic groups for over fifty years. Kaufman et al. (1997), Wendt, Kinsey, and Kaufman (2008), and the

June 2009 Report to Congress on Food Access by the USDA-ERS all contain quality lists outlining many of the exploratory retail food pricing studies that have been conducted by past researchers. Block and Kouba (2006, 838) describe the structural makeup of a retail food market within a geographical space as a food "landscape." This is an appropriate name for describing the structure of a local food market because it not only allows for identification of a particular geographic space, but also semantically allows the researcher or reader to think about the demographic setting and context that is unique to each market being analyzed.

Three primary goals of past exploratory studies have been to determine whether retail food prices are higher in low-income neighborhoods than in higher income neighborhoods, examine why price disparities may exist in areas with different demographics, and discover whether consumers facing higher prices are traveling elsewhere to do a majority of their food shopping. Some more recent studies were focused on the prices of grocery items across neighborhoods and store formats as well as identifying more exact models to identify the most important factors influencing the retail food prices. The recent studies have utilized more updated econometric analysis but in many cases have found similar results as some of the earlier studies by Alcaly and Klevorick (1971) and Kunreuther (1973). Just as Alcaly and Klevorick (1971) did but using different data and methods, Hayes (2000) examined the retail food market in New York City, NY, and found that residents in lower income areas do not pay more for food. Andreyeva et al. (2008) conducted an updated version of the Kunreuther (1973) study in New Haven, CT, and found better access to supermarkets than in the earlier study, and higher prices in smaller stores than in supermarkets. Overall, the authors found food prices to be lower in low-income neighborhoods, but the availability and quality of produce items to be lower as well. Chung and Meyers (1999) discovered prices to be lowest in chain stores and found chain stores

to be less likely to be located in low-income, urban areas than in suburban areas. Bell and Burlin (1993) also found food prices in low-income areas to be higher in areas that do not have a national chain store in the local market. These studies focused primarily on discovering whether higher prices exist, but a few also made an attempt to identify specific reasons for the disparities in costs across neighborhoods.

Many of these studies have focused on the disparities of access to food and food prices in urban areas. However, there are many rural markets throughout the country and the access issues that are unique in comparison to urban markets make rural markets important regions of study. Ambrose (1979) included rural areas in his geographic area of analysis and found rural retail food prices to be higher than suburban and urban prices. Powell et al. (2007) found fewer chain stores to be located in rural areas than in urban areas on a national scale. Kaufman (1999) describes accessibility of supermarkets to be lower in rural areas, and found low- income consumers in rural areas to shop more often in smaller grocery stores with higher prices.

The aforementioned exploratory studies have been able to offer descriptions of multiple food "landscapes" that can be found in different geographic neighborhoods with distinctive demographic characteristics. However, the studies are often unable to explain the role of the different factors influencing retail food prices. MacDonald and Nelson (1991) used national data from ten metropolitan areas to examine store effects rather than household effects. The authors define household effects as issues relating to consumer demand and store effects as pertaining to issues specific to store operating costs and the demographic environment in which they operate. MacDonald and Nelson (1991) find suburban food prices to be lower that urban food prices due to competition by warehouse stores. They also find demographic characteristics to impact prices. Stewart and Blisard (2006) make a similar but different distinction between household

and community effects. Household effects such as household demand are impacted by household income and other household specific demographic variables, while community effects include demographic measures specific to the area of study (Stewart and Blisard, 2006, 14-15). Kunreuther (1973) identified a "store effect" and a "size effect", both of which would contribute to low-income consumers paying higher prices for food than consumers in other neighborhoods. The "store effect" is associated with the arrangement of low-income neighborhoods and the tendency for smaller stores with higher prices to be located in lower income neighborhoods. The "size effect" recognizes the budget constraints of low-income consumers who are unable to take advantage of buying in bulk, which allows for saving money on a per unit basis due to their limited food budget (Kunreuther, 1973, 375-376). King, Leibtag and Behl (2004) argue that if a store in a low-income neighborhood does have higher prices, there is no support for the higher prices resulting from higher operating costs.

Supercenter style stores have gained a larger portion of the market share of grocery sales in the past decade, and have fundamentally altered the food "landscapes" in many parts of the country. Stiegert and Sharkey (2007) note that the total number of Wal-Mart supercenters in the United States increased by nearly 1,000 outlets from 2000 to 2005 (Stiegert and Sharkey, 2007, 296). Franklin (2001) documents Wal-Mart's ascendency within the retail grocery market by showing that its large expansion had made it the second largest food retailer in the nation by 1999. He identifies Baton Rouge, LA, as one of the key areas of Wal-Mart's increased investment and expansion and shows Wal-Mart as the third largest grocery retailer in Baton Rouge, LA, when the paper was published in 2001 (Franklin, 2001, 110). One longitudinal study by Woo et al. (2001) examined the impact of an entry of Wal-Mart into a market by measuring the prices of a market basket of goods at various supermarkets before and after Wal-Mart's entry

into the Athens, GA, food retail market. The authors were able to identify a significant decrease in prices at a number of firms soon after Wal-Mart entered the market, and found Wal-Mart to have consistently lower prices for the measured basket of food items over time (Woo et al., 2001, 176).

A recurring theme in many of these studies is that food prices are higher in smaller stores (Goodman 1968, Kunreuther 1973, MacDonald and Nelson 1991, Bell and Burlin 1993, Kaufman et al. 1997, Chung and Meyers 1999, Woo et al. 2001) and lower at chain stores and supercenters (Bell and Burlin 1993, Kaufman et al. 1997, Chung and Meyers 1999, Woo et al. 2001). These findings make it apparent that consumers in food environments that do not have larger supermarkets, chain stores, or supercenters may be disadvantaged by the spatial price disparities. However, an important distinction to make is whether the consumers in areas of high food prices are purchasing their food from the stores in their neighborhoods or are traveling elsewhere to do their grocery shopping. The early study by Goodman (1968) was pioneering in the sense that it was able to make the astute distinction between the prices being set by firms, and the prices actually paid by consumers. Goodman (1968) analyzed an urban neighborhood in Philadelphia and found prices to be higher in smaller, urban stores, but that a distinct majority of surveyed shoppers in the urban neighborhood would travel outside of their neighborhood to do their primary shopping at stores with lower prices. Kunreuther (1973) conducted a similar study of consumers in New Haven, CT, but found consumers to be less willing to leave their market to do their primary grocery shopping, and therefore, were adversely affected by the higher prices of smaller, local stores. Broda, Leibtag, and Weinstein (2009) use nation-wide pricing and survey data to emphasize actual consumption and argue that although smaller stores in urban, low-income areas do have substantially higher prices, low-income consumers are more likely to shop

at supercenters and other low priced stores. Therefore, low-income consumers are expending less for the same food items than higher income consumers (Broda, Leibtag, and Weinstein, 2009, 11-12).

A number of studies have expanded beyond the general supply and demand arenas to include health related aspects in their research of food environments. Jetter and Cassady (2006) conducted a study that is parallel in nature to the current study because it compared a TFP market basket cost with a market basket that included "healthy" items. The authors started with the TFP menu as the reference menu and then made substitutions of nineteen of the TFP items for healthier alternatives. For example, the authors substituted whole wheat bread for enriched, white bread and whole wheat pasta for enriched pasta (Jetter and Cassady, 2006, 39). The authors found the healthier market basket to be more expensive than the reference TFP market basket.

Another study that is parallel to the current analysis is the study by Cassady, Jetter, and Culp (2007), which compared the cost of a market basket with the fruits and vegetables included in the TFP market basket to a market basket of fruits and vegetables that meets the 2005 DGA. The TFP market basket was developed on the recommendations of the 1995 DGA, and thus the market baskets have differing constructions based on the updated recommendations. The authors used the same food items included in the TFP market basket and then adjusted the amounts of each fruit or vegetable category to reflect the new recommendations. They found the price of the 2005 DGA fruit and vegetable market basket to be lower in cost than the TFP fruit and vegetable market basket, but not at a statistically significant level (Cassady, Jetter, and Culp, 2007, 1912). These two studies by Jetter and Cassady (2006) and Cassady, Jetter, and Culp (2007) are similar

in inspiration to the current study due to their objective of comparing the cost of the TFP market basket with a healthier alternative.

Other health related studies have focused on the cost of healthier food items from a different perspective. Monsivais and Drewnowski (2009) analyzed the cost per nutrient for energy dense foods and healthier alternatives that lack the energy density. They found energy dense foods high in sugar and fats to be cheaper per kilocalorie than fruits and vegetables that are less energy dense (Monsivais and Drewnowski, 2009, 818). Other researchers have explored whether the prices of healthier food items are a barrier for consumption of those items. In a consumer behavior survey of close to 800 participants conducted by Eikenberry and Smith (2004), nearly 40-percent of survey respondents cited cost issues as a limitation for consuming healthier foods.

Researchers have also approached the subject of healthy food consumption in terms of quality and access to healthier food items. Block and Kouba (2006) found disparities in the quality of produce across neighborhoods and store type. Andreyeva et al. (2008) showed low-income neighborhoods to have lower quality produce than higher income neighborhoods, especially the quality of fresh fruit. Algert, Agarwal, and Lewis (2006), Jetter and Cassady (2006), the June 2009 USDA Report to Congress on Food Access and Rose et al. (2009) have focused on the access to healthy food items such as fruits and vegetables. Jetter and Cassady (2006) found smaller stores to have less available food items for purchase, and Algert, Agarwal, and Lewis (2006) discovered a lack of availability of fresh fruit items within walking distance of low-income consumers in Pomona, CA. Rose and Richards (2004) determined fruit consumption to increase for residents with easy access to supermarkets. In a study focusing on factors influencing unhealthy food consumption, Larson, Story, and Nelson (2009) point to

evidence that finds residents in neighborhoods with lower access to fast-food restaurants have lower obesity rates than residents living in areas with better access to fast-food outlets. Rose et al. (2009) and the June 2009 USDA Report to Congress on food access both note that the issues of access are different for each community and therefore require unique solutions that may combine both demand and supply aspects.

The aforementioned studies have been able to explain the various factors affecting price and make important observations on varying food market structures despite the unavailability of certain types of data. Although similarities exist across food environments, it is apparent that important differences exist which make each individual food market unique. Therefore, it remains worthwhile for researchers to conduct empirical economic and exploratory food retail pricing studies in different regions and neighborhoods. This study attempts to build upon this rich history of research to learn further about the structure of the food retail industry in the Baton Rouge, LA, metropolitan area, and the factors that influence retail food costs.

CHAPTER 3: ECONOMIC THEORY AND MODEL

3.1 Economic Theory

Lamm (1981, 69) outlined five main determinants of retail food prices to be "demand controls, marginal costs, market concentration, barriers to entry, and operational scale in any retail food market." An economic model for this study is constructed based on these five factors, although the market concentration and barriers to entry variables will be considered as part of one variable representing the degree of spatial competition that exists within the individual store's food environment. The basic economic model is:

$$COSTMB_i = f\ (D_i, MC_i, COMP_i) \tag{1}$$

where $COSTMB_i$ is the cost of a market basket purchased at store i, D_i are the demand conditions for store i, MC_i are the marginal costs for store i, $COMP_i$ is a proxy for market concentration and entry barriers for store i. Fixed cost effects on market basket cost are assumed to be comparable across the firms. This basic model is a hybrid model that includes both demand and supply effects, and borrows heavily from Binkley and Connor (1998). In order to expand further into some of the economic theory issues considered in this model that joins demand and supply factors, each of the identified factors will be discussed individually.

Demand Conditions: Utility Function

One assumption made while gathering the data was that the consumer would want to purchase the least expensive market basket possible, and do so by purchasing the least expensive of the individual items in the market basket. Therefore, even if she or he may have a preference for a certain brand of product, she or he would purchase the cheaper item. In order to give a theoretical example of how this demand system may exist, a utility function involving reservation prices is constructed borrowing heavily from the theoretical analyses developed by

Henderson and Quandt (1971) and Gabszewicz and Thisse (1979). The income of individual consumer *t* is presented as an allotment of a certain level of income to purchases of the same good, for example ice cream. The ice cream is of two different brands: brand X and brand Y. Each of the brands has its own price.

$$I_t = p_x X + p_y Y \tag{2}$$

Where I_t, represents ice cream expenditures of consumer *t*.

Next, assume that consumer *t* has some established preferences in terms of brand X and brand Y as shown below:

$$U(0, I_t) = U_0 * I_t \tag{3}$$

$$U(X, I_t) = U_X * I_t \tag{4}$$

$$U(Y, I_t) = U_Y * I_t \tag{5}$$

Assume brand X is preferred to brand Y. In terms of utility, $U_X > U_Y \geq U_0$. The reservation prices for consumer *t* for brand X and brand Y are $RP_t(X)$ and $RP_t(Y)$, respectively. Inserting the reservation prices into equations (3), (4) and (5) results in:

$$U(0, I_t) = U_0 * I_t = U_x(X, I_t - RP_t(X)) \tag{6}$$

Plugging equation (2) into equation (6) yields:

$$U_o * (p_x X + p_y Y) = U_X(p_x X + p_y Y - RP_t(X)) \tag{7}$$

This can be written as:

$$U_o * \left(p_x X + p_y Y\right) + U_X(RP_t(X)) = U_X(p_x X + p_y Y) \tag{8}$$

Subtracting, factoring and dividing, equation (8) becomes:

$$RP_t(X) = \frac{U_X - U_0}{U_X}(p_x X + p_y Y) \tag{9}$$

And the reservation price for brand Y is equal to:

$$RP_t(Y) = \frac{U_Y - U_0}{U_Y}(p_x X + p_y Y) \quad (10)$$

Since $U_X > U_Y$, consumer *t* would buy brand X over brand Y if she or he can afford it. Therefore, $RP_t(X) > RP_t(Y)$. If $I_t - RP_t(X) < 0$, but $I_t - RP_t(Y) > 0$, then consumer *t* will buy brand Y even though X is preferred to Y due to brand X being unaffordable for consumer *t*. The theoretical background allows justification for the consumer purchasing the cheapest brand of each product available, despite the established preference relationships. This is a limiting assumption because consumers who are purchasing a full market basket take many costs into consideration, including the cost of the full basket, while deciding to purchase each individual item. Additionally, the theoretical explanation does not allow for substitution. However, the theoretical explanation can be useful when the consumer is expected to minimize the cost of purchasing a pre-determined market basket based on a specific menu, and thus needs to include a certain amount of each specified item in the purchased market basket.

Marginal Costs

$$MC_i = f(L_i, S_i, SS_i, ST_i) \quad (11)$$

The marginal costs of firm *i* are assumed to depend on factors such as the labor costs of firm *i*, L_i; the number of services provided by firm *i*, S_i; the store size of firm *i*, SS_i, which may be used to measure economies of scale; and the store type for firm *i*, ST_i (i.e. chain, supercenter or independent).

Spatial Monopolistic Competition

One of the model's assumptions is that a firm with monopoly power has the ability to set prices. Within a monopolistically competitive market system, there is no distinction between the firm and the industry demand. Benson and Faminow (1985) describe the interaction between a

retail food outlet and its competitor as "linked oligopolistic" competition (Benson and Faminow, 1985, 297). The linked oligopolistic framework is useful for understanding the individual competitive interactions between two different firms, but on a market-wide level, it can be useful to assess the retail food market in terms of a monopolistically competitive market. Chamberlin (1965, 81) describes a group equilibrium that is achieved in a market defined by monopolistic competition, in which a firm that has differentiated products is essentially a monopolist but has competitors for related and substitutable products within its market. Therefore, the monopoly power would decrease as more firms with substitute products enter the market. A monopolist's demand curve has the same characteristics as the industry demand curve for a market with perfect competition. The monopolistic competition section that follows borrows heavily from Henderson and Quandt (1971). Quantity of sales is a function of price:

$$q = f(p) \tag{12}$$

Where:

$$dq/_{dp} < 0$$

The inverse demand function can be displayed with price as a single-value function of quantity:

$$p = f(q) \tag{13}$$

Where:

$$dp/_{dq} < 0$$

The main difference between a monopolist and a perfect competitor lies in the distinction between a monopolist's prices decreasing as sales increase. A perfect competitor accepts price as fixed and maximizes profit based upon variations in output; a monopolist may maximize profit with respect to variations in either output or price. The monopolist's total revenue (TR) is:

$$TR = pq \tag{14}$$

Where marginal revenue (MR) is the derivative of total revenue with respect to the output level:

$$MR = {}^{dR}/_{dq} = p + q\,{}^{dp}/_{dq} \tag{15}$$

Since ${}^{dp}/_{dq} < 0$, the monopolist's MR is less than price.

The perfect competitor's marginal revenue is:

$$MR = {}^{dR}/_{dq} = p + q\,{}^{dp}/_{dq} \tag{16}$$

Since ${}^{dp}/_{dq} = 0$, the perfect competitor's MR is equal to price. The monopolist with market power has the potential to set prices above marginal revenue in order to increase profits, while the perfectly competitive firm must accept the market price. In this study, a competition index will measure the amount of spatial competition in order to test whether spatially isolated firms may have spatial monopoly power and set food prices higher than competitors. If the coefficient estimates for the spatial competition index are negative, then it may be evidence that firms with a greater number of spatial competitors are less able to set prices above the market clearing price. If the coefficient estimates for the spatial competition index are positive, then it could be evidence of collusion among firms.

General Economic Models

The basic economic model listed in equation (1) is shown again below:

$$COSTMB_i = f\,(D_i, MC_i, COMP_i)$$

This reduced form model was constructed in order to include the main determinants on food price described by Lamm (1981). A two-equation model was introduced by Stewart and Davis (2005) in order to separately examine the factors that influence competition and price, while

maintaining the ability to explain relationships among variables in both equations by including the dependent variable in the first equation as an independent variable in the second equation. A conceptual two-stage model based on the general model developed Stewart and Davis (2005) is displayed below:

$$COMP_i = f(D_i) \tag{17}$$

$$COSTMB_i = f(MC_i, COMP_i) \tag{18}$$

Data Sources for Market Basket Cost Related Dependent Variables

This section includes a description of the data sources for the market basket cost related dependent variables, which are included in the reduced form model as well as equation 2 of the two-equation model. The subsequent section will include a more thorough discussion of the individual dependent variables. The cross-sectional food pricing data for the market baskets were gathered from sixty large grocery stores, supermarkets and supercenters in the Baton Rouge metropolitan area and surrounding parishes. The term "large grocery store" was determined to be a store where it would be possible to obtain a full market basket of all food types without making an unrealistic number of substitutes. Therefore, the store must have a reasonably complete produce section and fresh meat section since those items comprise an important part of the item list and are often not available at convenience stores, drug stores, dollar stores, and other small food markets. There were no restrictions on store size as long as a large majority of products on the list were available. In total, supermarkets in eight of the nine parishes in the Baton Rouge, LA, metropolitan area were surveyed. The store list was developed from the list of stores identified by Stewart (2006) and verified using Yellowpages.com, individual chain websites, and the Associated Grocers website. There were a total of 82 large grocery stores identified in the area.

The pricing data were obtained over the 3-week period, January 5, 2009, through January 24, 2009. The retail shelf prices were manually recorded over this period by two faculty, two staff, and two students in the LSU Department of Agricultural Economics and Agribusiness and the LSU School of Human Ecology. No transformations were made to the pricing data other than conversions to retail price per ounce. The survey sheets include a total of 208 food items and are included in Appendix F. These survey sheets are similar to those used by Stewart (2006) in her Master's thesis analysis, and include the food items included in both market baskets used in this analysis.

A meeting was held prior to the surveys in order to discuss the proper methods for gathering prices. Surveyors also participated in the first survey as a group in order to achieve an understanding of which prices are expected to be included. Sizes for many of the food items are listed on the food item list in order to help the surveyor identify the most commonly purchased item size. The surveyor priced the lowest priced item, even if it was a sale item. The brands of food items were not taken into consideration, since the only criteria for the recorded price is that it is lowest price of the item choices. If a bigger or smaller, but similar sized item was lower in price per unit, then the surveyor was advised to record the price and size of that item. Surveyors were discouraged from recording prices of items that were not of reasonable size for a family of four to consume in a realistic amount of time. Therefore, the largest sized items were not priced even though they are often the lowest in price per unit.

Studies that include a calculation of the cost of a market basket of food items at a number of surveyed stores inherently run into problems associated with missing items. An item may be missing due to the store not selling it, it being out of stock at the time of survey, or surveyor error. Kaufman et al. (1997) lists a number of ways researchers have dealt with the issue of

missing items. Some researchers have imputed prices for missing items based on the prices of other items in the supermarket, while others have left missing items out of the analysis (Kaufman et al., 1997, 4). This study has chosen an alternative method for replacing missing items, which includes replacing a missing item with a different item that is "nutritionally equivalent". The nutritionally equivalent substitutes were determined and verified by Dr. Carol E. O'Neil of the LSU School of Human Ecology. Tables with missing items and their substitutes are listed in Appendix B.

In a few cases, a single nutritionally equivalent item could not be determined, so a nutritionally equivalent substitution was made from a recipe utilizing items that were available from the complete survey list of prices. Also, there were a few instances in which the chosen substitute item was not equivalent in terms of the amount of refuse the food item has in comparison to the missing item. For example, turkey breast was a missing item, and the identified substitute was cooked chicken fryer. Based on information from the USDA National Nutrient Database, turkey breast is determined to be 100% edible, while cooked chicken fryer has 47% refuse. If the substitute item had more refuse, then it would be multiplied by a sufficient factor to achieve edible portion parity. In a specific calculation for the TFP menu, 36 ounces of turkey breast is substituted by cooked chicken fryer. Since a chicken fryer is 53% non-refuse, the chicken fryer price is multiplied by a factor equal to (1/0.53 = 1.886) in order to account for the loss of refuse and achieve nutritional equivalence.

3.2 Description of Dependent and Independent Variables

Discussion of Dependent Variables

A dependent variable for the reduced form model and the second equation in the system of equations is the cost of a market basket of food items included in the "Recipes and Tips for

Healthy, Thrifty Meals," (TFP) developed by faculty at Pennsylvania State University in conjunction with the USDA Center for Nutrition Policy and Promotion designed as a low cost market basket that meets the 1995 Dietary Guidelines for Americans (1995 DGA). The TFP Menu represents a healthy menu that is affordable enough to be purchased using USDA Food and Nutrition Service, Supplemental Nutrition Assistance Program benefits. Since the SNAP is designed to help low-income citizens achieve their basic food needs, the TFP menu has been used by researchers as an example of a low-cost menu that meets some basic nutritional requirements for two weeks for a family of four. The market basket cost calculation is based upon ounces consumed as opposed to being calculated as purchased. Therefore, the market basket cost does not account for any wasted food that may be lost due to disposal or spoilage.

Jetter and Cassady (2006) and Andrews et al. (2001) also used the TFP market basket in their analyses. Andrews et al. (2001) state that although unrepresentative, the TFP market basket can be useful for calculation and comparison of uniform market baskets across a cross-section of stores. Andrews et al. (2001) included a list of the foods included in the TFP market basket, and a list is included in Appendix A as well. These food lists are useful for researchers since the amount of each food included in the menus is broken down by ounces and food lists are included with the TFP menus, which makes calculations of the market basket considerably easier for researchers than constructing food lists from alternative menus.

Another dependent variable included in the analysis is the cost of a market basket of food items that meets the 2005 Dietary Guidelines for Americans (2005 DGA), and is based on a menu developed by Stewart (2006). Similar to the cost calculations for the TFP market basket, the 2005 DGA market basket cost in this analysis was calculated on a per ounce rather than on an as purchased basis. This cost calculation accounts for the amount of food that is consumed, but

does not account for any food that is disposed or lost due spoilage. Kaufman et al. (1997) observe that it has been difficult for researchers to develop a market basket that is representative of the foods actually being purchased and consumed. Block and Kouba (2006) used a market basket based on the TFP as well, but the authors also included a few extra items that were identified by community members to be important entities in local diets in order to try to make the market basket more representative. In a similar but more extensive manner, this study includes food items that are regionally-specific in order to try to analyze a market basket of food items that consumers in Southeastern Louisiana are expected to be buying and consuming. The two-week list of regionally-specific recipes and menu items developed by Stewart (2006) is included in Appendix C. Also, in Appendix D, is a complete list of food items for the two-week menu including foods made from the recipes and other food items in the menu with recommended servings and ounces listed. Using the menu developed by Stewart (2006) allows this study to analyze the factors influencing the cost of a market basket that meets the 2005 DGA and is also "representative" of Southeastern Louisiana diets. Comparing the factors that influence the costs of the TFP and a full, independent and "representative" market basket of food items is unique to this study.

The final dependent variable, a spatial competition gravity index, was created in order to measure the degree of spatial competition that exists for a firm within a radius of ten miles. A ten mile radius was chosen because areas that are not within 10 miles of a supermarket have been defined by Blanchard and Lyson (2003) to have low access to a supermarket. The gravity index is adapted from a retail gravity model developed by Bucklin (1971), based on the idea that consumers would have a higher probability of patronizing stores that were geographically closer. The model included in this study creates a continuous retail gravity weight for competition as

opposed to a probability function from the consumer perspective. The developed gravity model is:

$$COMP_{ij} = \sum_{j=1}^{n} \frac{DISTANCE_{ij}}{(DISTANCE_{ij})^2}$$

Where *i* refers to store *i,* and *n* represents the number of competing stores, *j,* within a ten mile radius of store *i*. Stores beyond ten miles from grocery store *i* are not considered in the gravity model calculation for store *i* since stores not within ten miles are not considered spatial competitors. The distance from store *i* to its spatial competitor *j* was measured using MapQuest, which calculates the travel distance between stores rather than the distance of a straight line segment between the stores. The ten mile radius for each store *i* was determined using Geographic Information Systems (GIS) in ArcView. Also, the gravity index is not limited to the 60 observations that were surveyed for prices, but also includes all other large grocery stores in the Baton Rouge, LA, metropolitan area that were not surveyed. The gravity index is weighted so that the competition gravity index is increased in magnitude if a competitor is closer in geographic distance. The higher number of competitors within a ten mile radius as well as the presence of competitors a shorter distance away will increase the value of the gravity index for each respective store, indicating greater competition.

Description of Independent Variables

The variables chosen in the economic and econometric models borrow heavily from the models developed by Binkley and Connor (1998) and Stewart and Davis (2005). The *POPDEN*, *INCOME* and *AVHHSZ* variables serve as proxies for demand within a designated market. The variable measuring population density, *POPDEN*, measures the number of people per square mile within each store's designated census tract. Population density is expected to have a positive influence on competition and a negative relationship with cost, since greater demand in

the form of the number of consumers would be expected to yield greater turnover. Median household income, *INCOME*, (measured in USD) is the independent variable that allows for testing whether income has a significant impact on the cost of the TFP and 2005 DGA market baskets. Both menus were constructed as two-week menus for a family of four, so median household rather than per capita income will be the measure included in the study. Income is expected to have a positive relationship with costs of the market baskets and competition. The *AVHHSZ* variable is included with the other demand proxy variables because Hoch et al. (1995) describe larger families as being more sensitive to price, and thus will have different consumption patterns than smaller households. Increased average household size is expected to increase demand.

Chung and Myers (1999) found that stores belonging to a chain had a significant impact on prices. Therefore, the variable, *CHAIN*, is included in the model as a dummy variable for distinguishing between chain and independent stores. Bell and Burlin (1993) and Chung and Meyers (1999) found prices to be lower in chains than in independently operated stores. Therefore, the chain variable is expected to be negatively related to market basket cost. Marion et al. (1979) define an independent store to be a store company that owns and operates fewer than eleven stores. Therefore, any firm that owns and operates eleven or more stores is considered a chain. Another variable that is included in the model is a binary dummy variable that represents supercenter style stores such as Wal-Mart and Target. This variable, *SPRCTR*, will be of particular interest due to Wal-Mart's broad expansion in the Baton Rouge, LA, metropolitan area. Leibtag (2005) identifies lower food prices in supercenter style stores, so the supercenter variable is expected to have a negative relationship with market basket cost as well.

The services variable represents a measurement of the number of services, *SERV*, a given food retail outlet provides. Anderson (1993) emphasized the importance of including a measure of cost in a model that seeks to explain the factors that impact price, so the service variable will serve to explain the variance in costs for extra services provided across firms. He mentions that stores containing a pharmacy as well as fresh meat and seafood service counters have higher costs than stores that lack these extra services (Anderson, 1993, 206). The services variable included in this study is a discrete count of the following six services: salad bar, olive bar, prepared hot meals, prepared salads, full-service deli, and full-service bakery. MacDonald and Nelson (1991), Anderson (1993), and King, Leibtag and Behl (2004) document a positive relationship between the number of services provided by a firm and the price of food items due to the increased labor and other variable costs associated with providing extra services. Based on these observations, the expected sign on the coefficient associated with services is positive.

MacDonald and Nelson (1991), Binkley and Connor (1998) and Hayes (2000) identify store size as an important economies of scale variable to include in a model that measures the impact of various factors on the cost of a market basket of food items. Store size is also an additional measure of cost since larger stores tend to have longer hours and higher utility costs (Anderson, 1993, 206). Cotterill (1986) and MacDonald and Nelson (1991) both mention that prices tend to decrease as store size increases up to a certain point. However, larger store size also allows for economies of scale, which can reduce prices. Therefore, the sign on the coefficient for store size is uncertain.

The minority variables, *BLACK* and *OTRMIN*, respectively, represent the percentages of residents who are self- identified as black or self-identified as being a part of another minority group. Since some census tracts are composed predominantly of self-identified black residents,

but none are of the census tracts have a majority of residents who are self-identified as being an ethnicity different than black or white, the minority variables were separated into these two separate variables. The signs for the *BLACK* and *OTRMIN* variables are indeterminate. Broda, Leibtag, and Weinstein (2009) and Hoch et al. (1995) find areas with large percentages of minority populations to be more sensitive to prices. If the consumers in the areas with higher percentages of minority populations travel elsewhere to shop, then the effects of the demographic variables on market basket cost and competition are difficult to capture, but are important factors in the individual food environment demand and competition and are thus in the model.

The competition index, *COMP*, is an independent variable in the reduced form model, as well as the second equation of the two-equation model. It is explained in detail in the section explaining the dependent variables as a measure of spatial competition. The coefficient for the competition index is expected to be inversely related with market basket cost based on the economic theory of monopolistic competition outlined above in the economic theory section.

3.3 Economic Model

The final reduced form model based on the economic theory pertaining to the factors that influence the cost of a retail food market basket, represented by the independent variables, is shown below.

$$COSTMB =$$

$$f(POPDEN, INCOME, HHSZ, CHAIN, SPRCTR, SERV, STRSZ, BLACK, OTRMIN, COMP) \quad (18)$$

Since competition is impacted by demand factors, Stewart and Davis (2005) recommend setting up a two-equation system in order to separate the demand factors from the supply side cost factors, while bringing in the competition variable in the second equation as an explanatory

variable since competition is expected to impact market basket cost. A similar two-equation system is set up for our model in addition to the reduced form model shown above. The economic models for equation 1 and equation 2 are below:

Equation 1: $$COMP = f(POPDEN, INCOME, AVHHSZ, BLACK, OTRMIN) \quad (19)$$

Equation 2: $$COSTMB = f(CHAIN, SPRCTR, SERV, STRSZ, COMP) \quad (20)$$

CHAPTER 4: DATA AND EMPIRICAL METHODS

4.1 Data Sources and Descriptive Statistics

Data for the demographic variables including the *INCOME*, *POPDEN*, *AVHHSZ*, *BLACK*, and *OTRMIN* for each census tract from the 2000 Census have been downloaded from Atlas: the Louisiana Statewide GIS. Along with the pricing data for the TFP and 2005 DGA market baskets, the data for the *STRSZ* and *SERV* variables were gathered during the individual store surveys. The store size was determined by an individual stepping off the width and depth of each store. These two counts were then multiplied together to obtain the store size in square feet. The services variable is a discrete count of the number of services provided by the store. Table 1, which lists the dependent and independent variables with more comprehensive definitions, information on data transformations, and descriptive statistics is below.

Table 1 shows the mean TFP market basket cost was $262.50 and the mean 2005 DGA market basket cost was $272.71 including all of the surveyed observations. The Department of Social Services for the State of Louisiana shows the current maximum SNAP benefits for a family of four to be $668. So, it initially appears as though a family of four in the Baton Rouge, LA, area could, on average, afford a TFP as well as a 2005 DGA market basket by purchasing the items in the menus in two consecutive two-week periods. However, the expenditures in some weeks may be higher than others because the menu cost is calculated in terms of price per ounce rather than purchasable units. In addition, the affordability of the market basket assumes no food is disposed of for any reason, i.e. spoilage, not eaten, etc. This assumption cannot be disregarded when considering the affordability of the market baskets. Another important statistic is the disparity between the population densities across census tracts.

Table 1: Descriptive Statistics for the Dependent and Independent Variables, 60 Observations.

Variable	Mean	Median	Minimum	Maximum	Std. Deviation
TFP COST Thrifty Food Plan two-week menu market basket cost; in ($)	262.50	260.29	204.93	432.87	36.61
2005 DGA COST Two-week menu for market basket cost that meet the 2005 Dietary Guidelines for Americans recommendations; in ($)	272.71	276.35	212.11	425.91	33.60
POPDEN Population density; residents per square mile; by census tract; in thousands	1.773	1.655	0.036	5.358	1.386
INCOME Median household income; by census tract; in thousands	40.704	38.102	17.170	77.668	13.819
AVHHSZ Average household size; number of residents per household; by census tract	2.61	2.70	1.87	3.08	0.31
CHAIN Binary dummy variable designating whether a variable belongs to a chain	0.383	0	0	1.00	0.490
SPRCTR Binary dummy variable designating whether a variable is a supercenter	0.183	0	0	1.00	0.390
SERV Discrete count of a number of services provided in a store	3.08	3.00	0	6.00	1.44
STRSZ Store size in square feet; in thousands	12.291	10.622	1.620	50.964	8.803
BLACK Percentage of residents self-identified as black; by census tract	32.53	25.45	0.50	97.00	24.43
OTRMIN Percentage of residents self-identified as being a member of a minority ethnicity other than black; by census tract	4.55	3.38	1.06	11.96	3.16
COMP Retail spatial competition gravity index	6.014	5.982	0	15.034	4.116

The Baton Rouge, LA, metropolitan area encompasses urban, suburban and rural areas, and thus is a useful area for comparing the full spectrum of food environments.

Block and Kouba (2006) found availability and quality to vary based on store type in the Chicago area. The authors compared the availability of 102 different food items and compared the availability across eleven different store types. They found the highest availability rates to be at chain supermarkets. In order to display a similar measure of availability of food items across types of supermarkets, the average number of missing items out of the 208 total items from each type of store was calculated. The chain stores were divided into their individual chains for comparison amongst the different supermarket companies that operate in the Baton Rouge, LA, retail food market. The availability table, Table 2, is shown below:

Table 2: Average Number of Missing Food Items Out of 208 Total Items, by Store Type.

Store Type	Average Number of Missing Items
National Chain 1 (3 stores)	10
Supercenter 2 (9 stores)	11.33
National Chain 2 (6 stores)	12
Regional Chain (6 stores)	13.14
Supercenter 1 (2 stores)	17
Independent (26 stores)	23.15
National Chain 3 (5 stores)	36.4
National Chain 4 (1 store)	41
Discount Chain (2 stores)	50

Note: Number of stores per type in parentheses

Table 2 shows that the majority of the food items included on the list were available for purchase at the supercenters and a few of the different national chains. There is quite a bit of disparity in availability across the different chains, with the discount chain store having the highest number of missing items. The independent stores, on average, had less availability overall than supercenters.

Algert, Agarwal, and Lewis (2006) assessed the access consumers had to fresh fruit and vegetable outlets by walking distance to a store that has fresh produce. In an alternative approach to measuring consumer access, Jetter and Cassady (2006) observed the lower availability of healthier food items in smaller grocery stores in low-income neighborhoods. Although the chain stores are similar in their corporate structure and management style, it is also true that all chains are not equal. One way to view how the chains can differ from each other and how the other store types compare in terms of access is to compare the availability of general food items as shown in Table 2, and fresh fruits and vegetables as shown in Table 3. Fifty different fresh produce items were included on the survey sheets for which to record prices. Table 3 displays the store type as well as the average number of missing fresh produce items out of 50:

Table 3: Average Number of Missing Produce Items Out of 50 Total Items, by Store Type.

Store Type	Average Number of Missing Fresh Produce Items
Supercenter 2 (9 stores)	5.888
National Chain 4 (1 store)	7
National Chain 2 (6 stores)	7
Supercenter 1 (2 stores)	8.5
National Chain 1 (3 stores)	8.5
Regional Chain (6 stores)	9.5
Independent (26 stores)	13.55
National Chain 3 (5 stores)	21.2
Discount Chain (2 stores)	24.5

Note: Number of stores in each type in parentheses

The table shows that there can be a large disparity for fresh produce availability depending on which type of store a consumer patronizes. The supercenters that were surveyed had the lowest number of missing fresh produce items out of the list of 50 and the discount chain stores had the highest number of missing fresh produce items.

4.2 Empirical Econometric Models

The first econometric model is the reduced form model constructed from the economic model discussed earlier. A linear relationship between the variables is assumed. The reduced form econometric model is shown below:

$$COSTMB_{ij} = \beta_0 + \beta_1 POPDEN_j + \beta_2 INCOME_j + \beta_3 HHSZ_j + \beta_4 CHAIN_i + \beta_5 SPRCTR_i + \beta_6 STRSZ_i + \beta_7 SERV_i + \beta_8 BLACK_j + \beta_9 OTRMIN_j + \beta_{10} COMP_i + \varepsilon$$

The reduced form model tests whether the cost of the TFP market basket and the 2005 DGA market basket, respectively, for store *i* in census tract *j* are influenced by the demographic characteristics specific to its census tract *j* and the store-specific characteristics of store *i*.

An econometric model set up as a system of equations which seeks to analyze the factors that impact competition and the cost of the two separate market baskets was also developed similar to the system of equations used by Stewart and Davis (2005). A linear relationship between the variables is assumed for both equations. The two-equation econometric model is shown below:

Equation 1:

$$COMP_{ij} = \propto_0 + \propto_1 POPDEN_j + \propto_2 INCOME_j + \propto_3 HHSZ_j + \propto_4 BLACK_j + \propto_5 OTRMIN_j + e$$

Equation 2:

$$COSTMB_{ij} = \beta_0 + \beta_1 CHAIN_i + \beta_2 SPRCTR_i + \beta_3 STRSZ_i + \beta_4 SERV_i + \beta_5 COMP_i + \varepsilon$$

The two-equation system tests whether the level of spatial competition of store *i* is impacted by the demographic characteristics of its associated census tract *j*, and whether the cost of the TFP or 2005 DGA market basket for store *i* are individually influenced by the store-specific factors and the level of spatial competition.

CHAPTER 5: EMPIRICAL RESULTS

5.1 Analysis Utilizing the Thrifty Food Plan Menu

The table below shows the Pearson correlation coefficients for the correlation between the dependent variable, the TFP market basket cost, and the independent variables for all sixty observations.

Table 4: Pearson Pair-wise Correlation Coefficients for the Cost of the Thrifty Food Plan Market Basket and the Independent Variables Included in the Multiple Regressions, 60 Observations.

Variable	**TFP Market Basket Cost**
POPDEN	**-0.15706** (0.2307)
INCOME	**0.16224** (0.2155)
AVHHSZ	**-0.13660** (0.2980)
CHAIN	**0.05802** (0.6597)
SPRCTR	**-0.46455***** (0.0002)
SERV	**0.16940** (0.1957)
STRSZ	**0.00903** (0.9454)
BLACK	**-0.12389** (0.3456)
OTRMIN	**-0.02709** (0.8372)
COMP	**-0.08242** (0.5313)

Notes: Correlation (p-value) in Parentheses
* Significant at10% level
** Significant at 5% level
*** Significant at 1% level

The only variable that has a significant correlation relationship based on the Pearson correlation p-value is the *SPRCTR* variable, which is negatively correlated with market basket cost. The correlation is significant at the 1-percent level. Table 5 shows the Pearson correlation

between the TFP market basket cost and the independent variables for fifty-nine observations. One observation was radically more expensive than the other market baskets and was thus excluded in some of the analyses for comparison because it was viewed to be affecting the normality of the residuals.

Table 5: Pearson Pair-wise Correlation Coefficients for the Cost of the Thrifty Food Plan Market Basket and the Independent Variables Included in the Multiple Regressions, 59 Observations.

Variable	**TFP Market Basket Cost**
POPDEN	**-0.17295** (0.1902)
INCOME	**0.10843** (0.4137)
AVHHSZ	**0.00820** (0.9509)
CHAIN	**-0.05491** (0.6796)
SPRCTR	**-0.54024***** (<.0001)
SERV	**0.00929** (0.9443)
STRSZ	**-0.03364** (0.8003)
BLACK	**-0.12265** (0.3547)
OTRMIN	**-0.05110** (0.7007)
COMP	**-0.19975** (0.1293)

Notes: Correlation (p-value) in Parentheses
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

Once again, the Pearson correlation coefficient for the *SPRCTR* variable is significant at the one percent level. Table 6 shows the Pearson correlation coefficients for the correlation between the dependent variable in the second equation of the two-equation system, the spatial

competition gravity index variable, *COMP*, and the independent variables for all sixty observations.

Table 6: Pearson Pair-wise Correlation Coefficients for the Competition Gravity Index and the Independent Variables Included in the Multiple Regressions, 60 Observations.

Variable	**COMP**
POPDEN	**0.59821***** (<.0001)
INCOME	**0.15568** (0.2349)
AVHHSZ	**-0.46428***** (0.0002)
CHAIN	**0.31516**** (0.0142)
SPRCTR	**-0.04297** (0.7444)
SERV	**0.28556**** (0.0270)
STRSZ	**0.20675** (0.1130)
BLACK	**0.09981** (0.4480)
OTRMIN	**0.20816** (0.1105)

Notes: Correlation (p-value) in Parentheses
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The Pearson correlation coefficient for *POPDEN* is positive and significant at the 1-percent level. The *CHAIN* and *SERV* variables are both significant at the 5-percent level and both show positive correlations with competition. The Pearson correlation coefficient for *AVHHSZ* is significant at the 1-percent level and shows a negative association with competition. The negative association can be viewed as evidence that larger households may exist in areas that are more residential and farther from primary commercial zones. The remaining variables do not show any statistical significance. The Pearson correlation matrix was also constructed for

the sample leaving out the cost outlier, but was remarkably similar to the correlation matrix for all sixty observations.

5.1.1 Results from the Reduced Form Multiple Regression Model

The reduced form multiple regression model was analyzed using the ordinary least squares (OLS) regression procedure. Table 7 shows the results of four separate analyses. In two of the models, only fifty-nine of the observations were included because there was one clear market basket cost outlier that was affecting the normality of the residuals and impacting the model in a profound way. The other two models exclude the minority variables in order to see whether the variables were a necessary part of the model.

The model F-value for the first regression with all sixty observations and no minority variables is significant at the 1-percent level. The *SPRCTR* coefficient estimate is significant at the 1-percent level, and can be interpreted as meaning that a TFP market basket at a supercenter would cost $47.58 less than a TFP market basket purchased at stores that are neither supercenters nor chain stores, all else held constant. No other independent variables are significant apart from the intercept. The White test p-value is insignificant, which means that the null hypothesis of homoskedasticity cannot be rejected.

The p-value for the Shapiro-Wilk W statistic is significant at the 1-percent level. Therefore, the null hypothesis of normality of the residuals is rejected, and it is assumed that the residuals may not be normally distributed (Regression with SAS). Hill, Griffiths, and Lim (2008) state that it is preferred that the error terms are normally distributed because then the least squares estimators will also be normally distributed.

Table 7: Multiple Regression Using the OLS Procedure Results with Thrifty Food Plan Market Basket Cost as the Dependent Variable (COST).

	TFP Market Basket Cost 60 Stores No Minority Variable		TFP Market Basket Cost 60 Stores Both Minority Variables		TFP Market Basket Cost 59 Stores No Minority Variable		TFP Market Basket Cost 59 Stores Both Minority Variables	
Variable	**β**	**t-value**	**β**	**t-value**	**β**	**t-value**	**β**	**t-value**
Intercept	300.122***	5.22	345.933***	5.40	267.231***	6.38	275.490***	5.63
POPDEN	-4.722	-1.03	-7.899	-1.55	-1.240	-0.37	-1.718	-0.44
INCOME	0.380	1.09	1.055*	1.90	0.339	1.34	0.437	1.03
AVHHSZ	-13.685	-0.77	-40.428	-1.67	0.369	0.03	-3.940	-0.21
CHAIN	-4.031	-0.33	-3.153	-0.26	-18.810**	-2.08	-18.452*	-1.99
SPRCTR	-47.575***	-3.83	-44.759***	-3.59	-51.449***	-5.71	-50.905***	-5.46
SERV	1.208	0.31	-0.294	-0.07	-1.909	-0.68	-2.082	-0.71
STRSZ	0.065	0.20	0.259	0.41	0.636	1.38	0.653	1.38
BLACK	…		0.430	1.39	…		0.057	0.24
OTRMIN	…		-1.272	-0.80	…		-0.296	-0.25
COMP	-0.674	-0.44	-1.336	-0.85	-0.920	-0.83	-1.008	-0.86
R^2	0.3140		0.3496		0.4370		0.4384	
Model F-value	2.92***		2.63**		4.85***		3.75***	
White Test p-value	0.2839		0.4392		0.2075		0.4387	
Shapiro Wilk p-value	<0.0001***		<0.0001***		0.3682		0.3917	
Condition Index (highest value)	3.187		5.04836		3.19907		5.17409	
Moran's I p-value	0.9886		0.9965		0.7182		0.7380	

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

If the OLS error terms are not normally distributed, the least squares estimators are assumed to be approximately normal for large samples. They identify a value of the number of observations minus the number of estimated parameters (β) above 50 to be sufficiently large (Hill, Griffiths, and Lim, 2008, 115). This is important because the t-tests for significance of individual parameters assume a normal distribution. In this case, the number of observations (N=60) minus the number of estimated parameters (β =9) is 51 (N- β), which may be viewed as a large enough sample to have approximately normal estimators.

Tests were also conducted for collinearity, a data problem that can make it difficult to separate the impact of correlated variables (Belsley, Kuh, and Welsch, 1980, 86). A condition index value between 5 and 10 is not viewed to reveal a collinearity issue, while a condition index of 30 or higher is often seen as evidence of codependence among the data and collinearity (Belsley, Kuh, and Welsch, 1980, 101). The highest value of the condition index for the first regression is 3.187, which suggests collinearity to not be present in the model. The observations are cross-sectional, so there is no need to check for autocorrelation problems as there is with time series data. However, due to the spatial nature of the data, there is potential for spatial autocorrelation. Fotheringham, Brundson, and Charlton (2000, 101) write that spatial autocorrelation may be present when trends in the distribution of one variable are seen to exist over space. Similar to non-spatial autocorrelation, positive autocorrelation can prevent the OLS estimates of regressions from being unbiased and efficient (Anselin, 1980). Zenk et al. (2005) found positive spatial autocorrelation to exist in their study, which had a significant impact on their results. Therefore, a test for spatial autocorrelation was conducted using GeoDa, but the p-value of the statistic that measures spatial autocorrelation, the Moran's I statistic, was not found to be significant. Thus, spatial autocorrelation does not appear to bias the OLS results.

The F-value for the second model, which includes both minority variables, is significant at the 5-percent level. The R-square value is slightly higher at 0.3496. The *SPRCTR* coefficient is again significant at the 1-percent level along with the intercept. The *SPRCTR* coefficient estimate is interpreted as expecting to decrease the cost of a TFP market basket by $44.76 by shopping at a supercenter as opposed to at stores that are neither supercenters nor chain stores, all else held constant. The coefficient estimate for *INCOME* is also significant at the 10-percent level, but has a positive impact on market basket cost. Based on the model, an increase in income of $1,000 is expected to increase a TFP market basket cost by $1.06, all else held constant. The p-value for the Shapiro-Wilk W statistic is significant at the 1-percent level, and normality of the residuals is again rejected. In this case, the sample size (N=60) minus the number of parameters (β=11) is 49 (N-β), which is one below the value Hill, Griffiths, and Lim (2008) identify as a rule of thumb for assuming the estimators to be approximately normal. The White Test p-value is once again insignificant and, therefore, the null hypothesis of homoskedasticity cannot be rejected. The condition index value of 5.048 suggests collinearity of the data to not be an issue. The insignificant p-value of the Moran's I statistic shows that there is insufficient evidence of spatial autocorrelation of the data.

The third regression leaves out the outlier observation that is believed to have been affecting the normality of the error terms, and therefore includes only 59 observations. Although Hill, Griffiths, and Lim (2008) state that the sample size is probably large enough to assume a normal distribution of the estimators, it was clear from a plot of the residuals that the outlier may be skewing the data substantially. Therefore, the outlier was omitted for comparison. This third regression also leaves out the minority variables. The F-value for the model is significant at the 1-percent level. The R-square value is higher than the first two regressions at 0.4370. The

intercept and the *SPRCTR* coefficient estimates are both significant at the 1-percent level. It can be interpreted as meaning that within the sample, a TFP market basket at a supercenter is estimated to cost $51.45 less than at stores that are neither supercenters nor chain stores, all else held constant. The coefficient for the *CHAIN* variable is significant for the first time, and is significant at the 5-percent level. This can be interpreted as a TFP market basket being $18.81 cheaper at chain stores than at stores that are neither chain stores nor supercenters, all else equal. The insignificant p-value for the White Test and the low condition index value suggest that heteroskedasticity and multi-collinearity are not issues in the model. The Moran's I statistic p-value is also insignificant again, which implies that the data are not spatially correlated. One notable change from the previous regressions is the insignificance of the Shapiro-Wilk W statistic p-value. Due to the insignificant p-value, the null hypothesis of normality of the residuals cannot be rejected. This is a different outcome from the previous regressions which included all sixty observations.

The final reduced form regression included the minority variables, but left out the outlier observation. The F-value for the model is significant at the 1-percent level, and the R-square value of 0.4384 is the highest of all four regressions. The *SPRCTR* coefficient estimate is again significant at the 1-percent level. This coefficient estimate can be interpreted as meaning that it is expected for the TFP market basket to be $50.91 less at a supercenter than at stores that are neither supercenters nor chain stores, all else remaining constant. The coefficient for the *CHAIN* variable is significant again at the 5-percent level. This can be interpreted as a TFP market basket being $18.45 lower in cost at chain stores than at stores that are neither chain stores nor supercenters, all else equal. Similar to the previous regression, the insignificance of the White Test p-value and the Shapiro-Wilk W statistic p-value leads to the conclusion that we cannot

reject homoskedasticity or normality of the errors. The condition index value of 5.174 is higher than that of the previous regression but is far from the level of concern for collinearity issues biasing the OLS estimates. The Moran's I p-value remains insignificant.

5.1.2 Results from the Two-Equation Model

In order to get a more focused view of the factors that impact competition and market basket cost separately, the two-equation system was estimated in a similar fashion to Stewart and Davis (2005). Stewart and Davis (2005) utilized seemingly unrelated regression (SUR) for estimation of their system of equations. The SUR procedure has been shown to yield more efficient results for regressions for a system of equations that have highly correlated residuals. For example, DeLorme, Jr., Hill, and Wood (1979) utilized the procedure when their residual correlations were near or above 0.9, and found the SUR procedure provided more efficient results than standard OLS regressions. Therefore, the residuals from the two equations were saved following two OLS regressions, and the correlation between the residuals for the two separate equations was calculated for analysis. The correlation of the residuals from the two equations is shown for the regressions with sixty and fifty-nine observations included respectively.

Table 8: Pearson Correlation Matrix for the Error Terms in Equation (1) and Equation (2) with Minority Variables for the Thrifty Food Plan Market Basket Regressions, 60 Observations.

	Residuals from Equation (1)	Residuals from Equation (2)
Residuals from Equation (1)	1.00000	-0.02550 (0.8466)
Residuals from Equation (2)	-0.02550 (0.8466)	1.00000

Note: Coefficient p-value in parentheses

Table 9: Pearson Correlation Matrix for the Error Terms in Equation (1) and Equation (2) with Minority Variables for the Thrifty Food Plan Market Basket Regressions, 59 Observations.

	Residuals from Equation (1)	Residuals from Equation (2)
Residuals from Equation (1)	1.00000	0.00348 (0.9791)
Residuals from Equation (2)	0.00348 (0.9791)	1.00000

Note: Coefficient p-value in parentheses

Both of the respective Pearson correlation coefficients were insignificant. It was concluded that the correlation of the error terms would not impact the estimates from the two-equation system. The correlation coefficients were calculated for the equations without the minority variables included as well, but the correlation coefficients were similar in magnitude to the correlation coefficients reported in Tables 8 and 9. Therefore, it is concluded that the SUR procedure would not improve the efficiency of the estimates for the two equations. Standard OLS estimates were calculated and results from the first equation are shown in Table 10.

The first regression included all sixty observations, but the minority variables were excluded. The model is significant at the 1-percent level and the R-square value is 0.4950. All of the explanatory variables are shown to have significance. The coefficient estimate for the population density variable, *POPDEN*, is significant at the 1-percent level and is estimated to increase the competition level. *INCOME* also has a positive relationship with competition and is significant at the 5-percent level. The estimated coefficient for *AVHHSZ* is significant at the 5-percent level and estimated to negatively impact *COMP*. This can be interpreted as meaning that as the average household size increases by 1 resident, the competition spatial gravity index is estimated to decrease by 3.287, all else remaining constant. The insignificant p-value for the White Test and the low condition index value suggest that homoskedasticity cannot be rejected and collinearity is not present in the data.

Table 10: Equation (1) of the Thrifty Food Plan Market Basket Two-Equation Model with Competition Gravity Index as Dependent Variable (COMP).

	COMP 60 Stores No Minority Variable		COMP 60 Stores Both Minority Variables		COMP 59 Stores No Minority Variable		COMP 59 Stores Both Minority Variables	
Variable	**β**	**t-value**	**β**	**t-value**	**β**	**t-value**	**β**	**t-value**
Intercept	8.491*	1.99	9.859**	2.14	7.975*	1.81	9.899***	2.05
POPDEN	1.695***	5.45	1.159***	3.06	1.713***	5.44	1.156***	2.93
INCOME	0.076**	2.57	0.146***	3.45	0.075**	2.50	0.146***	3.30
AVHHSZ	-3.287**	-2.39	-5.350***	-3.12	-3.092**	-2.16	-5.371***	-2.89
BLACK	…		0.060**	2.35	…		0.060**	2.25
OTRMIN	…		0.032	0.23	…		0.032	0.22
R^2	0.4950		0.5419		0.4903		0.5350	
Model F-value	18.30***		12.78***		17.63***		12.20***	
White Test p-value	0.4531		0.5729		0.4835		0.5945	
Shapiro Wilk p-value	0.0852		0.0144		0.0680		0.0180	
Condition Index (highest value)	1.57755		3.83770		1.58987		4.03649	
Moran's I p-value	0.5531		0.7174		0.5929		0.9723	

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The Moran's I p-value is non-significant, and thus there is not sufficient evidence to suggest that spatial autocorrelation is influencing the data. The Shapiro-Wilk W statistic p-value leads to a conclusion that the null hypothesis of normality of the residuals can be rejected at the 10-percent level. However, the number of observations (N=60) minus the number of parameters (β=4) is 56 (N-β), which may suggest that the estimates are approximately normally distributed.

The second regression contains all 60 observations and also includes both minority variables. The model is significant at the 1-percent level and the R-square value is a bit higher than the first regression at 0.5419. The coefficient estimates for *POPDEN*, *INCOME* and *AVHHSZ* are all significant at the 1-percent level and have the same associated signs as in the first regression. The variable representing the percentage of residents who are self-identified as black is significant at the 5-percent level and suggests a positive relationship with competition. This estimated coefficient can be interpreted as meaning that if the percentage of residents who are self identified as black increases by 1-percent, then the spatial competition index is expected to increase by 0.060. The insignificant White Test p-value and the low condition index suggest heteroskedasticity and collinearity are not issues of concern. There is reason to believe based on the Shapiro-Wilk W statistic p-value that the errors are not distributed normally. The number of observations (N=60) minus the number of parameters (β=6) is 54 (N-β), so it may be argued that the estimates are approximately normal. The insignificance of the Moran's I statistic p-value implies spatial autocorrelation is not impacting the estimates.

The third regression does not include the outlier observation that was impacting the reduced form models dramatically and also excludes the two minority variables. Results of the third regression are very similar to those of the first regression. The R-square value is slightly lower at 0.4903, but there are not many other notable differences. The fourth regression includes

the minority variables but excludes the outlier observation as was done in the third regression. Outcomes from the fourth regression closely resemble the second regression which had both minority variables and all of the observations. The R-square value is a bit lower at 0.5350 but the other coefficient estimates and p-values for the respective tests are very similar to the second regression. Assessment of the results of the third and fourth regressions leads to a conclusion that the regressions were not sensitive to the omission of the outlier observation. This intuitively makes sense since the observation was a distinct outlier in terms of the TFP market basket cost but not competition.

The results from the OLS regressions for the second equation in which the TFP market basket cost is the dependent variable and the independent variables from the first equation are not included are shown in Table 11. However, the spatial competition gravity index variable *COMP* is included as an independent variable in the second equation. Since the minority variables are not included in the regressions, there are only two regressions that are necessary due to the only difference between the regressions is the number of observations.

The first regression includes all sixty observations and the model is significant at the 1-percent level. The R-square value of 0.2667 is quite low in comparison to the other regressions. The sole coefficient estimate that is significant other than the intercept is the *SPRCTR* variable, which is significant at the 1-percent level. This coefficient estimate can be interpreted as meaning that if a consumer were to go to a supercenter, then she or he would spend $47.40 less than if she or he would have shopped at a non-supercenter store in the sample, all else held constant.

Table 11: Equation (2) of the Two-Equation Model with Dependent Variable Thrifty Food Plan Market Basket Cost (COST).

	TFP Market Basket Cost Both Minority Variables, 60 Stores		TFP Market Basket Cost Both Minority Variables, 59 Stores	
Variable	β	t-value	β	t-value
Intercept	265.980***	23.08	278.085***	32.94
CHAIN	-8.945	-0.76	-20.912**	-2.43
SPRCTR	-47.407***	-3.85	-50.49***	-5.71
SERV	4.258	1.27	-0.844	-0.34
STRSZ	0.168	0.27	0.608	1.37
COMP	-1.091	-0.95	-1.03	-1.25
R^2	0.2667		0.4082	
Model F-value	3.93***		7.31***	
White Test p-value	0.0604		0.1505	
Shapiro Wilk p-value	<0.0001***		0.2674	
Condition Index (highest value)	2.53247		2.53419	
Moran's I p-value	0.9873		0.7323	

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The White Test p-value is the lowest of any of the regressions and the null hypothesis of homoskedasticity can be rejected at the 10-percent level. The condition index remains low, which suggests that the data are not codependent. The Shapiro-Wilk W statistic p-value is significant at the 1-percent level which implies that some issues exist with the normality of the residuals. However, the number of observations minus the number of parameters value is 54 (N-β), so based on the rule of thumb outlined by Hill, Griffiths, and Lim (2008), the estimates may be approximately normally distributed. The Moran's I statistic p-value is insignificant, suggesting that the data are not spatially correlated.

The second regression excludes the outlier observation and the model is significant at the 1-percent level. The R-square value of 0.4082 is substantially higher than the first regression.

The intercept and the *SPRCTR* variable are once again significant at the 1-percent level. The *CHAIN* variable is significant at the 5-percent level. The estimated coefficient value for the *CHAIN* variable can be interpreted as meaning that a consumer may save an estimated amount of $20.91 if she or he shopped at a chain store rather than at a non-chain nor non-supercenter store included in the sample, all else held constant. The White Test p-value and the Shapiro-Wilk W statistic p-value being insignificant led to the conclusion that the null hypotheses of homoskedasticity and normality cannot be rejected. The low condition index value suggests that collinearity is not an issue with the data included in the sample. The Moran's I statistic p-value remains insignificant and the data are concluded to not be spatially correlated.

In their two-equation system, Stewart and Davis (2005) found the number of fast-food stores to be significant in the second stage equation. Since the number of fast-food stores was the dependent variable in their first equation, they could discuss the impact of the first stage independent variables on fast-food meal price. Our left-hand side variable in stage one (and same right-hand side variable in stage two) is the competition index which is non-significant in Stage 2, so unlike with Stewart and Davis (2005) it is inappropriate to discuss the impacts of significant variables in Stage 1 on market basket cost. We tried replacing the competition index with the number of large grocery stores (by zip code) in both stages, similar to Stewart and Davis (2005), but this variable was also non-significant in the Stage 2 equation.

5.2 Analysis Utilizing the 2005 Dietary Guidelines for Americans Menu Developed by Stewart (2006)

The results for the analysis including the 2005 DGA market basket are remarkably similar to those utilizing the TFP market basket. Table 12 shows the Pearson correlation

coefficients for the correlation between the dependent variable, the 2005 DGA market basket cost, and the independent variables for all sixty observations.

Table 12: Pearson Pair-wise Correlation Coefficients for the Cost of the Market Basket Developed by Stewart (2006) that Meets the 2005 Dietary Guidelines for Americans and the Independent Variables Included in the Multiple Regressions, 60 Observations.

Variable	**2005 DGA Market Basket Cost**
POPDEN	**-0.09967** (0.4486)
INCOME	**0.18988** (0.1462)
AVHHSZ	**-0.12626** (0.3324)
CHAIN	**0.04553** (0.7297)
SPRCTR	**-0.48497***** (<0.0001)
SERV	**0.12761** (0.3312)
STRSZ	**-0.03644** (0.7822)
BLACK	**-0.09503** (0.4701)
OTRMIN	**-0.02813** (0.8311)
COMP	**-0.02297** (0.8617)

Notes: Correlation (p-value) in Parentheses
* Significant at10% level
** Significant at 5% level
*** Significant at 1% level

Comparable to the correlation coefficients for the TFP market basket cost, the only independent variable that has a significant correlation relationship based on the Pearson correlation p-value is the *SPRCTR* variable, which is again negatively correlated with market basket cost. The correlation is significant at the 1-percent level. Table 13 shows the correlation matrix that excluded the market basket cost outlier observation, and the correlation estimates

were also similar to those of the TFP correlation matrix that excluded the cost outlier observation.

Table 13: Pearson Pair-wise Correlation Coefficients for the Cost of the 2005 Dietary Guidelines for Americans Market Basket and the Independent Variables Included in the Multiple Regressions, 59 Observations.

Variable	**2005 DGA Market Basket Cost**
POPDEN	**-0.09975** (0.4523)
INCOME	**0.14391** (0.2769)
AVHHSZ	**0.01769** (0.8942)
CHAIN	**-0.06749** (0.6115)
SPRCTR	**-0.56042***** (<.0001)
SERV	**-0.04070** (0.7596)
STRSZ	**-0.08921** (0.5016)
BLACK	**-0.08582** (0.5181)
OTRMIN	**-0.05145** (0.6987)
COMP	**-0.12075** (0.3623)

Notes: Correlation (p-value) in Parentheses
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The coefficient estimate for *SPRCTR* remains the only significant Pearson correlation coefficient, and it is significant at the 1-percent level. The correlation matrix for the competition variable and the independent variables does not change for the 2005 DGA analysis since the independent variables and the competition variable included in this analysis are the same.

Therefore, the Pearson correlation matrix is not listed again, but can be found in Table 6 in Section 5.1 for reference.

5.2.1 Results from the Reduced Form Multiple Regression Model

Similar to the assessment of the Pearson correlation coefficients, the results of the OLS regressions of the reduced form model with the 2005 DGA market basket cost are notably similar to those of the TFP market basket cost discussed previously. The regression was once again carried out for four different models, and the results can be found in Table 14. Two of the models excluded the minority variables and two of the models omitted the market basket cost outlier observation that has impacted the normality of the residuals of the previous regression.

The first regression, which includes all sixty observations but excludes the minority variables, has a model F-value that is significant at the 1-percent level. The R-square value for the model is 0.3179. The coefficient estimates for the intercept and the *SPRCTR* variable are also significant individually at the 1-percent level. The significance of the *SPRCTR* coefficient estimate can be interpreted as meaning that the regionally-specific 2005 DGA market basket used in this analysis costs $47.10 less at a supercenter than at stores that are neither supercenters nor chain stores included in the sample, all else held constant. No other coefficient estimates are found to be significant. The White Test p-value being insignificant and the null hypothesis of homoskedasticity cannot be rejected. The p-value for the Shapiro-Wilk W statistic is significant at the 1-percent level. Therefore, the null hypothesis of normality of the residuals is rejected, and it is assumed that the residuals may not be normally distributed (Regression with SAS). In this case, the number of observations (N=60) minus the number of estimated parameters (β =9) is 51 (N-β), which may be sufficiently large to assume normality of the estimators.

Table 14: Multiple Regression Using the OLS Procedure Results with Market Basket that Meets the 2005 Dietary Guidelines for Americans Cost as the Dependent Variable (COST).

	2005 DGA MB Cost 60 Stores No Minority Variable		2005 DGA MB Cost 60 Stores Both Minority Variables		2005 DGA MB Cost 59 Stores No Minority Variable		2005 DGA MB Cost 59 Stores Both Minority Variables	
Variable	**β**	**t-value**	**β**	**t-value**	**β**	**t-value**	**β**	**t-value**
Intercept	293.289***	5.58	338.053***	5.80	262.932***	6.91	273.665***	6.18
POPDEN	-3.297	-0.78	-6.662	-1.44	-0.083	-0.03	-1.012	-0.29
INCOME	0.444	1.39	1.144**	2.27	0.406*	1.77	0.579	1.51
AVHHSZ	-8.491	-0.52	-35.649	-1.62	4.480	0.38	-2.297	-0.13
CHAIN	-6.999	-0.63	-6.137	-0.56	-20.637**	-2.51	-20.120**	-2.39
SPRCTR	-47.101***	-4.14	-44.374***	-3.91	-50.677***	-6.19	-49.991***	-5.92
SERV	-0.039	-0.01	-1.597	-0.45	-2.916	-1.14	-3.231	-1.21
STRSZ	0.065	0.11	0.190	0.33	0.534	1.28	0.550	1.28
BLACK	…		0.459	1.63	…		0.118	0.55
OTRMIN	…		-1.058	-0.73	…		-0.165	-0.15
COMP	-0.003	-0.01	-0.701	-0.49	-0.231	-0.23	-0.401	-0.38
R^2	0.3179		0.3611		0.4619		0.4655	
Model F-value	2.97***		2.77***		5.36***		4.18***	
White Test p-value	0.3855		0.4392		0.1404		0.4387	
Shapiro Wilk p-value	<0.0001***		<0.0001		0.6414		0.5785	
Condition Index (highest value)	3.18710		5.04836		3.19907		5.17409	
Moran's I p-value	0.9989		0.8699		0.5819		0.6407	

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The highest value in the condition index is 3.187, which shows collinearity to not be an issue impacting the model. A test for spatial autocorrelation was once again conducted using GeoDa. The p-value of the statistic that measures spatial autocorrelation, the Moran's I statistic, was found to be insignificant. Thus, it is concluded that spatial autocorrelation does not appear to bias the OLS results.

The second regression, which includes both of the minority variables as well as all sixty observations, has an F-value that is significant at the 1-percent level. The regression has a higher R-square value than the first regression at 0.3611. The coefficient estimates for the intercept and the *SPRCTR* variable are once again significant at the 1-percent level. The coefficient estimate for the *INCOME* variable becomes significant in the second regression. This coefficient estimate can be interpreted as meaning that if median household income were to increase by $1,000, the 2005 DGA market basket cost would be expected to rise by $1.14, all else held constant. Heteroskedasticity, collinearity, and spatial autocorrelation are not issues of concern in the second regression. The normality of the residuals is again rejected as it is in the first regression.

The third regression excludes the market basket cost outlier observation as well as the two minority variables from the analysis. The model F-value is significant at the 1-percent level, and the R-square value of 0.4619 is higher than the previous two regressions that include all sixty observations. The results remain the same as in the second regression except the *CHAIN* variable coefficient estimate is significant at the 5-percent level, and the coefficient estimates for the *INCOME* variable remains significant at the 10-percent level although at a lower magnitude. The insignificance of the White Test p-value, Moran's I statistic p-value, and the low condition index is evidence that heteroskedasticity, spatial autocorrelation, or collinearity do not seem to

be dramatically affecting the OLS estimates. The Shapiro-Wilk W statistic is also insignificant, which means we do not reject null hypothesis of normality of the residuals.

The final regression includes the two minority variables, but once again leaves out the cost outlier. The model F-value for the final regression is significant at the 1-percent level and the R-square value of 0.4655 is slightly higher than that of the third regression. The coefficient estimates for the intercept and *SPRCTR* variables are again significant at the 1-percent level. The *CHAIN* variable coefficient remains significant at the 5-percent level. This coefficient estimate can be interpreted as meaning that a 2005 DGA market basket is estimated to cost $20.12 less at a chain store than at stores that are neither chain stores nor supercenters in the sample, all else the same. The income variable is no longer significant. The residuals appear to be normally distributed, as shown by the insignificant Shapiro-Wilk W statistic p-value. Also, collinearity, heteroskedasticity or spatial autocorrelation do not seem to be affecting the regression estimates.

5.2.2 Results from the Two-Equation Model

In order to measure the necessity of the SUR procedure recommended by Stewart and Davis (2005), the correlation between the residuals from Equation 1 and Equation 2 of the two-equation system was calculated with the DGA market basket cost as the dependent variable in Equation 2. Tables 15 and 16 show the Pearson correlation matrices for the two-equation model that include sixty and fifty-nine observations, respectively. The tables show little evidence of correlation between the residuals from equation 1 and equation 2. Therefore, the SUR procedure Stewart and Davis (2005) recommend using, and which DeLorme, Jr., Hill, and Wood (1979) found to improve the efficiency of the OLS estimates when the residuals are correlated is deemed to be unnecessary.

Table 15: Pearson Correlation Matrix for the Error Terms in Equation (1) and Equation (2) with Minority Variables for the 2005 Dietary Guidelines for Americans Market Basket, 60 Observations.

	Residuals from Equation (1)	Residuals from Equation (2)
Residuals from Equation (1)	1.00000	-0.04601 (0.7270)
Residuals from Equation (2)	-0.04601 (0.7270)	1.00000

Note: Coefficient p-value in parentheses

Table 16: Pearson Correlation Matrix for the Error Terms in Equation (1) and Equation (2) with Minority Variables for the 2005 Dietary Guidelines for Americans Market Basket, 59 Observations.

	Residuals from Equation (1)	Residuals from Equation (2)
Residuals from Equation (1)	1.00000	-0.02539 (0.8486)
Residuals from Equation (2)	-0.02539 (0.8486)	1.00000

Note: Coefficient p-value in parentheses

The correlation estimates of the equations that exclude the minority variables are nearly identical to those of the regressions in Tables 15 and 16. Since the SUR estimation procedure was not viewed to improve estimate accuracy, the two-equation system was estimated using the standard OLS procedure. Results from the first equation with *COMP* as the dependent variable are the same as the results from the first equation in the analysis of the TFP market basket cost. Therefore, the results are not shown again. They can be found in Table 10 in Section 5.1.2. The results from the OLS estimate of equation 2 with the 2005 DGA market basket cost as the dependent variable are displayed in Table 17. Results are reported for two rather than four regressions because the only difference between the regressions is the number of observations.

Table 17: Regression Results for Equation (2) with Dependent Variable 2005 Dietary Guidelines for Americans Market Basket Cost (COST).

	2005 DGA Market Basket Cost 60 Stores Both Minority Variables		2005 DGA Market Basket Cost 59 Stores Both Minority Variables	
Variable	**β**	**t-value**	**β**	**t-value**
Intercept	278.418***	26.35	289.489***	37.33
CHAIN	-10.909	-1.01	-21.855***	-2.77
SPRCTR	-46.464***	-4.12	-49.284***	-6.06
SERV	2.515	0.82	-2.152	-0.94
STRSZ	0.057	0.10	0.459	1.13
COMP	-0.244	-0.23	-0.189	-0.25
R^2	0.2684		0.4208	
Wald Test F-value	3.96***		7.70***	
White Test p-value	0.1442		0.1076	
Shapiro Wilk p-value	<0.0001		0.3848	
Condition Index (highest value)	2.53247		2.53419	
Moran's I p-value	0.8767		0.4564	

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The first regression includes all sixty observations and the model F-value shows that the model is significant at the 1-percent level. The R-square value of 0.2684 is low in comparison to the other regressions. The coefficient estimate for the intercept and the *SPRCTR* variable are significant at the 1-percent level, and the *SPRCTR* coefficient estimate is negative in relation to market basket cost. The coefficient estimate for *SPRCTR* can be interpreted as meaning that if a consumer bought the 2005 DGA market basket at a supercenter as opposed to a store in the sample that is not a supercenter nor a chain store, she or he would spend an average of $46.46 less, all else held constant. Heteroskedasticity, collinearity, and spatial autocorrelation do not appear to be issues impacting the model. The Shapiro-Wilk W statistic is significant at the 1-

percent level which is a sign that the residuals are not normally distributed. The number of observations (N=60) minus the number of parameters (β=6) is 54 (N-β), so it could be assumed by the rule of thumb established earlier that the sample is large enough for the OLS estimates to be approximately normally distributed.

The second regression does not include the market basket cost outlier observation and the model is significant at the 1-percent level. The R-square value of 0.4208 is not as high as the R-square values from the first equation but is considerably higher than that of the first regression. The coefficient estimates for the intercept, *CHAIN*, and *SPRCTR* variables are all significant at the 1-percent level. The coefficient estimates for the *CHAIN* and *SPRCTR* variables are negative. Interpreting the *CHAIN* variable, it can be concluded that a 2005 DGA market basket purchased from a chain store rather than from stores that are neither chain stores nor supercenters, is estimated to be $21.86 less on average, all else held constant. The Shapiro-Wilk W statistic p-value is insignificant, which means that the null hypothesis of normality of the error term is not rejected. Heteroskedasticity, collinearity, and spatial autocorrelation tests were also conducted and do not appear to be impacting the estimates. As with the TFP market basket, insignificance of the *COMP* variable in the second equation disallows any interpretation of influence of variables in the first stage equation the cost of the 2005 DGA market basket.

5.3 Comparative Analysis of the Two Market Basket Results

Analysis of the factors that influence the costs of a two-week Thrifty Food Plan market basket and a two-week market basket that meets the 2005 Dietary Guidelines for Americans shows that both market baskets initially appear, on average, to be affordable for a family of four receiving the maximum SNAP benefits. The average cost of a TFP market basket was $262.50 and the average cost of the market basket that meets the 2005 DGA was $272.71. Multiplying

each of these values by two yields four-week market baskets that cost $525.00 for the TFP market basket and $545.42 for the 2005 DGA market basket, respectively. These four week values initially suggest that both market baskets may be obtained with the maximum SNAP benefits for a family of four of $668. This calculation does not include the extra days beyond the four week period for the month, and is based on the calculations done on a per ounce basis and not on a purchasable unit basis. Therefore, it would be expected that the market basket purchased in one week could be more expensive than the next week, when some items would not need to be purchased because they are non-perishable and leftover food remains to be used in later weeks. In addition, this does not include provisions for spoilage or food otherwise left uneaten, which is a substantial assumption that must be considered when considering the affordability of the market baskets.

These calculations also pertain to the maximum SNAP benefit levels for a household of four people. The average SNAP benefit recipient in Louisiana in the fiscal year 2008 received $262.96 (SNAP Average Monthly Benefits). The SNAP is by definition a supplemental benefit to assist with food expenditures for low-income individuals and households. The program presumes that individuals and households will devote at least 30-percent of their own income toward food. The SNAP benefit for individual households is calculated as follows. Monthly net income for the household is multiplied by 0.3 and the resulting number is subtracted from the maximum benefit value of $668 to yield the household SNAP benefit allotment. There are also some additional deductions from the net income calculation that can increase SNAP benefit allotments for eligible parties (Fact Sheet on Resources). This value of net income multiplied by 0.3 for the average Louisiana household is $405.04. Therefore, the average four-person SNAP recipient household is expected to expend $405.04 of its net income toward food in order to

achieve the level of food expenditures that would be achievable on the maximum SNAP benefit allowance.

The appearance of affordability based on the $525.00 and $545.42 for the TFP and 2005 DGA market baskets respectively, assumes the average recipient household would devote at least 30-percent of its income on food. Golan et al. (2008, 29) determine that those receiving the maximum SNAP benefit are likely to be able to achieve a healthy diet. This conjecture of affordability on the maximum SNAP benefits appears to apply to the Baton Rouge, LA, metropolitan area. However, Golan et al. (2008) also affirm that only one third of SNAP recipients receive the maximum benefit, and so a majority of SNAP benefit recipients are assumed to devote a sizeable portion of their income to food expenditures. The authors suggest that the assumption of devoting 30-percent of monthly income may be too high in many cases based on evidence that shows low-income households increasing food expenditures by less than 10 cents for each dollar increase in income (Golan et al., 2008, 30). Therefore, Golan et al. (2008) find that it may be difficult for families not receiving the maximum SNAP benefit amount to achieve food expenditure parity with those receiving the maximum due to other household cost obligations such as rent, utilities, and other expenses that must also be met. The authors also suggest that a healthy diet may be unachievable for many households receiving below the maximum SNAP benefits (Golan et al., 2008, 31).

The mean 2005 DGA market basket cost of $272.71 is $10.21 more than the mean of the TFP market basket cost of $262.50. A student's t-test was conducted in order to examine if the market basket costs for the two market baskets are significantly different. The NPAR1WAY procedure was conducted in SAS in order to test the equality of means. The typical student's t-test was not used because the student's t-test assumes the errors are normally distributed, but

normality was violated when all sixty observations were included. The NPAR1WAY procedure allows for two-sample means testing without the normality assumption. The one-sided exact p-value for the two-sample test statistic in the Wilcoxon analysis is 0.0279, which is significant at the 5-percent level. This allows us to reject the null hypothesis that the means of the two samples are equal (NPAR1WAY Procedure). Therefore, we conclude that the mean 2005 DGA market basket cost is statistically significantly more expensive than the mean TFP market basket cost.

Although the mean 2005 DGA market basket cost is higher than the TFP market basket cost, both baskets initially appear to be affordable on the maximum amount of SNAP benefits at a large majority of the surveyed supermarkets. If the 2005 DGA market basket was repeated for an additional two weeks, then it seems as though the 2005 DGA nutritional requirements may be met on the maximum SNAP benefits in a majority of the surveyed stores. However, these calculations do not include the extra days in the month beyond a four week period and are based on per ounce and per serving calculations rather than the unit purchase price for each item. Therefore, the costs of market baskets across weeks for a full month would not be equal, and would likely be lower when leftover items are available and not be needed to be purchased in later shopping trips. Another important assumption that cannot be disregarded is that the calculations of affordability assume that no food is unconsumed due to spoilage or food left uneaten.

In both analyses, the coefficient estimates for the *SPRCTR* variable were consistently negative and significant. The magnitudes of the coefficient estimates for each of the analyses were similar as well. Each of the reduced form models with the TFP market basket cost and the 2005 DGA market basket cost as the dependent variable yielded coefficient estimates that can be

interpreted as meaning that if a consumer were to shop at a supercenter rather than at stores that are neither supercenters nor chain stores, then she or he on average would save over forty dollars over two weeks, all else held constant. The magnitude of the *SPRCTR* variable increased for each of the analyses to close to a value of fifty. This suggests that when the market basket cost outlier is excluded as a possible shopping option, the average TFP or 2005 DGA market basket is estimated to be about fifty dollars less expensive over two weeks, on average, at a supercenter than at a store that is neither a supercenter nor a chain store.

The coefficient estimates for the *CHAIN* variable became significant once the outlier observation was left out. The magnitude of the coefficient for the *CHAIN* variable was larger for the 2005 DGA reduced form regression, which suggests that shopping at a chain store as opposed to a store that is neither a chain nor a supercenter would result in a higher amount of savings than for the TFP market basket, all else held constant. The magnitudes of the coefficient estimates are -18.75 and -18.36 for the TFP regression and are -21.06 and -20.49 for the 2005 DGA regression, respectively.

The significance of the *SPRCTR* and *CHAIN* variables and their negative influence on market basket cost make it apparent that the most affordable market baskets can be obtained on average at a chain store or supercenter. One finding by Chung and Meyers (1999) in the Minneapolis area and in a national study by Powell et al. (2007) is that low-income neighborhoods are less likely to have chain stores than higher income neighborhoods. Figure 1 shows the dispersion of all large grocery stores in the Baton Rouge, LA, metropolitan area. The large grocery stores are represented by the yellow dots on the map. A visual assessment of Figure 1 shows a higher concentration of larger grocery stores centered in the East Baton Rouge Parish area, which is the location of Baton Rouge, LA, City. The center of the map with the

smaller census tracts is Baton Rouge, LA, City. The census tracts vary in shade by income level, with the darkest colored census tracts being the tracts with the highest median household income. Figure 2 shows the dispersion of supercenter and chain type stores in the region. Both figures include all stores in the region and not just stores that were surveyed for price information.

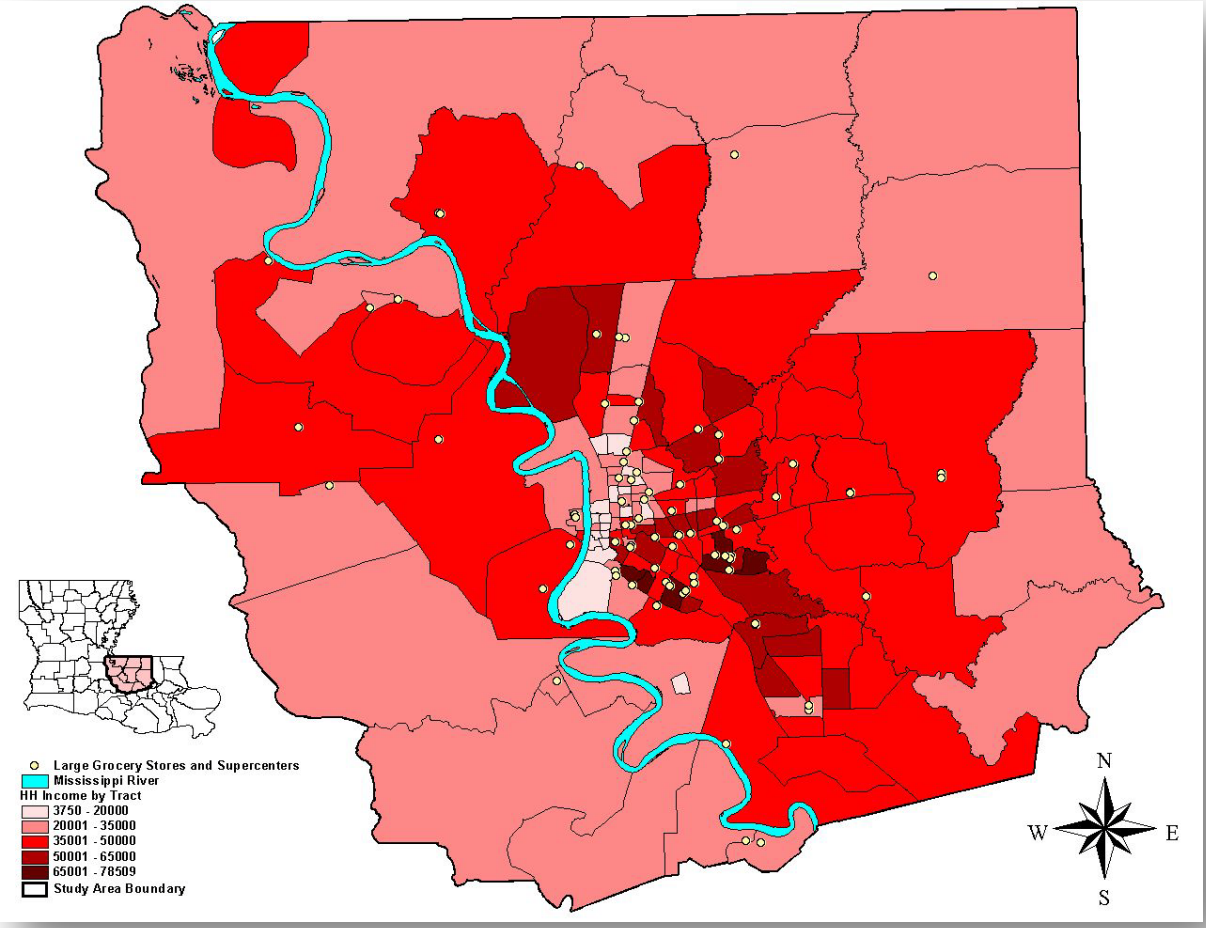

Figure 1: Map Identifying the Locations of Large Grocery Stores in the Baton Rouge, LA, Metropolitan Area.

A visual assessment of Figure 2 suggests a greater concentration of chain stores in areas of higher income. Another observation from the map above is that the rural populations are limited in their access to chain stores and supercenters, which prevents rural residents from purchasing the least expensive market baskets as compared to the suburban and urban populations.

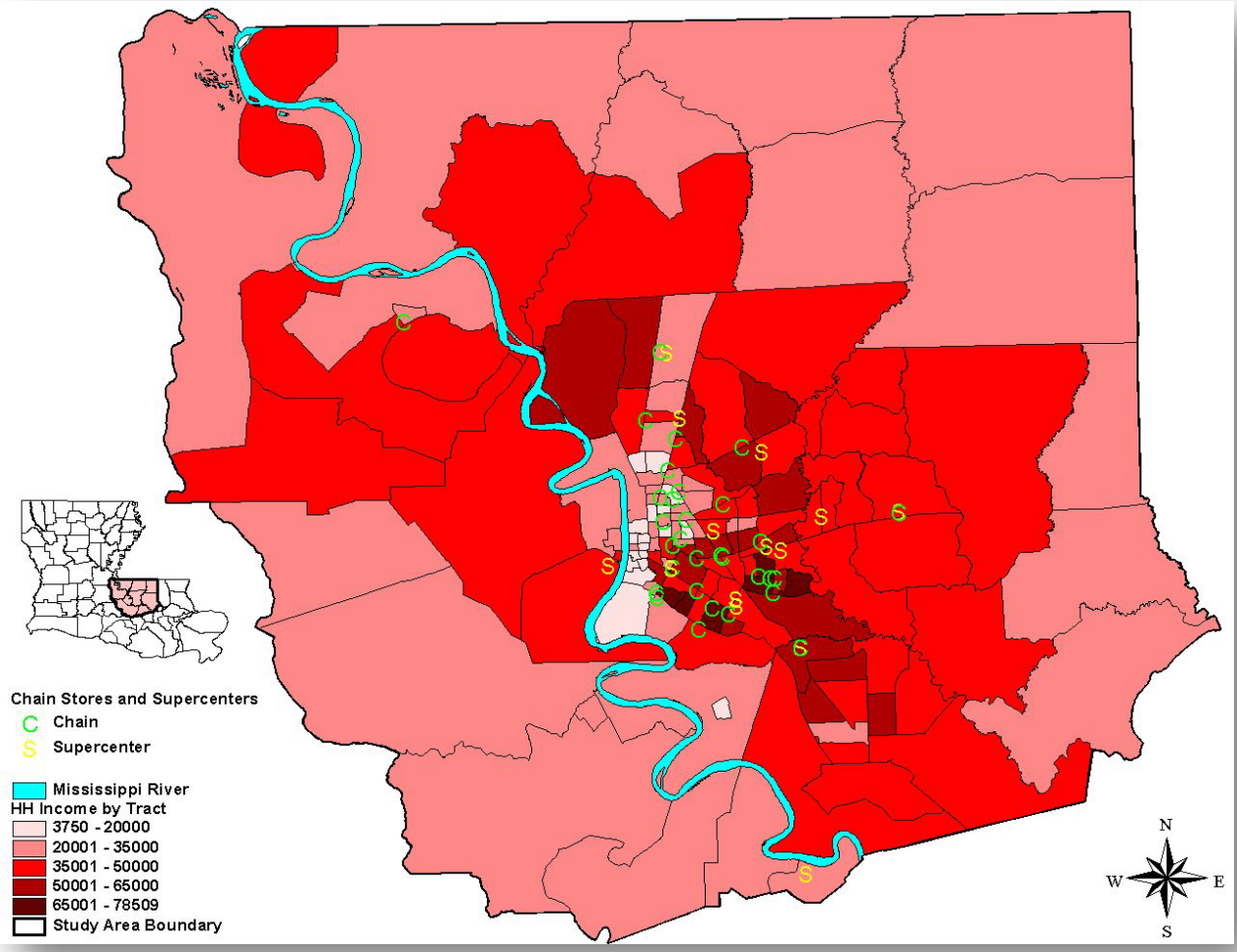

Figure 2: Map Identifying the Locations of Chain and Supercenter Stores in the Baton Rouge, LA, Metropolitan Area.

The behavior of the *INCOME* variable coefficient estimates is another point of variation between the TFP and 2005 DGA market basket analyses. The *INCOME* variable in the TFP reduced form model becomes significant at the 10-percent level for the model with all 60 observations and both minority variables. The coefficient estimate for the *INCOME* variable in the TFP reduced form model is positive with a magnitude of 1.055. The *INCOME* variable does not remain significant for any of the other reduced form regressions. The coefficient estimate for the *INCOME* variable in the 2005 DGA reduced form model is also significant in the regression with all 60 observations and both minority variables, but is significant at the 5-percent level with

a magnitude of 1.144. The *INCOME* variable coefficient estimate remains significant at the 10-percent level for the regression with 59 observations and no minority variables. The higher magnitudes and greater level of significance of the results suggest that *INCOME* is a more important determining factor on the cost of the 2005 DGA market basket than the TFP market basket.

In the two-equation system, income and population density are both found to have significant, positive influences on the levels of spatial competition facing a firm. The first equation with *COMP* as the dependent variable does not differ for the TFP and 2005 DGA analyses. The significance and positive magnitude of *INCOME* and *POPDEN* are not unexpected since higher income and the higher number of consumers is expected to increase overall demand for groceries. One result of note was the strong negative impact of *AVHHSZ* on competition that was consistent across all of the regressions. The significance of the estimated regression coefficient is not unexpected due to the significant negative correlation between *AVHHSZ* and *COMP* shown in the Pearson correlation matrix. This can most likely be attributed to larger households residing in census tracts that are predominantly residential and traveling to more commercially saturated tracts to grocery shop.

An additional point of interest is the small but significant positive influence of the coefficient estimate for the variable representing the percentage of residents who are self-identified as being black. The significance of the *BLACK* variable pertains to the first equation of the two-equation model, which does not differ between the TFP and DGA analyses. This variable is not significantly correlated with the spatial competition gravity index in the Pearson correlation coefficient matrix, but is significant in the multiple regression analysis. The magnitude of the BLACK variable coefficient estimate is 0.060, which is small, but significant at

the 5-percent level. The *COMP* variable serves as an inexact proxy for consumer access. If competition is higher in a certain area, then it is assumed that there is greater access to supermarkets in the area. Zenk et al. (2005) found there to be less access based on the spatial distance to supermarkets for residents of primarily African American areas of Detroit. The findings from the regression assessing the factors that impact competition may show that areas with a higher percentage of self-identified black residents may have sufficient access to large grocery stores in the Baton Rouge, LA, metropolitan area on an aggregate level. One cannot conclude from this finding that all areas in the Baton Rouge, LA, metropolitan area that have higher percentages of self-identified black residents have sufficient access to supermarkets. However, it is an interesting finding that inspires further examination of differences across neighborhoods that may not be captured by the aggregate analysis of large grocery stores in the region.

The spatial autocorrelation issues that impacted the results of the spatial access study by Zenk et al. (2005) were not found to be present in either of the TFP or 2005 DGA analyses. The Moran's I statistic p-value was consistently found to be insignificant, suggesting that spatial autocorrelation would not impact the OLS estimates. A spatial trend in prices does not appear to exist in the Baton Rouge, LA, metropolitan retail food environment. This suggests that there is a disparity in food basket costs throughout the region, and that stores with high market basket costs are found near stores with lower market basket costs.

The *COMP* variable was never found to be a significant factor on the TFP market basket cost or the 2005 DGA market basket cost. However, as seen from the correlation matrix between *COMP* and the explanatory variables, which applies to both analyses, the Pearson correlation coefficient for *SERV* was positively associated with the *COMP* variable and significant at the 5-

percent level. This positive correlation between services and competition could be seen as evidence that stores in a saturated market area are competing by providing more services rather than lowering prices. Connor (1999) has a nice chart that compares the price and service disparities provided by stores across store formats, and Anderson (1993) state that higher service levels can increase operating costs of firms. This situation is explained by Marion (1998, 397) to be "strategic learning," which occurs when a supermarket competes in ways other than providing the lowest prices, such as by providing better service. Once a market is saturated with a number of different competitors, then it is feasible to believe that the different stores do not compete on price but rather different services and the other fixed cost (better parking, higher quality) attributes Bell, Ho, and Tang (1998) outlined. These service attributes could diminish the hypothesized negative influence of COMP on market basket cost.

CHAPTER 6: CONCLUSIONS

The results from the analyses of the TFP and 2005 DGA market basket costs are remarkably similar. The 2005 DGA market basket was included in the analysis as a healthy market basket that is more "representative" of Southeastern Louisiana diets than the TFP. Other researchers, such as Block and Kouba (2006), have included a few additional regionally significant diet items to the TFP market basket. However, this study has utilized a complete market basket menu that was developed to include many regionally specific recipes and foods in food pricing analysis. The similarity of results between the TFP market basket, which has been described by Andrews et al. (2001) to be unrepresentative, suggests that including a "representative" menu for comparison does not influence findings.

It can be concluded that a market basket of healthy food items does not cost more, on average, at stores that are located in lower income areas. Median household income is estimated to have a significant and positive impact on both the TFP and 2005 DGA market basket cost. The *INCOME* variable was significant at the 5-percent level and the magnitude of the coefficient estimate in the 2005 DGA analysis was larger, suggesting that income was expected to be a greater influence on the cost of the 2005 DGA than the TFP market basket. The question of whether a market basket costs more in lower income neighborhoods is a different question than whether the poor actually pay more, as Broda, Leibtag, and Weinstein (2009) point out. In order to find out whether the poor pay more, it would be necessary to acquire further data on consumer behavior to see where low-income consumers in the Baton Rouge, LA, metropolitan area actually do their principal grocery shopping. The findings are also on an aggregate level and cannot be said to apply to each individual food environment.

The results of the TFP and 2005 DGA analyses both suggest that, on average, the lowest market basket costs for each respective market basket can be found at supercenters and chain stores. This analysis included the lowest priced products available in each store. The results suggest that the stores that have these organizational and management structures are able to supply the lowest priced brands at the lowest aggregate prices. Therefore, in order to best answer the question of whether the poor pay more for food, one must find out whether low-income consumers do the majority of their grocery shopping at chain or supercenter stores. Past analysis by Broda, Leibtag, and Weinstein (2009) found, through a national study of consumption records, low-income consumers to spend more on food at supercenters than higher income consumers. Whether this consumption trend applies to the Baton Rouge, LA, metropolitan area cannot be determined in this study, but the large amount of investment by Wal-Mart in the area, noted by Franklin (2001), in recent years suggests this trend may be applicable.

On an aggregate level, both the TFP and 2005 DGA market baskets initially appear to be affordable for recipients of the maximum level of SNAP benefits for a household of four in the Baton Rouge, LA, metropolitan area. However, the appearance of affordability of the market basket applies only on an aggregate level and does not pertain to individual supermarkets. In fiscal year 2008, the average SNAP benefit recipient in Louisiana received $262.96 (SNAP Average Monthly Benefits), suggesting that the average SNAP recipient is expected to devote a significant amount of income to food expenditures each month to achieve parity with the $668 maximum SNAP benefit allotment for a four-person household. Affordability of the market baskets would require the assumption that the average SNAP benefit recipient spends enough income in addition to the SNAP benefit allotment to purchase either the TFP or 2005 DGA market basket. This conjecture of affordability, however, also assumes there is no food that is

disposed or left uneaten, which would be unlikely in most households and is a crucial assumption in measuring the overall affordability of the market baskets.

The conclusion of affordability in terms of maximum SNAP benefit allotment is also limited by the nature in which the market baskets were priced. The market baskets were priced on a per serving basis rather than in terms of purchasable units. It is expected that a household that does not have any leftover food would expend a substantial amount more on a market basket than a household that retains non-perishable food that was stored from prior purchase. The calculations in this study can only make determinations based on an average, per serving basis, and the actual market baskets purchased will likely vary across stores. Whether the monthly aggregate costs are similar to those calculated in this study would depend on the shopping practices of individual households.

This study is also limited in its analysis based on the recording of the price of the lowest priced items without being consistent on brands. The results of the study may vary substantially if differences in brands were taken into consideration. The July 2009 USDA Report to Congress on Food Access suggests that discount chains have lower prices than other store types, in part due to supplying private label rather than nationally recognized brands. The results of this analysis display the most significant factors influencing price to be store type, which may be capturing the differences in branding of items across stores. Therefore, the results cannot be said to apply to market baskets of products that meet certain branding or defined item size criteria.

This study also cannot make any determination as to any causal reasons why the supercenter and chain style stores are, on average, estimated to have the lowest market basket costs, or why the cost of the market baskets is estimated to increase with income. The cost differences may be due to supply side reasons such as cost differences associated with the

different store types, or demand side issues related to the composition of the market baskets. It may be that consumers in higher income neighborhoods demand higher quality or that suppliers do not discount food prices as much for higher income consumers. Broda, Leibtag, and Weinstein (2009, 15) find prices for the same goods to be slightly higher in higher income neighborhoods, but also that higher income consumers buy more expensive types of the same goods. This study cannot differentiate between the demand and supply reasons for why market basket costs are lower at some store types.

A related limitation to this study is the inability to make a determination on differences in quality. This study assumes that the quality of the goods that are purchased is constant across stores. Block and Kouba (2006) found disparities in the quality of produce across neighborhoods and store type. Andreyeva et al. (2008) show low-income neighborhoods to have lower quality produce than higher income neighborhoods, especially the quality of fresh fruit. A dispersion of quality was viewed to exist in the fresh produce and fresh meats as stores were surveyed, but the quality differences were not included as part of this study.

This study also cannot make any determinations on overall access to large supermarkets or other store formats within which a consumer could supplement the store at which a household does the majority of their shopping. Block and Kouba (2006) found availability and quality to vary based on store type in the Chicago area, and included such stores as convenience stores, dollar stores, specialty stores, and liquor stores in order to assess the overall availability of nutritious food items. Rose et al. (2009) made similar observations in their analysis of the existence of food deserts in New Orleans, LA, and the June 2009 Report to Congress on Food Accessibility alludes to the differences in store types, complicating the analysis of overall food access. This study includes only large grocery stores and supercenters within which one can

obtain a TFP or 2005 DGA market basket or a market basket that is nutritionally equivalent. This study also does not include information on automobile ownership and public transportation system information that would be available to urban consumers.

The next phase of study in the Baton Rouge, LA, metropolitan area may move into the area of consumer behavior to gain a greater understanding about the actual shopping patterns of Baton Rouge, LA, residents. This study shows that on an aggregate level, the cost of a market basket is higher in areas with higher median income. The conclusions on the aggregate food environment for the Baton Rouge metropolitan area do not apply to each individual community, especially rural communities that are less likely to have access to chain stores as Kaufman (1999), Powell et al. (2007) and this study show. Assessment of rural access to supermarkets remains an area with many potential research opportunities, especially with regard to surveys of consumer behavior of rural residents. The diverse mix of urban, suburban, and rural communities in the Baton Rouge, LA, metropolitan area makes it a unique location to conduct a food pricing study, and the results of this study are a useful addition to the study of the food retail industry organization and the influencing factors on the cost of market baskets of food items.

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APPENDIX A: LIST OF ALL FOODS INCLUDED IN THE THRIFTY FOOD PLAN MARKET BASKET

Week 1: Thrifty Food Plan Menu Item List

Item #		Amount (ounces)
1	Apples	24.00
2	Bananas	44.00
3	Melon	16.00
4	Oranges	87.00
5	Cabbage	4.00
6	Carrots	20.00
7	Celery	3.00
8	Green Pepper	3.00
9	Lettuce, Leaf	4.00
10	Onions	40.00
11	Potatoes	190.00
12	Zucchini	7.00
13	Applesauce	2.00
14	Peaches	26.00
15	Pears	13.00
16	Green beans	12.00
17	Spinach	10.00
18	Tomato paste	6.00
19	Tomato sauce	17.00
20	Tomato Soup	10.50
21	Orange Juice, concentrate	96.00
22	Green beans	5.00
23	Peas	5.00
24	Bagels, plain, enriched	16.00
25	Bread Crumbs	2.00
26	Bread, white, enriched	35.20
27	English Muffins	16.00
28	Bread, French, Enriched	8.00
29	Hamburger Buns	8.00
30	Crackers, snack, low salt	4.00
31	Oatmeal, quick, rolled oats	3.00
32	Ready-to-eat Cereal (Corn Flakes)	6.00
33	Barley, pearl	4.00
34	Flour, enriched	24.00
35	Macaroni, enriched	27.00
36	Noodles, yolk-free, enriched	35.00

37	Rice, enriched	37.00
38	Evaporated Milk	16.00
39	Milk, 1% lowfat	320.00
40	Milk, Whole	96.00
41	Cheese, Cheddar	8.00
42	Beef Chuck Roast	40.00
43	Beef, Ground, Lean	38.40
44	Chicken, Fryer	24.00
45	Fish, breaded portions, frozen	16.00
46	Cod, frozen	16.00
47	Tuna fish, chunk-style, water-pack	12.00
48	Turkey breast	36.00
49	Turkey, ground	32.00
50	Turkey ham, deli	11.00
51	Beans, kidney, canned	27.00
52	Beans, lima, dry	6.00
53	Beans, northern, canned	9.00
54	Beans, garbanzo (chickpeas), canned	10.00
55	Eggs, large	15.00
56	Margarine Stick	7.00
57	Shortening	2.00
58	Salad dressing, Mayonnaise-type	16.00
59	Vegetable oil	9.00
60	Sugar, brown	2.00
61	Sugar, granulated	16.00
62	Chocolate pudding, instant	3.00
63	Lemonade, (ready-to-drink)	128.00

Week 2: Thrifty Food Plan Menu Item List

Item #		Amount (ounces)
1	Apples	20.00
2	Bananas	44.00
3	Grapes	24.00
4	Melon	16.00
5	Oranges	76.00
6	Carrots	16.00
7	Celery	5.00
8	Green Pepper	4.00
9	Lettuce, leaf	9.00
10	Onions	20.00
11	Potatoes	168.00
12	Tomatoes	6.00
13	Oranges	13.00
14	Peaches, lite-syrup	26.00
15	Mushrooms	4.00
16	Spaghetti sauce	26.00
17	Tomato sauce	8.00
18	Orange juice, concentrate	84.00
19	Broccoli	6.00
20	French fries	11.00
21	Green beans	23.00
22	Peas	15.00
23	Bagels, plain, enriched	8.00
24	Bread Crumbs	3.00
25	Bread, French	4.00
26	Bread, White, enriched	32.00
27	Bread, Whole wheat	4.00
28	Hamburger buns, enriched	8.00
29	Rolls, dinner, enriched	4.00
30	Ready-to-eat cereal: Corn flakes	1.00
31	Ready-to-eat cereal: Toasted oats	10.00
32	Flour, enriched	23.00
33	Macaroni, enriched	21.00
34	Noodles, yolk-free, enriched	18.00
35	Popcorn, microwave, unpopped	3.00
36	Rice, enriched	50.00
37	Spaghetti, enriched	11.00
38	Evaporated milk	4.00

39	Milk, 1% lowfat	288.00
40	Milk, whole	128.00
41	Cheese, cheddar	2.00
42	Cheese, cottage	7.00
43	Cheese, mozzarella	1.00
44	Beef, ground, lean	63.00
45	Chicken, fryer	29.00
46	Chicken, thighs	44.00
47	Fish, frozen	32.00
48	Tuna fish, chunk-style, water pack	12.00
49	Pork, ground	23.00
50	Turkey, ground	16.00
51	Turkey ham	11.00
52	Beans, garbanzo, canned	15.00
53	Beans, kidney, canned	15.00
54	Beans, vegetarian baked, canned	25.00
55	Eggs, large	17.00
56	Margarine, stick	15.00
57	Shortening	4.00
58	Salad dressing, mayonnaise-type	6.00
59	Vegetable oil	9.00
60	Sugar, brown	1.00
61	Sugar, granulated	3.00
62	Sugar, powdered	9.00
63	Jelly	8.00
64	Molasses	1.00
65	Pancake syrup	2.00
66	Chocolate chips, semi-sweet	2.00
67	Fruit drink	128.00
68	Fudgesicles, ice milk	8.00

APPENDIX B: LIST OF NUTRITIONALLY EQUIVALENT SUBSTITUTE ITEMS IN THE THRIFTY FOOD PLAN MARKET BASKET

Table 1: List of Items Missing from Week 1 of the Thrifty Food Plan Food List and the Nutritionally Equivalent Substitutes

Missing Menu Item	Nutritionally Substitute
Bagel	White Bread
Bread Crumbs	White Bread
English Muffins	White Bread
Enriched French Bread	White Bread
1% Milk	Skim Milk
Frozen fish portions	Tuna
Frozen Cod	Frozen Fish Portions; Tuna
Turkey breast	Cooked Chicken Fryer
Lettuce	Spinach
Lima beans, dry	Dry pinto beans; dry black beans
Lemonade, ready-to-drink	Soda; Fruit Drink; Homemade Lemonade
Pearl Barley	Rice
Garbanzo beans	Kidney Beans; Black beans;
Noodles, yolk-free	Macaroni
Ground Turkey	Ground Beef
Turkey Ham	Cooked Chicken Fryer
Beef Chuck Roast	Ground Beef
Zucchini (Tuna Pasta Salad)	Yellow squash; green pepper
Canned pears	Canned Pineapple; Fruit Cocktail
Tomato Soup (Beef Noodle Casserole)	Tomato Sauce; Diced Tomatoes, blended in food processor, salt added
Celery (Tuna Macaroni Salad; Chicken Noodle soup)	Green Pepper
Carrots	Canned Carrots
Apples	Applesauce
Melon	Orange
Orange	Banana
Tomato Paste	Diced Tomatoes (blended in food processor)
Tomato sauce	Diced tomatoes (blended in food processor)
Instant Chocolate Pudding	Yogurt
Spinach	Frozen spinach
Northern Beans, canned	Black
Evaporated Milk	Whole Milk (Twice the fluid volume)

Note: If missing item was included in a recipe the recipe name is in parentheses

Table 2: List of Items Missing from Week 2 of the Thrifty Food Plan Food List and the Nutritionally Equivalent Substitutes

Missing Menu Item	Nutritionally Equivalent Substitute
Bagels	White Bread
Bread Crumbs	White Bread
French Bread	White Bread
Dinner Rolls	White Bread
1% Milk	Skim Milk
Frozen Fish	Tuna
Ground Pork	Ground Beef
Turkey Ham	Cooked Chicken fryer
Fruit Drink	Cola; Homemade Lemonade
Chicken Thighs	Chicken Fryer
Whole Wheat bread	Whole Wheat Tortillas
Garbanzo beans, canned	Kidney; Black
Powdered sugar	Granulated (blended in food processor)
Molasses	Syrup; Jam
Evaporated Milk	Whole Milk (2x the fluid volume)
Ground Turkey	Ground Beef
Fudgesicles, ice-milk	Yogurt
Carrots	Canned Carrots
Microwave popcorn	Corn chips
Pancake Syrup	Jam
Canned Mushrooms (Stir-Fried Pork and Vegetables with Rice)	Okra; Green Beans
Grapes	Bananas
Brown sugar	Granulated Sugar
Celery (Tuna Macaroni Salad; Chicken Noodle soup)	Green Pepper
Mandarin oranges	Fresh Oranges
Apples	Applesauce
Cottage Cheese (Cheese Stuffed Potatoes)	Processed Cheese (Velveeta)
Granulated Sugar	Brown Sugar
Noodles, yolk-free	Macaroni
Lettuce	Spinach
Melon	Oranges
Banana	Oranges

Note: If missing item was included in a recipe the recipe name is in parentheses

Homemade Lemonade Recipe (Made from items on food list):
4 fresh lemons
1/2 gal. water
1 c. sugar
Split lemons in half. Squeeze juice out. Mix with water and sugar.

APPENDIX C: RECIPE LIST FOR MENU DEVELOPED BY STEWART (2006) THAT MEETS THE 2005 DIETARY GUIDELINES FOR AMERICANS

Week 1: Recipe Items List Included in the Two-Week 2005 Dietary Guidelines for Americans Menu Developed by Stewart (2006)

	Amount (ounces)
Tuna Salad (4 servings)	
Eggs	3.00
Tuna	12.00
Mayo	2.00
Celery	3.00
Relish	1.00
Potato Salad (4 Servings)	
Fat-free Italian dressing	2.00
Celery	1.00
Onions	2.00
Potatoes	7.50
Cajun Spiced Chicken (4 Servings)	
Flour	2.20
1% Milk	8.00
Chicken Leg Quarters	49.20
Green Bean Casserole (3 Servings)	
Green Beans	15.50
1% Milk	2.67
Cream of Mushroom Soup	5.38
Bread Crumbs	2.00
Margarine Spread	1.00
Egg	1.00
Chicken and Vegetable Stir Fry (3 Servings)	
Corn Starch	1.00
Canola Oil	1.00
Onion	3.00
Celery	3.00
Carrot	2.00
Bell Pepper	4.00
Chicken Leg Quarters	36.90
Green Onions	0.50

Easy Peach Crisp (8 servings)	
Canned Peaches	31.00
Lite Margarine Spread	3.00
Flour	1.50
Oatmeal	3.00
Brown Sugar	4.00
Chicken Alfredo with Vegetables (5 Servings)	
Fettuccine	12.00
Cream cheese	4.00
Lite Margarine Spread	1.00
1% Milk	4.00
Broccoli	16.00
Zucchini	12.00
Chicken Leg Quarters	49.20
Bell Pepper	3.00
Green Peas	16.00
Cooked Carrots	11.00
Beef Pot Roast with Vegetables (4 servings)	
Canola Oil	1.00
Chuck Roast	24.00
Onion	12.00
Ketchup	2.00
Red Potatoes	20.00
Carrots	16.00
Oatmeal Raisin Cookies (48 cookies)	
Lite Margarine Spread	6.00
Sugar	5.00
Brown Sugar	6.00
Eggs	2.00
Flour	5.50
Oatmeal	8.00
Raisins	5.00

Chili and Rice (6 Servings)	
Ground Beef	16.00
Onion	2.00
Kidney beans	15.50
Tomato sauce	15.00
Tomato paste	6.00
Brown rice	4.00
Mama's Meatloaf (6 Servings)	
Onion	4.00
Bell Pepper	4.00
Egg	1.00
Wheat bread	1.00
Ground beef	24.00
Ketchup	3.00
Apple and Carrot Salad (6 Servings)	
carrots	5.00
Apples	21.00
Lemons	3.80
Raisins	3.00
Mayo	3.00
Red Beans and Rice (5 Servings)	
Stewed Tomatoes	29.00
Kidney Beans	29.00
Brown Rice	13.00
Orange Banana Salad (2 servings)	
Orange	4.60
Orange Juice	1.00
Banana	4.00
Corn Bread (8 servings)	
Corn bread mix	1.00
Egg	1.00
Milk	2.67

Cream of Mushroom Soup Substitute	
Flour	1.00
Lite Margarine Spread	1.00
Whole Milk	4.00
Mushrooms (canned)	0.75
Water	4.00

Week 2: Recipe Items List Included in the Two-Week 2005 Dietary Guidelines for Americans Menu Developed by Stewart (2006)

	Amount (ounces)
Banana Pancakes (12 Pancakes)	
Flour	4.50
Sugar	1.00
Egg	1.00
1% Milk	8.00
Canola Oil	1.00
Bananas	8.00
Vegetable Medley (4 Servings)	
Italian dressing	4.00
Carrots	7.00
Broccoli	16.00
Cauliflower	20.00
Processed cheese	3.00
Mardi Gras Chicken (5 Servings)	
Chicken leg quarters	61.50
Italian dressing	16.00
Green bell pepper	4.00
onion	4.00
Lite Margarine Spread	1.00
Garden Stuffed Potatoes (3 Servings)	
Potatoes	22.50
Lite Margarine Spread	1.00
onion	4.00
Ranch Dressing	5.00
Frozen Broccoli	16.00
Canola Oil	0.50

Black bean and Corn Soup (8 Servings)	
Black beans	14.50
Stewed Tomatoes	14.50
Diced Tomatoes	14.50
Corn	15.00
Green Onions	2.00
Green Pepper	4.00
Celery	4.00
Chicken Quesadillas (5 Servings)	
Flour Tortilla	5.00
Processed cheese	9.00
Corn	15.00
Tomatoes	4.00
Green Onions	1.50
Chicken Leg Quarters	24.60
Oven Baked Chicken (3 Servings)	
Chicken Leg Quarters	36.90
Lite Margarine	1.00
Bread	4.00
Vegetable Pasta Casserole (8 Servings)	
Flour	1.00
1% Milk	32.00
Cheese	3.00
Pasta	16.00
Frozen Broccoli	16.00
Bread	1.00
Bread Pudding (6 servings)	
Eggs	2.00
1% Milk	16.00
Sugar	4.00
Raisins	5.00
Bread	11.00

Ham and Black-eyed pea soup with Greens (4 Servings)	
Onion	4.00
Ham	4.00
Canola Oil	1.00
Collard Greens	8.00
Black-eyed peas	15.50
Apple Cake (8 Servings)	
Flour	6.50
Apples	9.00
Sugar	7.00
Applesauce	4.50
Eggs	2.00
Cajun Jambalaya (4 Servings)	
Canola Oil	1.00
Turkey sausage	8.00
Chicken Leg Quarters	24.60
Onion	4.00
Bell Pepper	4.00
Celery	2.00
Brown Rice	13.00
Garden Coleslaw (6 Servings)	
Italian Dressing	4.00
Sugar	1.00
Lemon	3.80
Cabbage	10.00
Carrots	4.50
Bell Pepper	2.00
Onions	2.00
Vegetable Beef Soup (12 Servings)	
Beef Stew Meat	32.00
Corn	14.50
Green Beans	14.50
Kidney Beans	15.50
Diced Tomatoes	14.50

Creamed Spinach (6 Servings)	
Cream Cheese	4.00
1% Milk	2.00
Spinach	16.00
French Toast (6 Servings)	
Milk	8.00
Eggs	2.00
Sugar	1.00
Lite Margarine Spread	1.00
Oven Fried Pork Chops (4 servings)	
Pork chops	16.00
Lite Margarine Spread	1.00
1% Milk	1.00
Bread	4.00
Broccoli, Rice and Cheese Casserole (8 Servings)	
Brown rice	3.00
Onion	3.00
1% Milk	2.00
Processed cheese	4.00
Lite Margarine Spread	2.00
Frozen Broccolli	16.00
Cream of Mushroom Soup	10.75
Smothered Cabbage (4 Servings)	
Onion	4.00
Canola Oil	1.00
Cabbage	16.00
Kidney Bean Salad (6 servings)	
Eggs	2.00
Kidney Beans	30.00
Onion	2.00
Celery	1.40
Relish	1.00
Mayo	4.00

APPENDIX D: COMPLETE FOOD LISTS FOR 2005 DIETARY GUIDELINES FOR AMERICANS MENU DEVELOPED BY STEWART (2006)

Week 1: Complete List of Menu Items Including Recipe Items

Item #		**Amount (ounces)**
1	Oatmeal	14.50
2	Raisins	5.50
3	Lite Margarine Spread	26.00
4	Whole Wheat Toast	75.00
5	Orange Juice	96.00
6	1% Reduced Fat Milk	476.00
7	*Tuna Salad (2.5 Servings)*	
8	*Potato Salad (4 Servings)*	
9	Carrots	39.00
10	Ranch Dressing	5.00
11	*Cajun Spiced Chicken (4 Servings)*	
12	*Green Bean Casserole (3 Servings)*	
13	Garbanzo beans	29.00
14	Dinner Roll	24.00
15	*Banana Orange Salad (3 Servings)*	
16	Graham crackers	10.00
17	Bagel	7.50
18	Cream Cheese, Reduced fat	3.00
19	Banana	64.00
20	Turkey Ham	6.00
21	Mayo, Light	2.00
22	Baked Beans	18.00
23	*Chicken and Vegetable Stir Fry (3 Servings)*	
24	Brown Rice	34.00
25	Green Beans	9.50
26	*Easy Peach Crisp (4 servings)*	
27	*Tuna Salad (0.5 Servings)*	
28	Cheddar Cheese	7.00
29	Crackers	2.00
30	Whole Grain Cereal (raisin bran)	13.00
31	Jam	9.00
32	Ham	9.00
33	Romaine Lettuce	40.00
34	*Peach Crisp (4 Servings)*	
35	*Chicken Alfredo with Vegetables (4.5 Servings)*	
36	Yogurt	95.00

37	Peanut Butter	10.00
38	Apple	16.00
39	*Beef Pot Roast with Vegetables (3 servings)*	
40	Green Peas, frozen	13.00
41	*Oatmeal Raisin Cookies (9 cookies)*	
42	Eggs	6.00
43	Onion	1.00
44	Processed Cheese	11.00
45	Black Beans	29.00
46	Corn	37.00
47	Whole Wheat Tortillas	5.00
48	Fat-free Italian Dressing	4.00
49	*Chili & Rice (2.75 servings)*	
50	Saltine Crackers	4.00
51	Spinach, frozen	27.00
52	Celery	8.50
53	Pineapple, canned	16.00
54	*Chili and Rice (2.5 Servings)*	
55	Saltine Crackers	4.00
56	Grapes	20.00
57	*Mama's Meatloaf (3 Servings)*	
58	Potatoes	22.00
59	Broccoli, frozen	19.50
60	*Mama's Meatloaf (3 Servings)*	
61	*Apple and Carrot Salad (5.5 Servings)*	
62	*Red Beans (4.75 Servings)*	
63	*Cornbread* (6 servings)	

Week 2: Complete List of Menu Items Including Recipe Items

Item #		**Amount (ounces)**
1	*Banana Pancakes (12 Servings)*	
2	Light Syrup	8.00
3	Orange Juice	144.00
4	1% Reduced Fat Milk	594.00
5	Whole Wheat Bread	68.00
6	Turkey Ham	14.00
7	Processed Cheese, Sliced	4.00
8	Mayo, light	1.00
9	*Vegetable Medley (4 Servings)*	
10	*Mardi Gras Chicken (5 Servings)*	
11	*Garden Stuffed Potatoes (3 Servings)*	
12	Green Peas, frozen	20.00
13	Dinner Roll	12.00
14	Lite Margarine Spread	19.50
15	Popcorn	2.00
16	Grits	22.00
17	*Tuna Salad (3.5 Servings)*	
18	Romaine Lettuce	22.00
19	Carrots	15.50
20	Fat-free Ranch dressing	7.50
21	Yogurt	60.50
22	*Black bean and Corn Soup (5 Servings)*	
23	*Chicken Quesadillas (5 Servings)*	
24	Apple	32.00
25	Oatmeal Raisin Cookies (5 cookies)	
26	Bagel	7.50
27	Cream Cheese, Reduced Fat	3.00
28	Grapes	29.50
29	*Black Bean and Corn Soup (5 Servings)*	
30	*Oven Baked Chicken (3 Servings)*	
31	*Vegetable Pasta Casserole (2.5 Servings)*	
32	*Bread Pudding (2.5 servings)*	
33	Canned Peaches	13.00
34	Scrambled Eggs	5.00
35	Jam	3.50
36	*Vegetable Pasta Casserole (3.5 servings)*	
37	*Ham and Black-eyed pea soup with Greens (3.5 Servings)*	
38	Cornbread	

39	*Apple Cake (2.5 Servings)*	
40	*Oatmeal Raisin Cookies (8 Cookies)*	
41	Raisin Bran	17.50
42	Peanut Butter	10.00
43	Raisins	3.00
44	*Apple Cake (2.5 Servings)*	
45	*Cajun Jambalaya (4 Servings)*	
46	Corn	32.00
47	Fruit cocktail, canned	30.00
48	*Tuna Salad (3.5 Servings)*	
49	*Garden Coleslaw (3 Servings)*	
50	Kidney Bean Salad (2.5 servings)	
51	*Vegetable Beef Soup (5.5 Servings)*	
52	*Cornbread (12 servings)*	
53	*Creamed Spinach (3 Servings)*	
54	Saltine Crackers	8.00
55	*French Toast (13 Servings)*	
56	Pears, canned	17.50
57	*Vegetable beef soup (5.5 Servings)*	
58	Garbanzo Beans	17.00
59	*Oven Fried Pork Chops (4 servings)*	
60	*Broccoli, Rice and Cheese Casserole (4 Servings)*	
61	*Smothered Cabbage (3 Servings)*	
62	*Apple Cake (2 Servings)*	

APPENDIX E: LIST OF NUTRITIONALLY EQUIVALENT SUBSTITUTE ITEMS FOR 2005 DIETARY GUIDELINES FOR AMERICANS MARKET BASKET MENU DEVELOPED BY STEWART (2006)

Week 1: List of Menu Items and Nutritionally Equivalent Substitutes

Menu Item	Substitute
1% Milk (Cajun Spiced Chicken)	Skim Milk
Chicken Leg Quarters (Cajun Spiced Chicken)	Chicken Fryer
Bread Crumbs (Green Bean Casserole)	White Bread
Fettuccine (Chicken Alfredo w/ vegetables)	Spaghetti
Broccoli (Chicken Alfredo w/ vegetables)	Frozen Broccoli
Ketchup (Beef pot roast w/ vegetables)	Tomato Sauce; diced tomatoes (blended in food processor)
Cream Cheese (Chicken Alfredo w/ vegetables)	Processed Cheese (Velveeta); Cheddar Cheese
Zucchini (Chicken Alfredo w/ vegetables)	Yellow Squash; Celery; Butternut squash; Green Pepper
Orange (Orange and Banana Salad)	Apple
Relish (Tuna Salad)	Celery
Carrots	Frozen Carrots; Canned Carrots
Celery (Tuna Salad, potato salad, chicken and vegetable stir fry)	Yellow Squash; Green Pepper
Green Onions (Chicken and Vegetable stir fry)	Yellow Onions
Cream of Mushroom Soup (Green bean Casserole)	Cream of Mushroom Soup Substitute Recipe
Lemon (Apple and Carrot Salad)	Orange
Ham	Cooked Chicken Fryer
Turkey Ham	Cooked Chicken Fryer
Garbanzo Beans	Black beans
Romaine Lettuce	Spinach
Grapes	Banana
Whole Wheat Tortillas	Wheat Bread; Flour tortillas
Bagel	White Bread
Raisins (In Oatmeal; PB and Raisin sandwich; Oatmeal and Raisin Cookies)	Bananas in oatmeal and sandwich; Grapes dried into raisins for cookies
Banana	Orange

Note: Recipe for which the item was substituted is in parentheses

Week 2: List of Menu Items and Nutritionally Equivalent Substitutes

Menu Item	Substitute
1% Milk (Banana Pancakes)	Skim milk
Ham (Ham and Black-eyed Pea Soup)	Smoked sausage
Collard greens (Ham and Black-eyed Pea Soup)	Cabbage
Turkey sausage (Cajun Jambalaya)	Smoked sausage
Cream Cheese (Creamed Spinach)	Processed Cheese (Velveeta); Cheddar Cheese
Chicken Leg Quarters (Mardi Gras Chicken)	Chicken Fryer
Cauliflower (Vegetable Medley)	Zucchini; broccoli; yellow squash
Cabbage (Garden Coleslaw; Smothered Cabbage)	Red cabbage
Flour Tortilla (Chicken Quesadillas)	White bread
Carrots	Frozen Carrots; Canned Carrots
Beef Stew Meat (Vegetable beef soup)	Ground Beef
Relish (Kidney Bean Salad)	Celery
Celery (Kidney Bean Salad)	Yellow squash; Green pepper
Cream of Mushroom Soup (Broccoli, Rice and Cheese Casserole)	Cream of Mushroom Soup Substitute Recipe
Black-eyed Peas (Ham and Black-eyed Pea Soup)	Kidney beans
Green Onions (Chicken Quesadillas)	Yellow Onions
Black beans (Black Bean and Corn Soup)	Kidney beans
Banana (Banana Pancakes)	Strawberries
Lemon (Garden Coleslaw)	Orange
Raisins (Bread Pudding)	Canned Peaches
Bagel	White Bread
Turkey Ham	Cooked Chicken Fryer
Romaine Lettuce	Spinach
Whole Wheat Bread	Whole Wheat Tortilla
Garbanzo Beans	Kidney Beans; Black beans
Popcorn	Corn chips
Syrup	Jam
Fruit Cocktail	Canned Pineapple
Grapes	banana
Grits	Oatmeal
Canned Pears	Canned Pineapple
Dinner Roll	White Bread

Note: Recipe for which the item was substituted is in parentheses

APPENDIX F: STORE COLLECTION SHEETS USED IN SURVEY

		PRICE	Price per unit (oz, lb)	Comments
FRESH FRUIT:				
Apples, Red Delicious	loose, 2.5 in diameter			
Avocados	loose			
Bananas	Pound			
Blueberries	4.4 oz.			
Cantaloupe	1			
Grapes, red or white seedless	Bag			
Grapefruit	Loose			
Lemons	Loose			
Oranges, naval	loose, baseball sized			
Nectarines	Loose			
Peaches	Loose			
Pears, Bartlett, Green	loose, small			
Plums, Red	Loose			
Satsuma	Individual			
Strawberries	1 lb			
Watermelon	Pound			
FRESH VEGETABLES:				
Beans, Green	Loose			
Beet roots, red	Pound (bunch)			
Bok Choy	Pound			
Broccoli	Head			
Brussels Sprouts	Pound			
Cabbage, Green	Pound			
Cabbage, Red	Pound			
Carrots, whole	1 lb bag			
Cauliflower	Head			
Celery	stalk			
Corn	individual			
Cucumbers	individual			
Eggplant	Pound			
Greens, collards	bunch			
Greens, kale	bunch			
Greens, mustard	bunch			
Greens, turnip	bunch			
Lettuce, iceberg	head			
Lettuce, romaine	head			

Okra	loose			
Onions, green	bunch			
Onions, yellow	Pound			
Pepper, Green	individual			
Potatoes, baking	Pound			
Potatoes, red	5 lb bag			
Potatoes, sweet	Pound			
Radishes	bunch			
Spinach	Bunch (bag)			
Squash, acorn	Pound			
Squash, butternut	Pound			
Squash, yellow	Pound			
Squash, zucchini	Pound			
Tomatoes	Pound, cheapest type			
Turnips, white	Pound			
CANNED FRUIT AND VEGETABLES				
FRUIT				
Applesauce, unsweetened	25 oz. jar			
Fruit cocktail, lite syrup	15 oz can			
Oranges, mandarin	24 oz can, lite syrup			
Peaches, lite syrup	15 oz can			
Pears, lite syrup	15 oz can			
Pineapple, chunk, lite syrup	20 oz can			
Pumpkin (not pie filling)	1 can			
VEGETABLES				
Artichokes	14.5 oz can			
Asparagus	14.5 oz can			
Beets, sliced	14.5 oz can			
Carrots	14.5 oz can			
Corn, whole kernel yellow	14.5 oz can			
Corn, creamed	14.5 oz can			
Green beans, cut	14.5 oz can			
Mixed Vegetables	14.5 oz can			
Mushrooms, stems and pieces	4 oz can			
Okra	14.5 oz can			

Okra/tomatoes	14.5 oz can			
Peas, green	14.5 oz can			
Potatoes, white	14.5 oz can			
Spinach	14 oz can			
Tomato paste	12 oz can			
Tomato sauce	15 oz can			
Tomatoes, diced	14.5 oz can			
Tomatoes, stewed	14.5 oz can			
Turnip greens	14.5 oz can			
Yams	14.5 oz can			
BREAD, CEREALS, & OTHER GRAINS				
Bread, white, enriched	cheapest, specify # oz's			
Bread, whole wheat	cheapest, specify # oz's			
Buns, hot dog	Package of 8			
Hamburger buns, enriched	Package of 8			
Rolls, dinner, enriched	12 brown and serve			
Tortillas, whole wheat	package of 10			
Crackers, graham	16 oz box			
Crackers, saltines	16 oz box			
Crackers, whole wheat or multigrain	16 oz box			
Grits	5 lb bag			
Grits, Instant	1 box			
Oatmeal	18 oz box			
Oatmeal, instant	1 box			
RTEC (corn flakes)	24 oz box			
RTEC (toasted oats)	18 oz bag			
RTEC (raisin bran)	25 ½ oz bag			
Macaroni, enriched	16 oz			
Noodles, enriched	12 oz			
Pasta, spaghetti, enriched	16 oz			
Pasta, whole	16 oz			

wheat, ziti or penne				
Ramen noodles	Package			
Spaghetti sauce	26.5 oz can			
Popcorn, stovetop, unpopped	2 lb bag			
Barley, pearled	16 oz box			
Rice, brown	28 oz			
Rice, white, enriched	1 lb bag, long grain			
BEANS				
Canned				
Baked	28 oz			
Black	15.5 oz			
Black-eyed peas	15.5 oz			
Kidney, dark red	15.5 oz			
Lima	large, 16 oz bag			
Garbanzo (chickpeas)	15 oz			
Great Northern or Cannellini	15.5 oz			
Pinto	15.5 oz can			
Chicken noodle soup	10.75 oz can			
Cream of mushroom soup, reduced fat	10.75 oz can			
Tomato soup	10.75 oz can			
Dried				
Black	1 lb bag			
Black-eyed peas	1 lb bag			
Pinto	1 lb bag			
Kidney or Red	1 lb bag			
White (Great Northern or Cannellini)	1 lb bag			
Lentils	1 lb bag			
Peas, split	1 lb bag			
Bean mix	1 lb bag			
BAKING				
Cornstarch	12 oz box			
Chocolate chips, semi-sweet	12 oz bag			
Chocolate	3oz box			

pudding, instant, sugar-free				
Cornbread, mix	8.5oz box (e.g. Jiffy)			
Cornmeal	1 box			
Flour, enriched	5lb bag all purpose			
Jell-O, strawberry, sugar-free	3oz box			
Shortening	42 oz			
Oil, canola	48oz			
Oil, vegetable	48 oz			
Sugar, light brown	16oz box			
Sugar, granulated	5lb bag			
Sugar, powdered	32 oz box			
OTHER FOOD ITEMS				
Evaporated milk	20 oz can			
Raisins	15 oz container			
Mashed Potatoes, dried	15.3 oz box			
Jam, strawberry or grape	32 oz			
Pancake syrup, lite	24 oz			
Peanut butter, creamy	28 oz			
Mayonnaise, reduced fat	32 oz			
Mustard, yellow	9 oz			
Pickle relish	smallest and cheapest			
Salad dressing, fat-free	16 oz			
Salad dressing, regular	16 oz			
Vinegar	16 oz			
Cookies, chocolate chip	Bag--cheapest			
Cookies, oatmeal	Bag--cheapest			
Doughnuts, glazed or powdered	Box--cheapest			
Little Debbie’s	1 box			

Twinkies	1 box			
Cola, cheapest brand	2 liters			
Fruit drink	1 gallon jug			
Chips, Regular Potato	12 oz			
Chips, Regular Corn	13 oz			
MEAT				
Bacon, turkey	12 oz			
Beef, chuck roast, boneless	Pound			
Beef, stew meat	Pound			
Beef, ground round, 15% fat	Pound			
Chicken, leg quarters	10 lb bag (or closest size)			
Chicken, fryer	whole, only record price/lb			
Deli meats, sliced	6 oz, cheapest type			
Fish, catfish	pound			
Fish, breaded frozen portions	pound			
Fish, Tuna, chunk-style, water packed, canned	5 oz			
Pork, chops	2.5-3.5lb, thin cut, economy chops			
Sausage, hot dogs	1 lb			
Sausage, Lunchmeat	1 package			
Sausage, smoked	1 lb			
Turkey, ground	Pound			
Vienna Sausages	1 can			
Potted Meat	1 can			
SPAM	1 can			
Treet	1 can			
FROZEN				
Orange juice, concentrate	12 oz			
Frozen FRUIT	Pound			

Beans, Lima	32 oz			
Broccoli, chopped	16 oz			
Carrots	16 oz			
Cauliflower	16 oz			
Green beans, cut	16 oz			
Mustard greens	16 oz			
Mixed Vegetables	16 oz			
Okra, cut	16oz			
Peas	14 oz			
Spinach, chopped	14 oz			
French Fries	32 oz bag, plain			
Ice cream, vanilla	1/2 gallon			
Fudgesicles, ice milk				
Pizza, cheese, large	1 pizza			
DAIRY				
Butter, unsalted	1 lb			
Margarine, tub, 40% lite spread	48 oz			
Margarine, stick	16 oz (4 sticks)			
Milk, fluid skim	1 gallon			
Milk, fluid whole	1 gallon			
Eggs, large	1 dozen			
Cheese, cheddar	8 oz block			
Cheese, cottage	24 oz container			
Cheese, mozzarella	8 oz block			
Cheese, processed (Velveeta)	2 lb block			
Orange juice	1 gallon jug (128oz each)			
Yogurt, lowfat	8 oz or 6 oz;			

What is the approximate square footage of the grocery store?

Dimensions: _____ ft wide x _____ ft deep.

Does the grocery store have a full service bakery and/or deli with:

Salad bar	Y	N	
Prepared hot meals	Y	N	
Prepared salads		Y	N
Sliced meats	Y	N	
Prepared baked goods	Y	N	
Olives	Y	N	

Comparing this grocery store with other full-service grocery stores, I would classify this store as:

_____ Small (small neighborhood corner store)

_____ Medium (Bet-R, Calandro's, etc.)

_____ Large (most Albertson's, Wal-Mart, Super Target, etc.)

VITA

Patrick Lee Hatzenbuehler was born and raised in Pocatello, Idaho. He received his Bachelor of Arts degree from Georgetown University in May 2006, with a major in government and a minor in history. Patrick is currently earning a Master of Science degree in agricultural economics from Louisiana State University, with a degree expected in May 2010. He is an avid fan of Georgetown basketball and LSU football, and enjoys skiing, golf, reading and travel.