DISSERTATION

NATURAL BEEF: THEORETICAL AND EMPIRICAL CONSUMER DEMAND

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY JENNIFER L. GRANNIS ENTITLED NATURAL BEEF: THEORETICAL AND EMPIRICAL RETAIL CONSUMER DEMAND BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION
NATURAL BEEF: THEORETICAL AND EMPIRICAL CONSUMER DEMAND

Conventional supermarkets concentrate on capturing the largest pool of consumers to generate profits from the industry's low margins. Selling to the largest pool of customers means that marketing, promotion, stocking and service decisions are based on the tastes and preferences of an *average* consumer. Innovators in the grocery industry, recognizing a shift in consumer tastes and preferences, are transforming the industry to attract smaller segments of consumers. The theory presented here demonstrates a method to understand the value of product diversification and a model of the gains from providing products that may have broader appeal than those targeted to the *average* customer. The increase in retail returns through this approach of developing in-store niches lies not in increased single-item purchases of any one consumer, but through the increased number of items purchased (a larger bundle) by an individual on a single shopping trip.

Additional information is necessary to establish a new product in a retail grocery store. This information includes the appropriate price point and a description of the target consumers. The survey data used to develop a model of store choice is also used to define the target market segments and to evaluate the relationship between willingness to pay for new natural ground beef and steak. These results show that income is a significant predictor of probability of paying a premium and describes the most likely purchasers.

Results show that demographic variables have limited predicted ability in the empirical models, and while production characteristics are significant in predicting store choice they have small marginal effects. The theoretical model, however, is tested empirically and the costs of providing only *average* products is real and results in a 13 percent reduction in demand for the supermarket. Consumers are willing to travel to multiple grocery outlets when the realized utility from finding the optimal product outweighs the increased travel cost. Target market segments are also described that can be valuable tools when forming marketing and promotion campaigns.

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Most of all, this work was possible because of Kevin.

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CHAPTER I
INTRODUCTION

The structure of retail food markets has changed markedly over the past decade. Increased competition from mass marketers has altered the way that traditional supermarkets bring customers in the door and stock their shelves. New product mixes represent the food retailers' response to competition felt from natural food stores (Richman, 2000; Lohr and Semali, 2000; Kinsey, et al, 1996). The realization of the importance of providing consumers social attributes, such as food safety, environmental friendliness, healthiness (by certifying limited or no antibiotic and hormone use), contributed to the development of a range of new beef products (Lassater Grassfed Beef, Laura's Lean Beef, Maverick Ranch Natural Beef and Coleman Lean Beef). This increase in product lines represents an opportunity for producers to enter small niches of the retail food industry that they are capable of supplying with sufficient volumes of natural or organic meats that meet the demand of socially, nutritionally or environmentally conscious consumers.

However, the beef industry has not moved as quickly as other market segments (i.e. dairy, eggs) to incorporate niche-marketing strategies. Though the products listed previously do offer differentiated beef products, their availability has only recently become widespread, and previously consumers had to shop at specialty stores or purchase directly from a producer to find the products they desired. The Progressive Grocer's annual survey of grocery shoppers indicates that the most important product in deciding where to shop is the "meat department." The service meat department is also used "almost always or frequently" by 50 percent of shoppers and "occasionally" by an additional 30 percent. Therefore, there is a tremendous opportunity for beef producers to pursue niche marketing strategies that focus on individual market segments, and not on some *average* supermarket consumer.

In addition to demanding differentiated products, consumers regularly shop at more than one marketplace (Janoff, 2000). Identifying characteristics of consumers that are important in their store choice decision has value for both producers and retailers (USDA, 1998; Lohr and Semali, 2000; Richman, 2000). The retailer needs to know the appropriate price level and potential market share when extending product lines since product introductions are both expensive and risky (Roy, Hanssens and Raju, 1994; Herrmann and Roeder, 1988; DeVuyst, 2000; Larivier and Padmanabhan, 1997; White, Troy and Gerlich, 2000). A producer's knowledge of consumers, including their choice of store and price sensitivity, can facilitate relationships with retailers and reduce the risk of failure for a new product. Retailers can use demand information to design promotion strategies and extend product lines to capture shoppers who would make purchases across many outlets when the products they desire are not available in a single store.

The objective of this research is to establish a model of consumer demand for retail stores and the meat products they carry to facilitate a producer's ability to secure shelf space in a retail grocery store. Supporting empirical research will show how the introduction of beef differentiated by production characteristics (conventional vs. natural) may improve a retailer's market share for meat products, and thereby support producer efforts to secure retail relationships. A theoretical model based on characteristics demand for products and industrial organization location models is used to establish a framework that provides a testable model of consumer demand for groceries. Retail pricing schedules and demand for products differentiated by their production practices are also addressed as both market research and applications of the theoretical model.

Three hypotheses arise from the objective, and each will be examined in an individual research paper. The first hypothesis addresses whether natural meats are a potentially profitable and competitive market niche for a conventional supermarket. To address this, a theory is developed of how a consumer chooses a store to make purchases from, assuming that the store and the products contained within it are differentiated by their individual characteristics. Two additional hypotheses address specific demand issues that are related to securing placement and pricing of products by analyzing specific customer segments. The second hypothesis states that the probability of shopping at a specific store for meat is a function of demographics, stated probability of paying a premium for new natural meat products, and production attribute ratings. Although actual costs of shopping in multiple outlets are not available, current shopping behavior is used to empirically test the relative importance of such costs relative to the benefits of finding a basket of desired products to shoppers. The third hypothesis states that the retail price a consumer is willing to pay for a new natural beef product depends on their shopping choices, demographic characteristics, revealed preference for meat consumption at home and rating of the relative concern about a beef product's potential production characteristics. The three models define how differentiated products are demanded in the retail marketplace and can assist a producer in securing shelf space. Additionally, the research defines the appropriate pricing and promotion strategies that should be made when differentiated beef products are tendered as product-line extensions.

The theory of retail product line differentiation will show how a consumer chooses a store when they are faced with more than one store choice and the first empirical model shows why a supermarket may have incentives to place differentiated beef products in a meat case. Both empirical models address hypotheses using the results of a mail survey completed in the spring of 1998 in the Inter-Mountain region (Colorado and Northern New Mexico). Contingent valuation (CV) information from the survey is used to estimate the willingness to pay (WTP) for natural ground beef and natural steak. The following section will describe the state of the retail food industry and define specific terms used in the retail food industry. Next, a literature review of relevant research is presented and Chapter III introduces the theoretical model. Then a data and methodology section explores the preliminary survey results related to the second and third hypotheses. Chapters V and VI develop and present the results of the two empirical models. Finally, the conclusions chapter (VII) integrates the results of the three papers and illustrates how each provides an important component of analyzing and communicating consumer, retailer and producer benefits from product line extensions within a conventional supermarket.

The Retail Food Market

The *Progressive Grocer's* annual report on the grocery system offers a snapshot of the retail grocery industry and defines the different types of retail grocery outlets. In the past a *supermarket* was a limited service retail food sales outlet, but today supermarkets often have a deli counter, meat counter and prepared meals. Supermarkets may also carry non-grocery items such as bath products, flowers and video rentals (Lewis, 2000). Supermarket sales in 1999 were up 5.6 percent for all stores, and accounted for 39.6 percent of total grocery sales. The national average for supermarket square footage is 17,000 square feet while *Superstores* have square footage of at least 30,000 square feet. Another large grocery format, the *Supercenter,* has square footage in excess of 150,000 square feet and accounts for 47.1 percent of all grocery sales. *Supercenters*, such as K-Mart, Wal-Mart and Costco, have limited product lines and package products in larger volumes, with only 40 percent of their floor space stocked with grocery items (Kinsey et al., 1996; Lewis, 2000). The "Economy" category included limited assortment, warehouse, and super warehouse stores and accounted for 13.4 percent of total grocery sales.

The specific characteristics of the store that draw the consumer into grocery stores are also reported by the *Progressive Grocer.* The most important characteristic in the choice of store is the average price of products. The next five characteristics are related to the services the store provides including speed of checkout, friendliness of checkers, incidence of stockouts and cleanliness of the store. The highest ranked product is the meat department. The service meat department is used "almost always or frequently" by 50 percent of consumers.

Specialty stores are also an important element in today's grocery industry. Two types of retail outlets that sell natural products are defined by Lohr and Semali (AAEA Selected Paper, 2000). The *natural products store* is "similar to a supermarket, but emphasizes organic natural foods and supplements." Examples include Wild Oats, Whole Foods and Vitamin Cottage. Second, Lohr and Semali define a *natural or health foods* *store* as "primarily an outlet for [natural] food products." These stores can be co-ops, health foods stores, and natural foods outlets, which are often smaller in square footage than average supermarkets.

Though the overall growth in the natural products industry was less than ten percent in 1998, growth in some organic food categories has been phenomenal. For example, growth rates of over 90 percent were found in the dairy and snacks categories. However, many conventional retailers who have introduced organic lines have been unsuccessful (Richman, 2000). Richman reports (p. 1) "...nearly half (49 percent) of all mass market supermarkets surveyed had attempted to increase the scale of their natural food offerings or diversify their natural food operations, fewer than 20 percent of those that had tried claimed success." Lohr and Semali determined that the attitude of the manager and their education level were significant in the probability of a store carrying an natural/organic product demonstrating a need for managerial training regarding the stocking and selling of organic products.

"Natural/organic shoppers" also shop in traditional markets and are motivated by convenience (Kinsey et al., 1996). In 1998, natural product sales (both natural food and herbal and mineral supplements) were estimated at $28 billion but this was a minor fraction of the $365.4 billion in sales for all grocery sales (Richman, 2000; Janoff, 2000). Natural food sales were $7.6 billion or 27 percent of all natural product sales. The "organic" product category showed the largest growth of all natural product categories at 22 percent.

The Natural Foods Merchandiser reported that only 50 percent of the $28 billion in natural product sales were made in natural food stores. This provides further evidence that the supermarket industry is innovating to meet demand for products that satisfy social and psychographic needs of shoppers in addition to the traditional role of meeting sustenance related food demand (Hauptman and Cavanaugh, 2000). The focus of this research on product-line differentiation and product mix is based on the extension of natural and organic product lines within a conventional supermarket to serve some of the evolving needs of consumers, thereby opening a more diverse set of market opportunities for producers.

CHAPTER II
LITERATURE REVIEW

This chapter will present a general overview of literature on industrial organization, contingent valuation and demand for meat, as each play a part in the development of the theoretical model and applications. There is a well developed body of research on retail pricing and product supply from the marketing and industrial organization fields (Lee and Staelin, 1997; Lariviere and Padmanabhan, 1997; Aguirregabiria, 1999; Choi, 1991). There has also been recent research in the area of slotting fees and allowances that illustrate the revenue and risk management strategies of retailers (DeVuyst, 2000; Lariviere and Padmanabhan, 1997; Major, 2000a; Major 2000b; White, Troy and Gerlich; Bloom, Gundlach and Cannon). Yet, a theory of retail consumer food demand based on optimal product mix has not been developed. To understand the theory of retail consumer demand based on differentiated products (which includes characteristic driven product demand for both food products and the store) the three sub-fields mentioned above are reviewed.

There is an extensive area of research that deals with the empirical demand for meat products and an increasing body of research investigating the CV methodology as it pertains to food products (Arrow et al., 1993; Moon and Ward, 1999; Feuz et al., 2000; Umberger et al., 2000; Melton, Huffman and Shogren, 1996). Recent research into the demand for organic produce has also created models of a consumer's choice of store and whether a store decides to carry organic products (Thompson and Kidwell, 1998; Lohr and Semali, 2000). Central issues related to data collection and estimation of WTP models for food products are provided and empirical studies of meat demand are reviewed.

Product Line Extension and Differentiation

The initial discussion of the retail marketplace will draw upon an introduction of the industrial organization literature and the theory of product differentiation. One of the basic assumptions of classical economic theory is that all products offered for sale are homogenous. However, this simplification does not accurately represent the state of the retail food industry. In the "linear city" model originally introduced by Hotelling, producers are located along a line of unit length. Though they produce identical goods, the costs of transportation of the consumer to the store (the product's location) differentiates the product. The further a consumer travels to the retail outlet, the higher the price. The profit function when the two firms are located at the extremes of the line (assuming linear costs) is:

$$\Pi_i(p_i, p_j) = (p_i - c)\frac{(p_j - p_i + \tau)}{2\tau} \quad (2.1)$$

$$\Pi_i = \max_{p_i}\left[\Pi^i(p_i, p_j)\right] \quad (2.2)$$

First Order Condition for Firm i:

$$p_j + c + \tau - 2p_i = 0 \quad (2.3)$$

Where: τ = transportation cost per unit of length
c = cost of production
p_i, p_j = prices of the products

Then prices are: $p_1 = p_2 = c + \tau$ and profits are: $\Pi^1 = \Pi^2 = \frac{\tau}{2}$. How far a consumer is located from the product determines whether or not they will purchase the product

(Tirole, 1988). Although geographical distance is important in a consumer's choice of store to frequent, more important for this research is the analogous interpretation of the above model where distance is replaced by product differentiation. In the product differentiation interpretation, the distance indicates how far the combination of characteristics in a product differs from the optimal characteristic set for some consumer (Krouse, 1990).

The unit circle model, an extension of the linear city model, also has value in understanding the importance of product differentiation for a retailer's profit maximization problem. In the unit circle market, instead of monopolistically competitive companies being located evenly along a line with finite endpoints, they are proportionally located around the circumference of a circle (Krouse, 1990). The circle is specified as one unit in length and each producer commands sales of some proportion of the circle. A consumer makes purchases from the vendor located on the circle that is nearest them, since price is a summation of costs and travel distance. The profit maximization first order conditions are identical to the results of the linear city model. Analogously, consumers make purchases from the retailer with the bundle of characteristics that most closely matches their utility maximizing choice. The higher the price, the further the product's characteristics bundle is from the consumer's optimal bundle.

To better understand demand for retail food products, the introduction of Lancaster's characteristic driven demand model can be useful. A consumer will maximize utility by purchasing the product that has the optimal characteristic bundle according to their individual preferences. If the optimal product is not available the consumer will purchase the bundle that is closest to their optimal product. Obviously, though, not being able to purchase the product with the optimal characteristics bundle leads to a less than optimal utility or *disutility*.

The Lancaster model allows for n-characteristics to be chosen from, and a two characteristic space with six product choices can be represented by the following figure[1]:

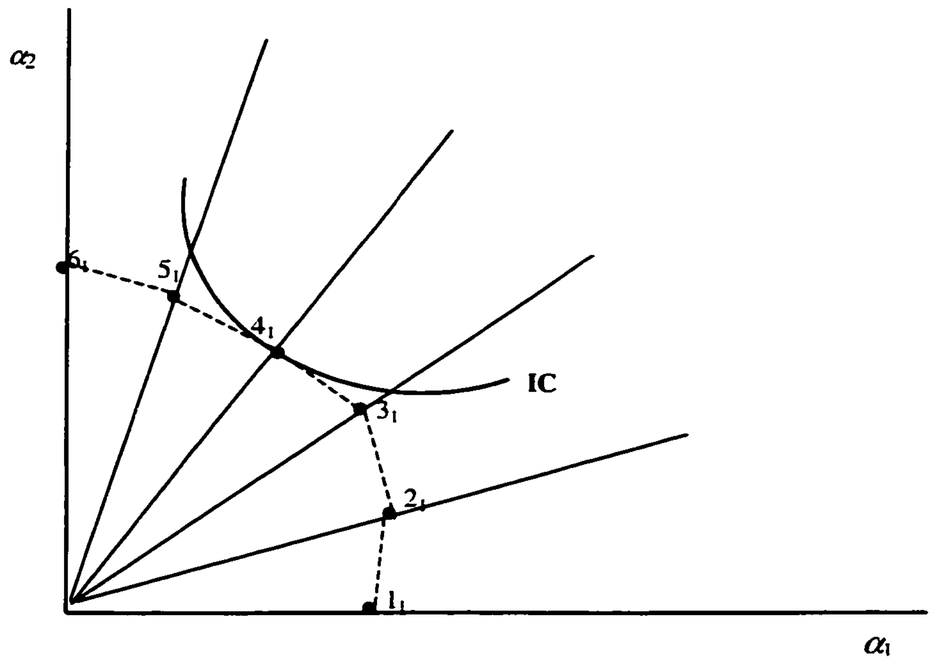


Figure 2.1: Lancaster's Characteristic Demand

Where:

- α_1 and α_1 are two characteristics
- 1, 2, 3, 4, 5, 6 represent six possible products that contain combinations of α_1 and α_2. The closer a product is to the axis of α_1 or α_2, the larger amount of that attribute it contains. Products 1 and 6 contain only α_1 and α_2 respectively.
- 1_1, 2_1, 3_1, 4_1, 5_1, 6_1 represent the set of products available at the same price level
- IC represents the indifference contour. As these products are not combinable in use, 4_1 is the optimal choice at the current price level.

[1] This figure closely follows Krouse, p. 140 and Lancaster, p. 23

Combinable in use implies that intermediate products (those located between the rays) can be created by buying two products that have the utility optimizing amounts of α_1 and α_2 and using them together to create the intermediate product. If α_1 corresponds to natural beef and α_2 corresponds to conventional beef, combining the two would not produce *half-natural* beef, or a *more* natural product than the conventionally produced product. Therefore, the remainder of this theoretical development will concentrate only on non-combinable in use products.

Lancaster presents a model of consumer demand for individual characteristics, which are the underlying components of the utility maximizing bundle. If x_j is the *j*th commodity then: $x_j = \sum_k a_{jk} y_k$ and k represent the level of activity and y_k is the level of goods consumed. Lancaster also assumed that each activity produces a fixed vector of characteristics and z_i is the amount of the *i*th characteristic: $z_i = \sum_k b_{ik} y_k$. In both equations, k, x, y and z are all assumed to be linear and a and b are coefficients to be estimated. Finally, it is assumed that an individual maximizes an ordinal utility function of characteristic. Lancaster further simplifies the model by assuming a one-to-one correspondence between activities and goods:

$$\begin{aligned} &\text{Max } U(z) \text{ subject to} : px \le k \\ &\text{Where} : \; z = z_i \sum_k b_{ik} y_k \\ &z, x \ge 0 \end{aligned} \tag{2.4}$$

This overview of industrial organization topics forms the basis of the theoretical model and emphasizes that economic models can be used to model demand for differentiated products.

Contingent Valuation (CV)

Economic research has many examples where the CV stated preference method is used (Arrow et al., 1993). From its foundation as a way to measure consumers willingness to pay for hypothetical changes in the environment, CV surveying techniques have been incorporated into various other fields. The CV methodology is often used in a benefit-cost framework to develop estimates of the costs to society of food safety risks (Buzby, et al. 1998; Buzby, Skees and Ready, 1995) Another application of the CV framework has focused on developing individual price premiums for purchasing certified or risk reduced food (Henson, 1996; LaTouche, Rainelli and Vermesch, 1998; Covey et al., 1998; van Ravensway and Wohl, 1995).

The shortcomings of CV in the food safety area has been illuminated by the above authors as well as others (Caswell, 1998; Buzby, Skees and Ready, 1995; Fox et al., 1995). Sample selection bias, non-response bias and unfamiliarity with the hypothetical product, price, or marketplace are all potential shortcomings of the CV method no matter what type of product is under consideration (Eklof and Karlsson, 1997; Fu, Liu, Hammitt, 1999). WTP treatments have favored dichotomous choice questions (DC) after the suggestions of the 1993 Arrow et. al NOAA report. Dichotomous choice question formats ask respondents to indicate whether or not they will pay a price suggested by the survey instrument. These questions differ across subsamples, and are combined to create estimates of WTP. Since 1993, more sophisticated DC formats have been developed and these include double or multiple bounded dichotomous choice (Loomis, Traynor and Brown).

Another question format is the payment card. The payment card method asks respondents to pick a value on a scale (discrete or continuous) that is above a specified base price that they would be willing to pay (Arrow et al., 1993; Boardman, 1996). Some of the potential biases of these two question formats include WTP values that cannot be collected in the real world because of budget constraints, or starting point and ending point biases from the values suggested to the respondent in the elicitation (Fox et al., 1995; Latouche, Rainelli and Vermersch, 1998; Blumenschein et al., 1998; Rowe, Schulze and Breffle).

Haneman, Loomis and Kanninen (1991) used a survey treatment that asked a series of dichotomous choice questions to gather information on both the WTP for the amenity, as well as the respondents sensitivity to the price level. Fu, Liu and Hammitt (1999) apply a similar technique in calculating their WTP for food safety. Both are examples of the double-bounded dichotomous choice (DBDC) survey treatment. In the DBDC survey treatment the respondent is asked if they would pay a specified amount of money for the food safety characteristic. If the answer is *yes*, then they are asked if they would pay a higher amount. If the answer is *no* to the first question, the second question asked is if they would be willing to pay a lower amount for the characteristic. A *yes-yes* series of answers implies that the "respondent's maximum willingness to pay lies between the second bid and infinity (Fu, Liu and Hammitt, 1999)." A *no-no* response indicates that the respondents WTP is between the second question's bid amount and zero. A *yes-no* response pattern indicates that the true WTP of the respondent is between the value of the bid offer in the first question and the bid offered in the second question.

This same pattern of bounded responses can be achieved using the three-tiered payment card that is used in this study and described in detail in Chapter IV.

In this research both the demographic information that is relevant in predicting a consumer's WTP a certain premium level, and how the rating of a set of attributes and characteristics of meat affect purchase decision are investigated. The measurement of attributes, characteristics or other quality variables is either conducted on a Likert-like scale or the attributes are ranked against each other. This study utilizes information collected in a Likert-like survey format. A review of empirical models of the demand for meat, including characteristic ratings and demographic information, follows in the next section.

Empirical Demand for Meat

Because there are few studies that specifically address the demand for natural or organic beef, studies of other meats and organic produce are reviewed. A paper by Boland and Schroder (2000) evaluated the marginal value of quality attributes in the wholesale prices of primal beef cuts. Their results showed that an *organic* label was only significant in estimating the price for *Rib Eye*, *Inside Round* and *Gooseneck* cuts. They also found that *number of days aged* was a significant predictor in the wholesale price of all of the beef cuts evaluated with the exception of *Inside Round.*

An article by McGarry Wolf and Thulin (2000) explored both demand for branded local beef as well as a comprehensive panel of production characteristics and attributes in an in-person interview. Their target market was described as married and from a higher dual-income household than non-target consumers. Members of their target market were also past purchasers of branded beef and made their decision to buy meat while in the store. They also determined that the "presentation of the meat and point-of-purchase material" were important in marketing the beef.

A paper by McGuirk, Preston and McCormick (1990) provided a cluster analysis that described target markets for products based on food safety concerns. The target market they suggested as having the best potential for marketing products that offered increased food safety at a premium, had a median age of 43 and was 56% female. Most members of the cluster (65%) worked outside the home and averaged $28.26 per person per week on groceries. Income level of this cluster ($29,854) was higher than the sample average ($26,126), and average number of children was 1.88. Furthermore, members of this cluster were "highly concerned about health hazards associated with additives and preservatives, nitrates, ..., and antibiotics and hormones in animal feed."

A series of papers by Feuz, Umberger, Calkins and Killinger (2000) evaluated three attributes in an experimental auction format (Feuz et al., 2000; Umberger et al., 2000). Two beef products, one produced in the US and one produced in Argentina, were evaluated through a series of visual and taste experiments. In a taste test, with tenderness held constant, consumers preferred the domestic, grain fed beef (the Argentinean beef in question was grass fed). Respondents who favored the domestic beef were willing to pay $1.61 more per pound, and those preferring Argentinean beef were willing to pay $1.36 more per pound. Thus, flavor preference translated into a premium for that product when the target market was identifiable. Umberger et al. also evaluated the demographics of consumers according to their preference for USDA Choice beef or USDA Select beef. Willingness to pay indicated that higher income consumers tended to bid more for marbled beef and more frequent consumers of beef also bid more for choice steak.

An experimental auction study was conducted to determine WTP for pork chops (Melton, Huffman and Shogren, 1996). WTP estimates were insensitive to education level, but decreased as age and household size increased. Women and consumers with children living at home tended to offer less for the pork chops. In a mail study, Misra, Grotegut and Clem (1997) found that willingness to buy pork treated with the hormone pST was correlated with age, gender, education, marital status, household income and concern about pST. Finally, Nayga (1995) analyzed the 1992 Consumer Expenditure Survey by the BLS. Results indicated that family size, age and income all had significant positive effects on demand for ground beef and steak.

Store Choice

A new variant of demand literature for specialized products links the retail store to consumer choices for individual products. An article by Thompson and Kidwell (1998) analyzed consumers' choice of retail outlets to purchase organic produce from, rather than calculating their WTP for organic produce. The dependent variables in the two-equation specification were probability of shopping at a specific store and probability of purchasing organic produce. Results indicated that household income was significant and had a positive effect on store choice. Gender was also significant and female shoppers were more likely to choose the specialty store. However, age and level of education had no effect on the choice of stores. Their research also analyzed the impact of the specific store at which the produce was purchased in the final decision to buy organic produce. Tests for exogeneity showed that the purchase of organic produce was endogenous with the decision to shop at one of the two stores in the sample. The choice of store, however, was weakly exogenous to the probability of purchasing organic produce. Because only two stores were included in the survey design they were unable to generalize their results to a variety of store choices. In conclusion they stated, "...assuming that consumers shop exclusively at one store may not be accurate. Many consumers shop at multiple stores for different products on a regular or sporadic basis."

From this review of survey and estimation techniques and reported research results it is obvious that there is an extensive basis for combining sociodemographic information with traditional economic demand estimates. New research has also begun to explore the link between the consumer and their shopping outlet of choice. The descriptive variables and empirical model designs included in this study are based on past research. Innovations include modeling store choice with likert ratings of production characteristics and using the three-tier payment card to estimate mean WTP.

CHAPTER III
AN INDUSTRIAL ORGANIZATION MODEL OF CONSUMER DEMAND FOR DIFFERENTIATED GROCERY OUTLETS

A supermarket sells a mix of products and services to customers who may shop for those products at more than one outlet. The interior of today's supermarket is an open format with a large floor size (minimum of 17,000 square feet), and volume driven sales are still the industry measure of profitability (Lewis, 2000). By focusing on volume sales per square foot, in order to generate profits from low margins, the conventional supermarket has had to concentrate on capturing the largest pool of consumers. Selling to the largest pool of customers means that marketing, promotion, stocking and service decisions are based on the tastes and preferences of an *average* consumer while *non-average* consumers are disregarded.

Unfortunately, the *average* American has changed, and a single pool of reliable and loyal customers with similar tastes may no longer exist. Grocery industry innovators, recognizing a shift in consumer tastes and preferences, are changing the industry to attract smaller segments of consumers. These niche marketing strategies have been successful where applied, but niche marketing strategies have been more slowly incorporated in the meat department. The discussion of *average/non-average* consumer marketing is directed at the current state of supermarket marketing activities for meat. Niche strategies are being introduced to the meat case, but their particularly slow acceptance by beef producers should be a concern considering rapidly fluctuating consumer preferences.

Another area of development in niche marketing is the increasing number of store floor plans being designed and built. New store formats cater to price-sensitive consumers (warehouse and club stores); up-scale markets service the least price-sensitive, quality-oriented shoppers (Wild Oats, Stew Leonard's); and hypermarkets provide one-stop shopping for time-constrained customers (Super Wal-Mart, Super Kmart). Each new format results in a further segmentation of the pool of grocery consumers to cater to unique demands not met when an *average* customer business plan is followed.

The rationale of concentration on the *average* consumer is rooted in competitive market analysis, and once adopted beef producers have been loathe to abandon the model. Homogenous products and pricing theories are effective in understanding the behavior of mass-marketers trying to capture the *average* (homogenous) consumer. To understand a theory that values the *non-average* (heterogeneous) customer, an understanding of industrial organization (IO) theory is needed. The theory presented here demonstrates a method to understand the value of product diversification and a model of the gains from providing products that may not have broad appeal to the *average* customer base. The increase in retail returns through this approach of developing in-store niches lies not in increased single-item purchases of any one consumer, but through the increased number of items purchased (a larger market basket) by an individual on a single shopping trip.

The Changing Supermarket Industry

Past evidence shows that customers make purchases from more than one supermarket (Janoff, 2000). Any model that develops a testable framework of the supermarket must describe both the changing purchasing decisions of customers as well as illustrate the rationale of store formats that do not cater to the *average* meat consumer. The theory is based upon the following observations about current grocery shopping behavior.

The following statements can be used to describe today's grocery shopper: 1.) any single customer can be assumed to make food purchases from more than one grocery outlet, 2.) the loyalty of these customers is valuable to whatever outlet they are currently making the majority of their purchases from and, 3.) they are being sold products that are designed to satisfy the *average* consumer of that store. The lack of optimal product diversification contributes to consumers shopping at multiple markets to satisfy their demand for certain elements of their market basket.

A hypothesis regarding consumer demand for retail food outlets can be drawn directly from the preceding three descriptive statements.

> Hypothesis$_{consumer}$: Consumers make purchases from multiple outlets when the average product does not satisfy their optimal characteristics preferences.

The set of characteristics are aggregated to form the product that is purchased by the consumer which implies that the product may be the store itself. Profits for a single store could increase when customers no longer make purchases at multiple outlets. If a consumer is concerned about the use of hormones in the production of beef, they could purchase hormone-free beef at the supermarket, rather than having to buy hormone-free beef from another store. The supermarket maintains the purchases of the hormone sensitive consumer, and may be able to attract new customers since they have added a characteristic to their store. The linear city, circular city and characteristics demand models are extended to form the final model of product driven diversification. The cost of shopping at multiple markets is then tested in an empirical estimation.

Product Demand: Concentric Unit Circle with Links

The production characteristics for goods sold within a grocery, (i.e. organic beef, pastured chicken, hormone free dairy, low-cholesterol eggs) can be the characteristics that are purchased to maximize an individual's utility (Lancaster, 1991). It is possible to

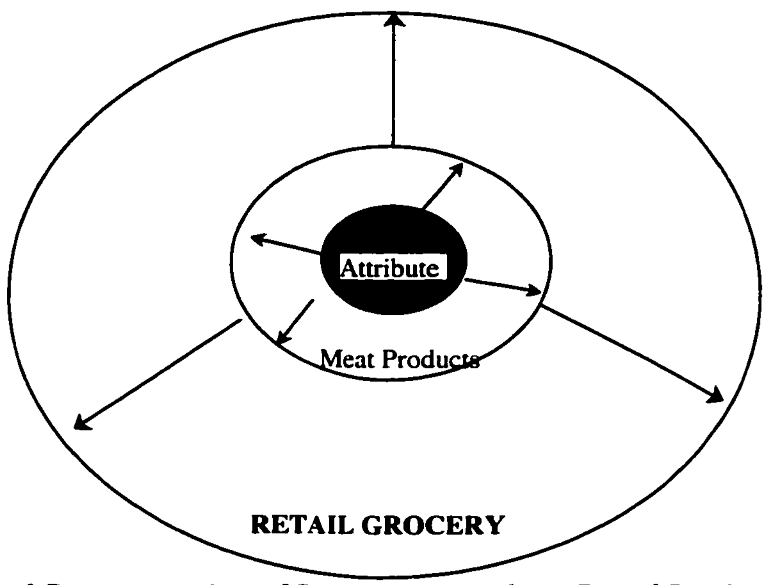


Figure 3.1: Visual Representation of Successive Attribute Based Product Demand

assign a characteristics set to a grocery store. For instance deli, floral, pharmacies, ready-to-eat meals and banking services were all introduced to add characteristics to the store that would contribute to the demand for that store. The production characteristics of products carried also add a characteristics set to the grocery store. Finally, intangible characteristics, such as the perception of cleanliness, atmosphere, floor design, and speed of checkout are also considered when a customer makes the choice of retail store.

The model can be interpreted as an expanding circle of products that are interrelated. Each successively larger ring corresponds to the next broader product that is described by a set of attributes or characteristics contained in the smaller circles. Figure 3.1 shows how the demand for the product *meat* is based upon the demand for the set of *attributes* that make up the meat. The demand for a particular grocery store is based, in part, on the demand for the set of *meat products* that a store carries, which is based upon the attributes that the meat contains. The larger space between the *meat products* ring and the *store* ring is meant to symbolize the fact that there are many product levels not directly addressed here.

Industrial Organization Models

In both the unit line model and the unit circle model, the demand for a product is based on the distance between the customer and the product offering on the line or circle. Distance serves as the diversification mechanism and this is analogous to product diversification through characteristics when separability is assumed (Krouse, 1990). Lancaster's model of characteristics demand is added to the unit circle theory to form the model of product diversification.

The circular model is chosen since it seems to represent the current nature of the U.S. grocery market where a number of brand-name retailers are located within a certain area near every shopper. Any consumer could be located on the circle between two stores, neither of which are their optimal choice. Both consumers and producers are located uniformly around the circle, which has a perimeter of 1. As in the linear city model, an indifferent consumer is assumed to be located on the unit circle between two firms, i and j. Setting the two firms prices equal yields the same demand as in the linear city model with the same profit function and first order conditions (Tirole, 1988). While there may be a segment of the population making shopping choices based on their distance from a store, survey results indicate that the top three reasons why a consumer chooses a particular store are, cleanliness, accurate price scanning and low prices while convenient store location is ranked eleventh. (Janoff, 2000). Therefore, a model accommodating both utility maximizing criteria (characteristics and location) is needed.

This model is specified so that the demand for a product is based on the underlying characteristics of the product. This can be demonstrated by actual store choices made by consumers. The *Progressive Grocer* reported that, in 1999, the seventh most important factor in a choice of supermarket was the Meat Department (none of reasons 1-6 were products). Additionally, 50 percent of consumers indicated that they used the Service Meat section *almost always or frequently* (the most of any department reported), and a further 33 percent used it *occasionally* (Janoff, 2000). Thus, there is evidence that the perception of meat products that the supermarket carries, which can be considered one of the store's characteristics, influences the purchase of the product from that outlet.

The consumer will maximize utility by purchasing from one of the J firms located uniformly around the circle, where J_0 is the firm used as an example here. The J-1 rivals to J_0 hold prices fixed at $\overline{P}$. It is also assumed that J is "big-enough," and all Ps are low enough for all neighboring brands to be competitive. The purchase of some brand Θ_j is associated with a utility surplus that can be measured as

$$U(\Theta_j, \Theta^\circ) - p_j. \tag{3.1}$$

The consumer chooses one unit of the differentiated commodity to maximize utility:

$$\underset{j}{Max}\{U(\Theta_j, \Theta^\circ) - p_j\} \geq \mu. \tag{3.2}$$

However, if the customer must take Θ_j over Θ° (because the optimal product is not available), and constant proportionality is assumed then a measurable level of disutility will be incurred,

$$U(\Theta_j, \Theta^\circ) = \mu^\circ - \tau|\Theta_j - \Theta^\circ|. \tag{3.3}$$

Where τ is a constant per unit cost of travel. If τ>0, it implies that the consumers utility maximization problem can be rewritten as (Krouse, 1990), where $\upsilon = \mu^o$-μ_j.

$$\underset{j}{Max}(\upsilon - \tau|\Theta_j - \Theta^\circ| - p_j) \geq 0 \tag{3.4}$$

This can be reinterpreted as demand for differentiated products that imply utility maximization when the optimal product can be purchased. Then Θ° can be further defined as a bundle of characteristics that contribute optimal utility to the consumer,

$$\Theta^\circ = f(\alpha_1, \alpha_2). \tag{3.5}$$

If Θ° is a function of attributes, α_1 and α_2, then Θ_j is also a lower utility providing function of α_1 and α_2. It also follows that υ is a function of attributes, since it is merely the difference in utility value from the consumption of the optimal product to the one that is actually purchased. The relevant attributes considering a store as a product, may be price, production practices (organic, natural, conventional, fair trade), distance from the consumer to the store, atmosphere of the store, services offered by the store, speed of checkout and variety of product lines offered. Additional attributes that may be important when the product is a food item include flavor, freshness, visual quality and storability. Applied research constraints may limit the collection of some attribute values, but the inclusion of product specific attributes make it possible to draw conclusions about store choice based on the available limited set of attributes. Rewriting the utility maximizing problem from the circular city model to include the information that Θ^o, Θ_j, μ^o, and μ are all functions of attributes yields:

$$\underset{j}{Max}\left[\mu^{\circ}(\alpha_1,\alpha_2,\ldots,\alpha_n)-\mu_j(\alpha_1,\alpha_2,\ldots,\alpha_n)\right]-\tau_j\left|\Theta_j(\alpha_1,\alpha_2,\ldots,\alpha_n)-\Theta^{\circ}(\alpha_1,\alpha_2,\ldots,\alpha_n)\right|-p_j\geq 0 \tag{3.6}$$

Next, price can be solved for and substituted into the circular city profit maximization equation to reveal a characteristics model that uses measures of disutility to represent non-optimal product offerings. Then p_j is a perceived price, since one of the attributes determining the optimality of Θ may be the price of the physical product to be purchased, or a matrix of average prices in the case of a retail grocery outlet.

$$p_j=\left[\tau_j\left|\Theta_j(\alpha_1,\alpha_2,\ldots,\alpha_n)-\Theta^{\circ}(\alpha_1,\alpha_2,\ldots,\alpha_n)\right|-\mu^{\circ}(\alpha_1,\alpha_2,\ldots,\alpha_n)-\mu_j(\alpha_1,\alpha_2,\ldots,\alpha_n)\right] \tag{3.7}$$

The original definition of τ as a fixed unit measure of travel is no longer applicable, since it is dependent on an individual consumer's utility preferences which vary across products. It is bounded by 0 and 1. If Θ_j is a product identical to Θ°, except for a slight difference (Kroger vs. Safeway) then τ is small, but if the product represents something very different from the optimal brand, then the value of τ will be higher (closer to 1). When the item in question is not a store, the former can be thought of as the situation where medications that have expired patents have generic competitors that contain identical ingredients. On the other end of the τ scale, there are flash frozen organic vegetables and canned, shelf-stable competitors. Both are *vegetables*, but offer vastly different characteristic combinations. As Θ_j moves away from Θ°, $1/\tau$ decreases, since the implicit cost rises. When a product is very different from the optimal product, the direct cost will dominate and the indirect costs represented by the multiplication of $1/\tau$ and μ^o- μ will approach zero (see equation 3.13, below). If a product is similar to the optimal product, the indirect costs will play a greater role in the demand for that product.

Profit maximization for the retail level or product level can be written as (assuming 2 products i and j),

$$\Pi_i(p_i)=(p_i-c)\frac{(p_j-p_i+\tau_i)}{n\tau_i} \tag{3.8}$$

$$\Pi_i(p_i)=\{[\tau_i|\Theta_i-\Theta^\circ|-(\mu^\circ-\mu_i)]-c\}\frac{\{[\tau_j|\Theta_j-\Theta^\circ|-(\mu^\circ-\mu_j)]-[\tau_i|\Theta_i-\Theta^\circ|-(\mu^\circ-\mu_i)]+\tau_i\}}{n\tau_i} \tag{3.9}$$

and the First order conditions are:

$$p_j+c+\tau_i-np_i=0 \tag{3.10.1}$$

$$p_i+c+\tau_j-np_j=0 \tag{3.10.2}$$

Recalling that p_i and p_j have been redefined as a perceived price:

$$p_i(\alpha_1,\ldots,\alpha_n)=\begin{bmatrix}\tau_i|\Theta_i(\alpha_1,\alpha_2,\ldots,\alpha_n)-\Theta^\circ(\alpha_1,\alpha_2,\ldots,\alpha_n)|- \\ \mu^\circ(\alpha_1,\alpha_2,\ldots,\alpha_n)-\mu_i(\alpha_1,\alpha_2,\ldots,\alpha_n)\end{bmatrix} \tag{3.11.1}$$

$$p_j(\alpha_1,\ldots,\alpha_n)=\begin{bmatrix}\tau_i|\Theta_j(\alpha_1,\alpha_2,\ldots,\alpha_n)-\Theta^\circ(\alpha_1,\alpha_2,\ldots,\alpha_n)|- \\ \mu^\circ(\alpha_1,\alpha_2,\ldots,\alpha_n)-\mu_j(\alpha_1,\alpha_2,\ldots,\alpha_n)\end{bmatrix} \tag{3.11.2}$$

The following demand equations result:

$$D_i(p_i, p_j) = \frac{\lfloor \tau_j |\Theta_j - \Theta^\circ| - (\mu^\circ - \mu_j) \rfloor - \lfloor \tau_i |\Theta_i - \Theta^\circ| - (\mu^\circ - \mu_i) \rfloor + \tau_i}{n\tau_i} \tag{3.12}$$

$$D_i(p_i, p_j) = \frac{\left\{ \frac{\tau_j}{\tau_i} \left[(\Theta^\circ - \Theta_j) - (\mu^\circ - \mu_j) \right] - \left[(\Theta^\circ - \Theta_i) - \frac{1}{\tau_i}(\mu^\circ - \mu_i) \right] + 1 \right\}}{n} \tag{3.13}$$

$$D_j(p_i, p_j) = 1 - x = 1 - D_i(p_i, p_j) \tag{3.13.1}$$

The first term in the numerator of the demand for *i* is the perceived price for product *j* and the second term is the perceived price for product *i*. The +1 is an artifact of the factoring out of the various τ terms of the equation, which also leaves the denominator with only the single *n* term (which in this example would be 2). By defining price as a function of characteristics, the *perceived price* is expressed as a function of both travel cost, the actual cost of the product (i.e. ground beef) and various other attributes that influence the purchase of Θ° or Θ_j. This allows the model to be flexible enough to accommodate both an aggregate product like the supermarket and an ultimate product such as ground beef.

The direct cost of not finding Θ° at a single retailer implies that Θ_j is purchased at the same market, or Θ° is purchased from an alternate market. Those people shopping at more than one outlet incur the direct cost of non-optimal brand purchase, the implicit costs of utility foregone ($\mu < \mu^o$) and τ. The *Progressive Grocer* data confirms that consumers are shopping at multiple outlets: 99 percent of people shop at supermarkets, 76 percent shop at mass merchandisers, 29 percent at wholesale clubs and 11 percent at specialty food stores. These numbers demonstrate that consumers are already paying the costs of shopping at multiple outlets. (Janoff, 2000).

Testing Hypotheses Using Applied Data

Now that the model for profit maximization has been defined, the applicability of the model to the actual supermarket retail industry is evaluated. This is done by utilizing the model to test the two hypothesis outlined above. Recall the hypotheses:

> Hypothesis$_{consumer}$: Consumers make purchases from multiple outlets when the average product does not satisfy their optimal characteristics preferences.

This hypothesis can be reinterpreted in the light of characteristics as:

$$\text{Hypothesis}_{\text{consumer}}\text{: } D_C(\Theta) = f(\alpha_{1c}, \alpha_{2c}, \ldots, \alpha_{nc})$$

Both indicate that demand and profit maximization are based upon characteristics. The characteristics sets $(\alpha_{1c}, \alpha_{2c},\ldots,\alpha_{nc})$ and $(\alpha_{1r}, \alpha_{2r},\ldots,\alpha_{nr})$ do not necessarily contain the same or fully different characteristics, and some overlap can be expected.

The characteristics that can be evaluated when the product is a traditional purchasable product (like beef) are: price, production practices, and flavor. However, because some characteristics (like taste) are subjective and differ across customers, information on the perceived characteristics content must also be evaluated. In the example that follows (Chapter V) the product is the retail store itself and the characteristics set listed above for the purchasable product is a subset of the store's characteristics set:

$$D_{C,R}(\Theta) = (\alpha_{1r}, \alpha_{2r}, \ldots, \alpha_{ir}(\alpha_{1c}, \alpha_{2c}, \ldots, \alpha_{nc}), \ldots, \alpha_{nr}). \tag{3.14}$$

The characteristics that are important when the store is a product can include those listed above and distance from the consumer to the store, atmosphere of the store, services offered by the store, speed of checkout and variety of product lines offered.

The direct cost of not shopping at or not purchasing the optimal product can be measured by counting the number of other outlets or products offered that are direct competitors available at the time a purchase was made. The indirect cost, τ, is a unique value for each consumer, but can be proxied using techniques similar to travel-cost. However, when travel cost information is not available, another approach can be employed. For example, respondents to a survey were asked to indicate the number of "non-supermarket" outlets they shopped out. These choices can be summed to form a measure of their willingness to search other stores to find the products that complete their optimal market basked. As this value increases, it indicates that shoppers are willing to take on the higher cost of traveling to alternate markets to satisfy their personal preference. In other words, the indirect cost of traveling to alternate shops to purchase their products is outweighed by the realized utility gains of purchasing an optimal product. Conversely, the higher number of markets frequented can also be interpreted as a proxy measure of lost sales to the supermarket by not offering the niche-product demanded by their customers. Chapter V addresses a variable designed as described here, that demonstrates a willingness by respondents to shoulder the burden of increased travel cost to improve their product selection.

CHAPTER IV
DATA AND METHODOLGY

Survey Design and Development

The results of a regional survey form the basis of the empirical analysis of what factors may attract organic shoppers to purchase natural beef at the supermarket, as well as the analysis of price levels and price sensitivity. Socio-demographic variables important in choosing a store at which to buy meat are developed from responses of shoppers from Colorado and New Mexico. Results from the CV section of the survey are used to address the hypothesis that the retail price a consumer is willing to pay for a new natural beef product depends on their demographic characteristics, revealed preference for meat consumption at home, and ratings of production characteristics. The unique nature of the CV elicitation payment card is discussed. Basic descriptive statistics of survey results are included in Table 1.

The survey was developed based on the past research and survey technique developed by Sparling, Wilken and Mckenzie (1992). The National Family Opinion (NFO) organization was contracted with to complete the survey. The survey was prepared at CSU and pre-tested by the NFO. Pre-testing included both focus groups and pre-surveying conducted by the NFO. Suggested changes were implemented and a final survey instrument was mailed to the sample in March of 1998. The NFO uses the Dillman technique for mail surveys, which resulted in a 61 percent response rate.

The respondents were identified by the NFO from their database of participants who answer surveys for the organization. The survey was addressed to the "primary" grocery shopper for the household. The objective of the survey was to address potential market segments for natural or organic meat products. The survey questionnaire covered past meat purchasing choices, attribute perceptions, and willingness to pay for natural pork and beef products. A question specifically addressed store choice for "Meat Shopping," to the exclusion of other types of grocery products. Demographic information was supplied by the NFO from their panel of participants, and was matched to respondents.

The survey sample was not completely random. Two groups, Hispanic households and rural households were oversampled. This approach was chosen to satisfy the objectives of the original study to sell beef and pork products to both rural residents and to Hispanic households. However, there is not an overly frequent incidence of Hispanic respondents in the sample (due to the small percentage of returns), and rural households account for 26 percent of the sample.

Natural meat was defined in the survey instrument as "..from animals raised using environmentally sound practices with no antibiotics or hormones, and never confirmed to small or crowded pens. Cattle grazing is managed to preserve streams and protect endangered species." Fourteen hundred responses were received from the sample of 2430 consumers. This 61 percent response rate was further reduced to 1370 usable responses after the data was cleaned for logical inconsistencies.

In contingent valuation surveys, it is often a concern that non-respondents vary in some significant way from respondents. This can occur since the product can be hard to visualize or have characteristics that members of the survey sample are not interested in or concerned about. To test for this specific concern, the NFO supplied data for both respondents and non-respondents. Demographic variables of interest for this test included household size, income level and lifestage variable. The lifestage variable included information about age, family structure and marital status in one categorical variable. This information was used since variables such as the number of children living at home and the nature of the family (single parent vs. couple) have been shown in past studies to be significant descriptors in WTP estimations. Statistical tests of means were completed to determine if the demographic variables recorded for respondents differs significantly from non-respondents. Table 4.1 shows the means of the two respondent groups as well as the t-statistic and p-value for the two tailed test of significance to determine if the means were the same across the subsamples.

Table 4.1: Non-Response Bias

Demographic Variable	Respondent Mean	Non-Respondent Mean	T-Ratio	P-Value
Household Size (5 levels)	2.38	2.65	-5.13	0.0000
Income Level (5 levels)	2.97	3.00	-0.634	0.5261
Lifestage	5.30	5.26	0.311	0.7558

All of the tests were performed with the null hypothesis that the difference in means was zero. The null hypothesis for household size was rejected but it was not rejected for income and lifestage. However, this difference was expected as larger households responded less frequently than smaller households.

Store Choice

To collect the information on multiple store choices the survey was structured to allow responses on where *Most*, *Some* and *None* of meat purchases were made. As seen in Table 4.2, the question matrix allowed for each respondent to choose at least one store for *most* meat shopping and multiple answers for *some* and *none* choices. Results from the shopping matrix are reported in Table 4.2, and the overwhelming majority (87.7%) of respondents indicated that they did most of their meat shopping at the supermarket. However, 14.3% of respondents indicated that they purchased some of their meat from a *meat shop*. The incidences of multiple choices is most clearly seen in the *none* row, which sums in excess of 270% of the sample. Very small portions of the sample do most of their shopping at the alternate store choices, but there were larger groups of respondents that do at least *some* of their meat shopping at the alternate market choices. On average, respondents indicated that they shopped at 1.3 shops, regardless of frequency of the other choices.

Table 4.2: Meat Shopping Choices Across Store Outlets

	Supermarket	Natural Food Store	Meat Shop	Producer
MOST	87.7%	1.2%	1.8%	4.8%
SOME	7.9%	6.0%	14.3%	6.0%
NONE	4.4%	92.9%	83.9%	89.1%

These results are consistent with USDA estimates for 1998. The USDA indicated that 79.8% of all food sales were made at a *Food store*, 2.1% of sales were made direct from *Farmers, manufacturers, wholesalers*, and 15.5% were made from *Other stores*. Though this sample had some differences from the USDA results they can most likely be attributed to the fact that this survey questioned only meat shopping and not all grocery purchases.

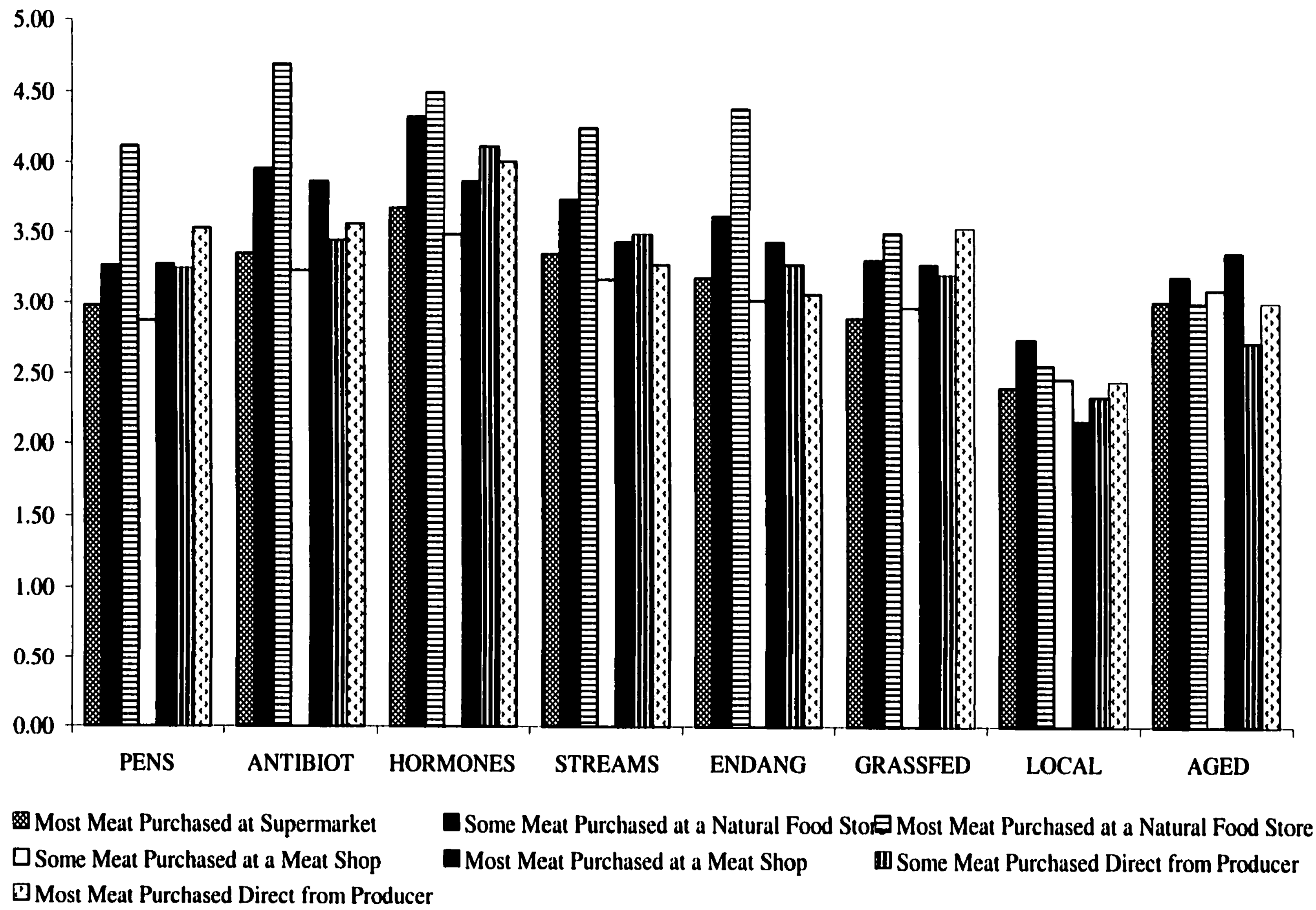


Figure 4.1: Attribute Ratings Across Store Choices Attribute Ratings Across Store Choices

The production characteristics rated were included to help producers identify effective components for future promotions material. In Figure 4.1 all attribute ratings were averaged across store choice for those respondents who did *most* of their meat shopping at each of the four stores. Across all stores the attribute *no use of hormones* in meat production was rated highest in absolute values.

Evaluating shopping choice according to how frequently a consumer shops at one store and comparing those groups against each other leads to some interesting conclusions. *A priori* it would be expected that those respondents indicating they do most of their meat shopping at a natural food store would rate all attributes higher than respondents doing only some of their shopping at the natural food store. However, these results show that the shoppers doing most of their shopping at a natural food store were more sensitive to *grazing managed to protect streams*, *grazing managed to protect endangered species*, and *grassfed* attributes; while the remaining characteristics were rated higher by respondents doing only some of their shopping at a natural foods store.

Those respondents indicating they purchase most of their meat from producers, rate *no growth hormones*, *grazing managed to protect streams* and *grazing managed to protect endangered species* lower than respondents doing only some of their meat shopping direct from producer. Those respondents doing most of their meat shopping from meat shops were the group that most closely resembles *a priori* assumptions about natural food shoppers. These respondents were concerned about the use of confining *pens*, *antibiotics*, *hormones*, *streams*, *endangered species*, and *grass feeding*. Their ratings were similar to the *some* natural food store shoppers, though the *most* meat shopper subgroup is not as sensitive to the hormone usage issue as *some* natural food shoppers and *some* producer direct purchasers.

The first conclusion from the above discussion is that natural food shoppers purchasing most of their meat at such outlets closely resemble the popular view of the natural food shopper, a group not always associated with meat consumption. Their concerns are centered on environmental issues while hormone and antibiotic usage were not relatively as important to this group. Consumers doing some of their shopping at a natural food store were concerned about hormone and antibiotic usage. Shoppers at the other outlets, meat shops and direct-from-producers, exhibited relatively high concerns about inputs and environmental issues.

Past Purchases of Natural Beef

Another area that was covered in the survey was *Past Purchases of Natural Beef.* More than 16 percent of respondents had tried natural beef in the past. Of these respondents, 1.5 percent ate natural beef weekly in the past six months, 4.6 percent ate it monthly and 9.7 percent ate it less often than monthly. Also, 17.4 percent of respondents indicated that they did not know if they had eaten natural beef in the past six months. Those respondents who had tried natural beef were asked their opinion of natural beef's eating characteristics when compared to conventionally produced beef. The characteristics they ranked were color, tenderness and flavor the results are reported in Table 4.3. Most respondents seemed to think that all three characteristics were the same in both types of meat, though flavor was considered better for natural beef. On average, those respondents who had purchased natural beef in the past rated all production characteristics higher than the rest of the sample. These respondents were also willing to pay a higher premium for natural ground beef and steak on average.

Table 4.3: Ranked Characteristics for Natural and Conventional Beef

Characteristic	Regular Better	Both the Same	Natural Better
Color	10.3%	54.3%	35.3%
Tenderness	14.0%	49.2%	36.8%
Flavor	9.9%	44.4%	45.7%

Willingness to Pay Elicitation

In this survey, WTP information was collected for four natural meat products: ground round, steak, ham, and pork chops. As the product being discussed did not yet exist or was only in a limited number of retail food outlets, the price was hypothetical. The hypothetical product was defined in the following manner:

> Please imagine that you are at the counter where you usually buy fresh meat. Four types of meat are available labeled as both regular and as naturally produced. The naturally produced meat is from animals born and raised within 250 miles of where you live. The meats are displayed identically; their color, fat and size are exactly the same.

The only differences between conventional meat and the new product that the consumers were expected to take into account was that the product was labeled as natural and was produced regionally.

Cost Per Lb.	$1.70	$1.89	$2.09	$2.29	$2.49	$2.69	$2.89
a) Reasonable to Pay	☐	☐	☐	☐	☐	☐	☐
b) Begin to be Expensive	☐	☐	☐	☐	☐	☐	☐
c)Too Expensive	☐	☐	☐	☐	☐	☐	☐

Figure 4.2: Willingness to Pay Question Grid (Sample for Ground Beef)

The elicitation format is reproduced as Figure 4.2. Current market prices were developed from local market prices and focus groups prior to the survey. The pricing scale increased incrementally, but at values less than a ten percent increase (8.8%, 17.8%, etc.). This was done to maintain the traditional supermarket pricing scheme, where prices end in "9". Survey results from all three payment card levels for both natural beef and natural steak are reported in Table 4.4 and Table 4.5. In this payment card format the respondents upper and lower bounds on WTP were specifically elicited. This is because the Reasonable to Pay values are the minimum level of premium that a respondent would be willing to pay and the Too Expensive to Pay represents the amount that is above the highest price the respondent would pay. This results in bounded prices that are nearly identical to the results from double-bounded DC.

Table 4.4: WTP Results from the Three Tier Payment Card: Natural Ground Beef

Base Price: $1.69				
Price (From Payment Card)	Premium Level (%)	Reasonable to Pay	Begins to Be Expensive	Too Expensive to Pay
$1.70	.59	20.5%	1.3%	1.1%
$1.89	11.8	37.2%	8.3%	2.6%
$2.09	23.7	17.5%	21.6%	7.4%
$2.29	35.5	6.6%	21.2%	14.9%
$2.49	47.3	3.0%	15.8%	16.7%
$2.69	59.2	0.9%	8.4%	14.2%
$2.89	71.0	1.1%	6.0%	10.6%
$3.09	82.8	0.4%	3.3%	10.8%
$3.29	94.7	0.0%	0.9%	3.4%
$3.49	106.5	0.1%	0.5%	1.8%
$3.59	102.2	0.0%	0.5%	4.5%

Table 4.5: WTP Results from the Three Tier Payment Card: Natural, Local Steak

Base Price: $4.99				
Price (From Payment Card)	Premium Level (%)	Reasonable to Pay	Begins to Be Expensive	Too Expensive to Pay
$5.00	.2	31.3%	4.5%	5.0%
$5.49	10.0	23.7%	19.3%	4.9%
$5.99	20.0	11.2%	21.5%	15.9%
$6.49	30.1	1.9%	12.8%	18.9%
$6.99	40.1	1.2%	8.5%	11.6%
$7.49	50.1	0.3%	2.7%	7.2%
$7.99	60.1	0.0%	1.2%	5.1%
$8.49	70.1	0.0%	0.6%	1.5%
$8.99	80.2	0.0%	0.1%	1.3%
$9.59	92.2	0.0%	0.1%	0.3%
$10.09	102.2	0.1%	0.2%	1.9%

Figures 4.4 and 4.5 represent survey market shares across stated WTP. These graphs also include a line representing those respondents who indicated that they had purchased natural beef in the past. Those respondents who had revealed preference for natural beef offered higher WTP values than those who had not previously tried natural beef. Figure 4.4 represents market shares, or WTP curves, for natural ground beef while Figure 4.3 represents market shares for natural steak. More respondents, whether past purchasers or not, indicated a WTP for natural ground beef than for natural steak. Significant market shares were indicated for both products at moderate premium levels (20-30%). As market shares shrink drastically as prices rise. Of the 1370 survey respondents, 521 consumers (38%) were willing to pay $5.49 (10% price premium) for natural steak and 197 consumers (14%) were willing to pay $5.99 (20% price premium). At $1.89 (12% price premium), 912 consumers (67%) would buy natural ground round, and at $2.09 (23% price premium), 403 consumers (29%) were still willing to buy the natural ground round. For ground beef, respondents were willing to pay at most an 83% premium, while no steak consumers were willing to pay more than a 50% premium. At

the lowest premium level, one cent higher than base price for both steak and ground beef, 87% of all respondents indicated that they would purchase ground beef and only 69% of steak consumers indicated they would purchase the product. In both figures, the difference between the two samples (all consumers and those who purchased natural beef in the past) declined as the price level rose.

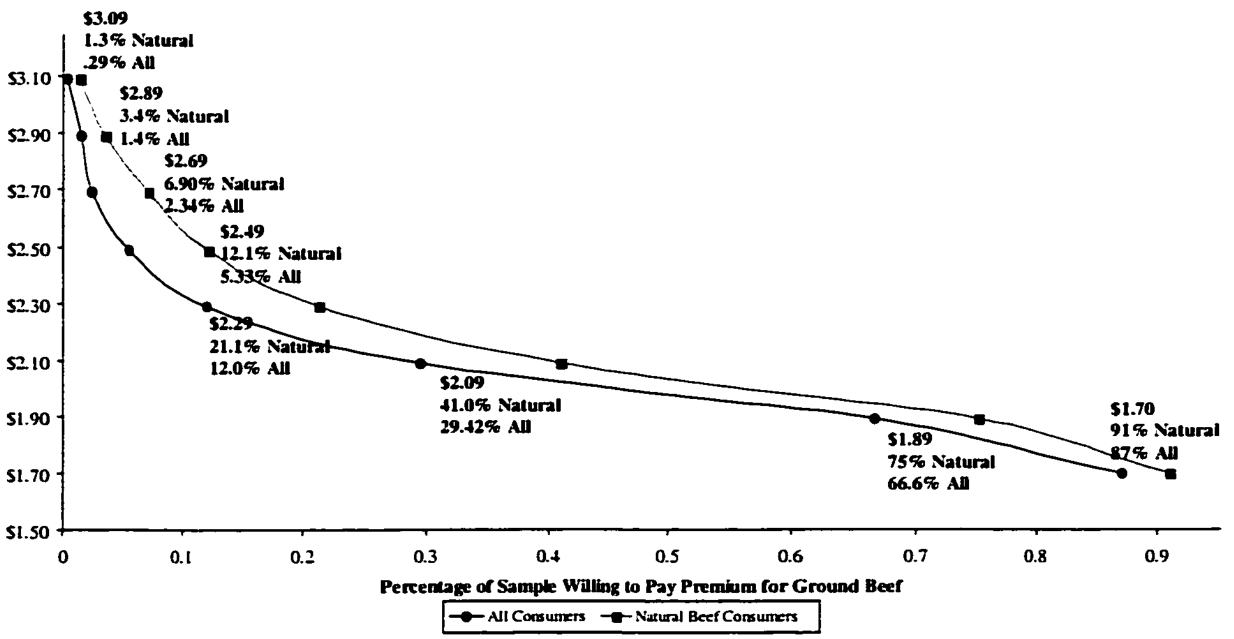
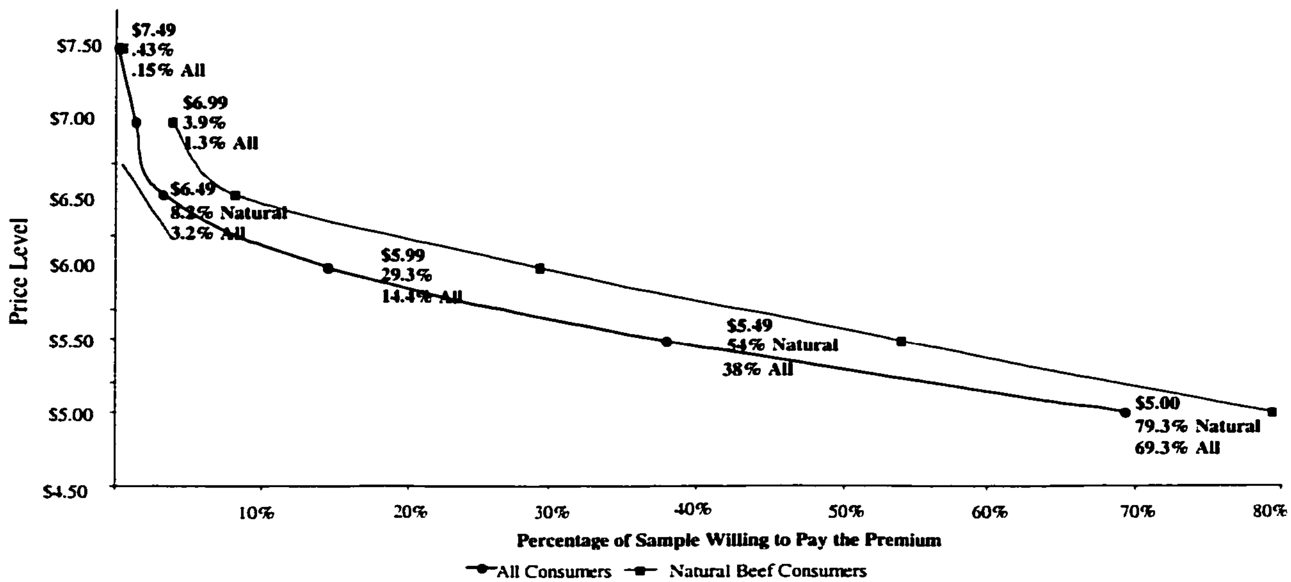


Figure 4.3: Willingness to Pay Curves for Steak: All Consumers and Natural Beef Consumers

Figures 4.5 and 4.6 represent attribute ratings across stated WTP values. Figure 4.5 represents natural ground beef and Figure 4.6 represents natural steak. As expected, respondents who indicated they would pay higher prices also seemed to rate production characteristics higher. A notable exception was the discounting of the *aged* characteristic at the highest premium levels when evaluating WTP for natural steak. For both meat products, *no use of hormones* has the highest average value which increases with increasing premium levels. The average rating for the *animal raised within 250 miles* attribute, labeled *local* in the graph, was the lowest of all the attributes. Although the



<u>*Figure 4.4: Willingness to Pay Curves for Ground Beef: All Consumers and Natural Beef Consumers*</u>

steak graph shows this characteristic's average rate rising slightly at higher premium levels, there is no clear trend in the ground beef chart. In general, the remaining characteristics were rated in the following order; *antibiotics*, *streams*, *endangered species*, *pens*, *grassfed*, and *aged.* Specifically, the environmental and animal-friendly attributes appeared to increase more among those with a higher willingness to pay and are relatively higher in the steak figure. The average rating for attributes in Figure 4.5 is more varied, indicating differing views among those customers willing to pay a premium for natural steak.

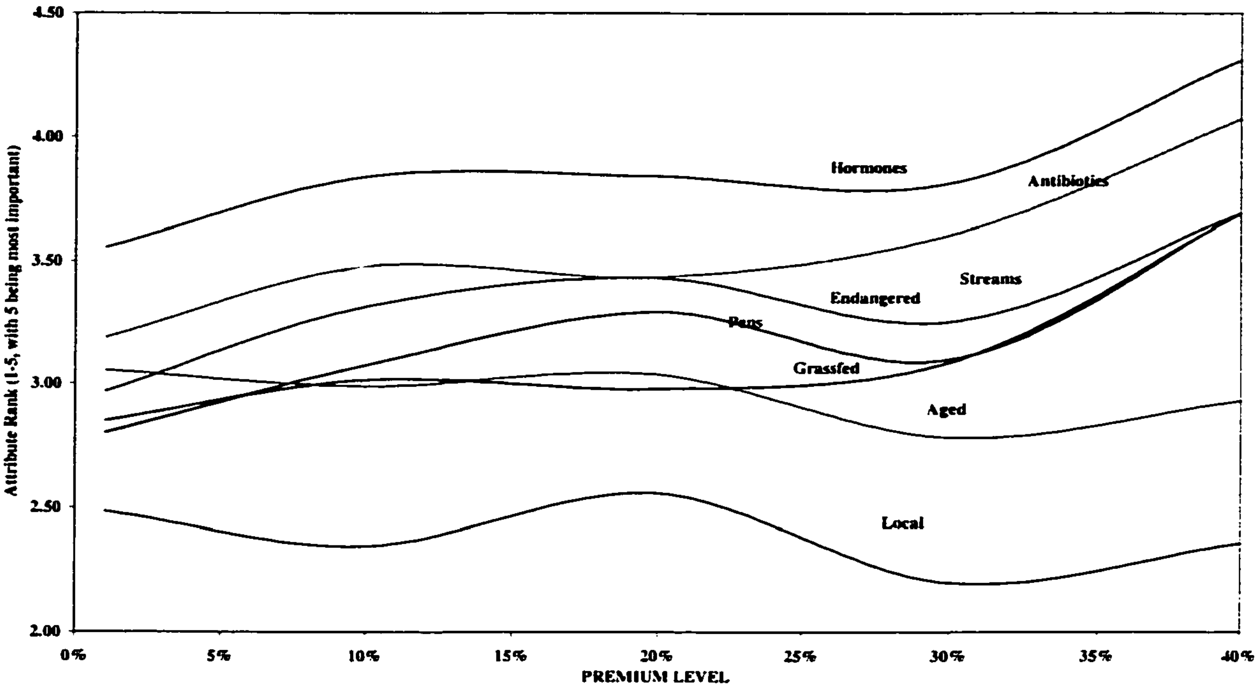


Figure 4.5: Average Attribute Ratings for Ground Beef Consumers across Premium Levels

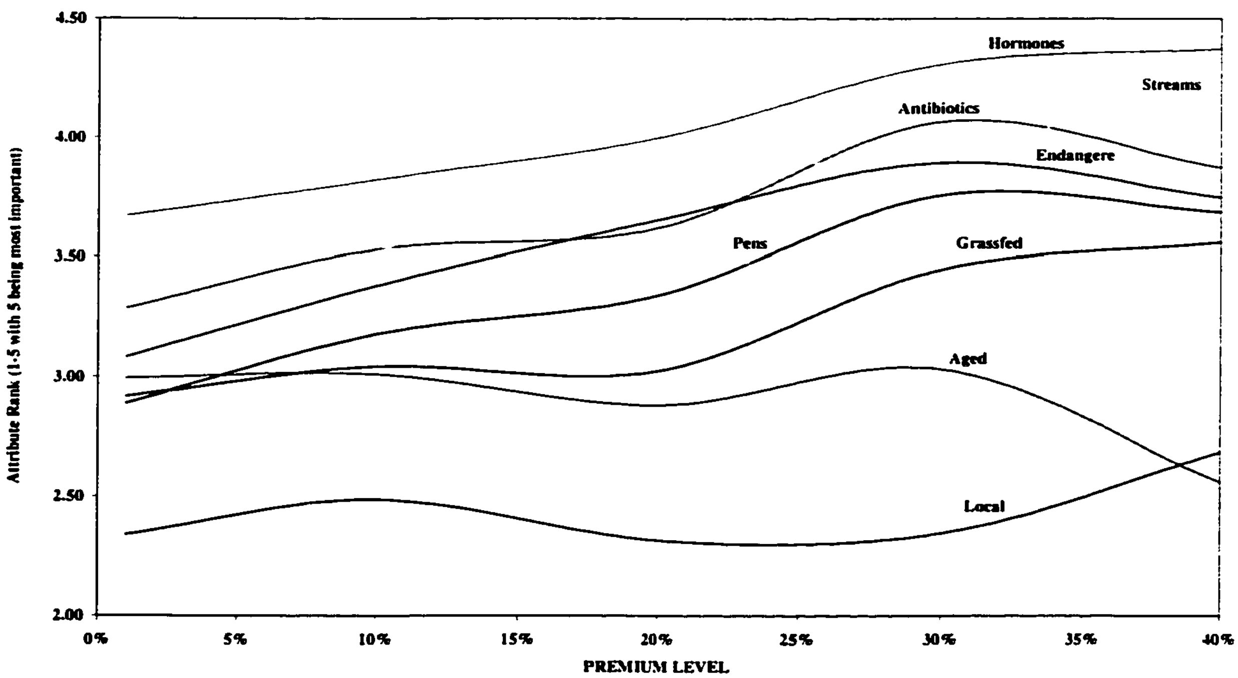


Figure 4.6: Average Attribute Ratings for Steak Consumers across Premium Levels

CHAPTER V
DEMAND FOR INDIVIDUAL RETAIL GROCERY OUTLETS

To better understand the opportunities for supermarkets to retain customers who would otherwise shop for meat at other markets (natural food store, meat shop or direct from a producer), an econometric model of how consumers choose the purchase site for meat is developed. Until now, the introduction of organic products into supermarkets has been limited to a small number of products with low sales (Richman, 2000). By increasing the number of organic/natural products carried, the retailer can benefit by attracting customers who have purchased meat at other markets and provide new products that maintain existing customers by satisfying their demand for new products (Richman, 2000).

The results from a mail survey of Colorado and New Mexico shoppers are used to identify important predictors of the store at which meat is purchased. These results demonstrate the existence of a market for product-line extensions that rely on differentiation through production characteristics which address societal concerns about livestock production processes. The econometric model includes socio-demographic variables and the ratings of some production characteristics (attributes) for meat that are important to consumers. An empirical measure of the potential losses due marketing retail strategy to the *average* consumer is included to measure a consumers willingness to bear the cost of traveling to non-supermarket stores to purchase their desired optimal product preferences.

Data Collection and Results

This data was collected in a mail survey conducted by the National Family Opinion (NFO) organization in 1998. The survey was developed and designed by Ed Sparling and was sponsored by Rocky Mountain Farmer's Union (RMFU). The survey was designed to elicit a respondent's stated preference for natural meat products (ground beef, steak, ham, pork chops, sides of beef), past meat shopping practices and concern about certain livestock production practices[2]. Because the original focus of the model was to serve the producer-members of RMFU, the survey sample was drawn from the Front Range and the Western Slope of Colorado and New Mexico including the cities of Albuquerque, Santa Fe and Farmington. A concern was the probability that Hispanic respondents, considered a key market for some pork products, would not return the survey in a representative manner of their population. Therefore, Hispanic households were oversampled. Rural areas were also oversampled based on the assumption that consumers in this area would be closer to producers and therefore more likely to purchase meat from them. Results show that only 6.1 percent of the respondents were Hispanics, but the 2000 census estimated Colorado's Hispanic population at 17 percent and New Mexico's Hispanic population was estimated at 42 percent. Rural respondents only accounted for 25.8 percent of the sample.

In the survey instrument, *naturally produced meats* were defined as "..from animals raised using environmentally sound practices with no antibiotics or hormones and never confined in small or crowded pens. Cattle grazing is managed to preserve streams and protect endangered species." Though the survey was written and conducted in 1998, it is similar to the National Organic Program final rules that include no use of hormones and antibiotics as being essential components of organic production. A detailed question specifically addressed store choice for meat purchases and excluded other types of grocery products (Figure 5.1).

	Most of My Meat	**Some**	**None**
Supermarket........................	□	□	□
Health/Natural foods store............	□	□	□
Retail meat shop.......................	□	□	□
Rancher or Producer..................	□	□	□

Figure 5.1: Store Choice Question Format

To collect the information on multiple store choices, the survey was structured to allow responses on where *most*, *some* and *none* meat purchases were made. The question matrix allowed each respondent to choose at least one store for *most* meat shopping and multiple answers for the *some* and *none* choices[3]. Results from the shopping matrix are reported in Table 1, and the overwhelming majority (87.7%) of respondents indicated that they did most of their meat shopping at supermarkets. Over 76 percent of respondents indicated that they only shopped at the supermarket for meat, but the remaining 24 percent of respondents represent a sizable market that can be exploited by a more diverse product mix. The table also shows the breakdown across the urban (city/county >100,000 residents) and rural populations. The rural population show a higher incidence of purchases from producers for the rural population, but it appears that the same small number of respondents did most of their meat shopping at a natural food store.

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[2] Natural beef is used interchangeably with organic beef, though the definition of Natural beef used in the survey would not meet the National Organic program rules. At the time of the survey no organic beef was available for sale in Colorado.

Table 5.1: Meat Shopping Choices Across Store Outlets

	Supermarket	Natural Food Store	Meat Shop	Producer
MOST	87.7%	1.2%	1.8%	4.8%
SOME	7.9%	6.0%	14.3%	6.0%
NONE	4.4%	92.9%	83.9%	89.1%
		Rural Population		
MOST	84.5%	1.4%	.8%	9.0%
SOME	9.0%	4.2%	11.9%	9.3%
		Urban Population		
MOST	89.7%	1.1%	2.2%	3.3%
SOME	7.6%	6.6%	15.2%	5.0%

Characteristics, measured in this study as livestock production characteristics, can be interpreted as both measures of disutility and the physical components of the store. The measurement of *no use of hormones* rated on a scale of one to five, with five being most important, is the inverse of the measure of *use of hormones* on the same scale. Therefore, what the respondent rates represents disutility from the use of hormones in livestock production. These characteristics can also be considered as characteristics of the store that can influence a consumer's choice of store. However, because of the nature of consumer demand studies, it is very difficult to separate the two values within the information that the attribute-rating matrix provides. Therefore, only the gross attribute rating is used.

Those respondents indicating they purchased *most* of their meat from producers, rated *no growth hormones*, *grazing managed to protect streams* and *grazing managed to protect endangered species* lower than respondents doing only *some* of their meat shopping directly with producers (Table 5.2). Those respondents doing *most* of their meat

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[3] The data was cleaned to remove multiple responses for *most*. This criterion rejected 43 responses.

shopping from meat shops were more concerned about the *use of confining pens, antibiotics, hormones, streams, endangered species*, and *grassfeeding*. These results suggest that respondents choosing to purchase at least some of their meat at outlets other than the supermarket have, on average, rated production characteristics higher than supermarket shoppers.

Table 5.2: Average Attribute Ratings Across Store Choice and Frequency of Shopping

(n)=size of sub-sample	PENS	ANTIBIOT	HORMONE	STREAM	ENDANG	LOCAL	AGED	GRASSFED
SUPERMARKET RATINGS								
Most (1204)	3.09	3.44	3.81	3.40	3.26	2.36	2.96	3.01
Some (108)	2.98	3.39	3.66	3.26	3.18	2.17	2.89	2.93
NATURAL FOOD RATINGS								
Most (16)	3.38	3.38	3.75	3.44	3.25	2.31	2.94	3.88
Some (82)	3.43	3.50	4.09	3.30	3.07	2.40	2.93	3.37
MEAT SHOP RATINGS								
Most (25)	3.12	3.76	3.96	3.60	3.60	2.28	3.00	3.56
Some (196)	2.95	3.42	3.68	3.31	3.12	2.54	3.12	2.96
PRODUCER RATINGS								
Most (66)	3.53	3.56	4.02	3.27	3.06	2.44	3.00	3.53
Some (83)	3.24	3.45	4.12	3.49	3.28	2.37	2.76	3.20

Model

To analyze the question of what motivated purchases of meat at particular outlets, a series of probit models was estimated. Each equation is specified so that the dependent variable was the stated incidence of meat shopping at one of the four outlets included in the survey (supermarkets, natural food stores, meat shops and direct from a producer). The equations were similar to models suggested by Thompson and Kidwell (1998) and were estimated using the maximum likelihood PROBIT procedure available in LIMDEP

7. The probit model was specified to investigate how the dependent variables influenced the probability of shopping at a particular market (noted as a 0-1 response by survey respondents).

The dependent variables are defined from the store choice responses. The largest sub-group was *most*-Supermarket, and the dependent variable MOST represents this group. A second group combined *most* and *some* Natural Food Store shoppers (MOSTNAT). Similarly, the *most* and *some* subgroups were combined for the meat shop (MOSTSHOP) and producer (MOSTPROD) equations.

The ALTSHOP (ALTSHOPN, ALTSHOPS, ALTSHOPP) variables are included to measure the willingness to search stores to find the products that complete their optimal market basket. The fact that the ALTSHOP variables are greater than zero indicate that it was necessary to make purchases from at least one of the alternate markets for consumers to satisfy their demand for an optimal product. As the value increases, it indicates that shoppers are willing to take on the higher cost of traveling to alternate markets to satisfy their personal preference. The indirect cost of traveling to alternate shops to purchase their products is outweighed by the realized utility gains of purchasing an optimal product. In other words, the results of the ALTSHOP variable will be interpreted as a measure of the disutility concept, where disutility was defined as:

$$U(\Theta_j, \Theta^\circ) = \mu^\circ - \tau|\Theta_j - \Theta^\circ|. \tag{5.1}$$

Table 5.3: Definitions and means of Descriptive Variables

VARIABLE	PERCENT OF SAMPLE OR MEAN	DESCRIPTION
Demographics		
GEN	66.5%	One if respondent was female
AGE9CAT	4.67	Average age of respondent
FEMEDU	3.76	Average education level (3= college, 4=graduate)
URBAN	74.2%	One if respondent lived in an urban area (pop > 100,000)
INC3	23.62%	$30,000 - 50,000 annual income
INC4	25.73%	$50,000 - 75,000 annual income
INC5	19.40%	Greater than $75,000 annual income
EXP1	22.7%	Less than $200 average weekly grocery expenditures
EXP2	44.9%	Greater than $200 average weekly grocery expenditures
YSINGLE	5.23%	Young Single, <35 (no children)
OSINGLE	8.94%	Old Single, >65 (no children at home)
YCOUPLE	6.76%	Young Couple, <45, no children
WRKOCPL	13.37%	Working Old Couple, >45, no children
RETOCPL	11.70%	Retired Old couple, no children
YPARENT	14.54%	Young Parent, <45, child <6
MPARENT	11.34%	Middle Parent, <45, child >6
OPARENT	13.15%	Older Parent, >45, any child
Revealed Preference for Meat		
FRQBF	2.8	Average beef meals eaten at home
DNBFYES	17.0%	One if bought natural beef in the past
Attribute Ratings		
PENS	3.04	No small or crowded pens
ANTIBIOT	3.40	No use of antibiotics
HORMONES	3.73	No use of growth hormones
STREAMS	3.74	Grazing managed to preserve streams
ENDANG	3.20	Grazing managed to protect endangered species
LOCAL	2.39	Animal born and raised within 250 miles
AGED	2.99	Meat aged at least 14 days
GRASSFED	2.94	Grass Fed
Willingness to Pay for Natural Beef		
STKPAY1	1.3	Average WTP for natural steak, premium levels
GBPAY1	2.1	Average WTP for natural ground beef, premium levels
Past Shopping Information		
ALTSHOP	.34	Number of alternate shopping outlets frequented for meat purchases
ALTSHOPN	.27	Frequency of shopping at a meat shop or direct from a producer
ALTSHOPS	.18	Frequency of shopping at a natural foods store or direct from a producer
ALTSHOPP	.23	Frequency of shopping at a natural foods store or meat shop

Pricing is also an essential component in the probability of a consumer purchasing a product. However, no supermarket carried local, natural meat products at the time this survey was completed. The WTP information gathered in the survey is used as an estimate of both a range of possible supermarket prices (assuming natural beef would be offered at a premium) and a measurement of an individual consumer's probability of purchasing the product. Including the WTP results provided additional information about the relationship between willingness to pay higher premiums for this particular product, overall price sensitivity of consumers (more generally), and store choice.

Therefore, the model specified for store choice is,

$$
\begin{aligned}
\text{Prob}(\text{Store}_i = 1) = \Phi_i(&\beta_0 + \beta_1\text{GEN} + \beta_2\ \text{AGE9CAT} + \beta_3\text{YCOUPLE} + \beta_4\text{WRKOCPL} + \beta_5\text{RETOCPL} + \\
&\beta_6\ \text{YPARENT} + \beta_7\text{MPARENT} + \beta_8\ \text{OPARENT} + \beta_9\text{YSINGLE} + \beta_{10}\text{OSINGLE} + \\
&\beta_{11}\ \text{FEMEDU} + \beta_{12}\text{EXP1} + \beta_{13}\text{EXP2} + \beta_{14}\text{URBAN} + \beta_{15}\text{FRQBF} + \beta_{16}\text{DNBFYES} + \\
&\beta_{17}\text{INC3} + \beta_{18}\text{INC4} + \beta_{19}\text{INC5} + \beta_{20}\ \text{PENS} + \beta_{21}\ \text{ANTIBIOT} + \\
&\beta_{22}\ \text{HORMONES} + \beta_{23}\ \text{STREAMS} + \beta_{24}\text{ENDANG} + \beta_{25}\ \text{GRASSFED} + \beta_{26}\ \text{LOCAL} + \\
&\beta_{27}\text{AGED} + \beta_{28}\text{GBPAY1} + \beta_{29}\text{STKPAY1} + \beta_{30}\text{ALTSHOP}_j) + \varepsilon_{i1}
\end{aligned}
$$

Where: $i = 1, 2, 3, 4$

Store_1 = MOST meat shopping at a Supermarket

Store_2 = MOSTNAT : Sum of Most and Some meat shopping at a natural foods store

Store_3 = MOSTSHOP : Sum of Most and Some meat shopping at a meat shop

Store_4 = MOSTPROD : Sum of Most and Some meat purchased direct from a producer

$j = 1, 2, 3, 4$

ALTSHOP = Summation of all non - supermarket stores shopped

ALTSHOPN = Summation of shopping at a meat shop or direct from producer

ALTSHOPS = Summation of shopping at a natural food store or direct from producer

ALTSHOPP = Summation of shopping at a natural food store or a meat shop

Prediction accuracy for the four equations was 87.2, 92.9, 84.2 and 89.3 percent, respectively. The modified R^2 (Greene, 1997) for each of these equations was .455, .503,

.501 and .471. Log-Likelihood tests were used to confirm that the specification reported here was better than alternate specifications that excluded DNBFYES and the WTP variables (GBPAY1 and STKPAY1). GBPAY1, STKPAY1 and the ALTSHOP variables were tested for endogeneity and all were determined to be exogenous (Thompson and Kidwell, 1998; Rivers and Vuong, 1988).

Results of Single Equation Store Choice Models

The econometric models depict the probability of shopping at one of the four stores. Results of the econometric equations and marginal effects are reported for the means in the full table of results, Tables 5.5a - Table 5.5d, located at the end of the chapter (Greene, 1998). A table including only significant variables, is included as Table 5.4. These results should be considered carefully, remembering that there rural residents and Hispanic households were oversampled.

Residents of an urban area were 3.4 percent more likely to shop at a supermarket than residents of a rural area. The ALTSHOP variable is significant and negative, indicating that as respondents shopped at more alternate markets, the costs of shopping at alternative markets to gain benefits of optimal product mix increases. Incomes greater than $50,000 corresponded to a lower probability of shopping at a supermarket than respondents in lower income categories. The marginal effects of these two categories are a 4.5 percent and a 5.25 percent decrease in the probability of shopping at the supermarket. The *no small or crowded pens* and *grassfed* variables are significant and negative in predicting the probability of shopping at the supermarket. As the respondent rated these attributes higher the probability of shopping at a supermarket decreased by 2.3 percent and 1.4 percent respectively. Finally, though it has a small marginal effect, increasing values of WTP for ground beef was a positive predictor of the probability of purchasing meat at the supermarket.

The results showed that retired, older couples with no children living at home are 9 percent more likely to shop at meat shops than all other lifestage categories. Higher concern about *hormone* usage also increased the probability of shopping at a meat shop by 2 percent, while each additional rating level of the *local* attribute unexpectedly decreased the probability of shopping at a meat shop by 2 percent. Women were 4 percent less likely to shop at meat shops then men, and respondents with incomes greater than $75,000 were 7 percent more likely to shop at a meat shop than respondents in other income categories. Past purchasers of natural beef were 7 percent more likely to shop at a meat shop, than if they had not purchased natural beef in the past.

Female respondents are 1.8 percent less likely to shop at a natural food store than males. Past purchases of natural beef increased the probability of shopping for meat at a natural food store by 7.6 percent, but increasing concern about *hormones* and *local* meat production increased the probability of shopping at a natural foods store by only 2 percent (combined).

Urban respondents are 6 percent less likely to purchase meat from a meat producer than residents of rural areas. More frequent beef purchases and past purchases of natural beef also contributed to the probability of purchasing meat from producers. Concern about small *pens*, *hormones* or *grassfeeding* contributed 1.6, 1.9, and 2.1 percent to the probability of purchasing from a producer as attribute ratings increased one level. However, higher concern about antibiotic use decreased the probability of purchasing direct from a producer by 1.4 percent. Finally, higher willingness to pay values decreased a respondents probability of purchasing from a producer by nearly 2 percent as they stated each additional higher premium level.

Conclusions

The theoretical concept of disutility is tested by including the ALTSHOP variable which measures the consumers willingness to shop at alternate markets to complete their optimal product mix. The ALTSHOP variable is a summation of the responses regarding alternate markets that a respondent buys meat from (*most*-natural foods store, *most*-meat shop, *most*-producer, *some*-natural foods store, *some*-meat shop, *some*-producer). When the store itself is the product, the absence of a natural beef product (which has been defined as a characteristic of the store) means that the store is no longer the optimal product and consumers shop at an alternate market, accepting the increased cost of travel in order to bring home their preferred product. The results from the supermarket equation shows that respondents who travel to alternate markets are 13.5 percent less likely to do most of their meat shopping at the supermarket. Indicating that their realized utility is increases more than the cost of travel. This application of the theoretical argument addresses the concern that, regardless of consumer WTP, if products are not available in one place, consumers will frequent multiple markets to locate them. Recent introductions of natural beef products into large supermarket chains indicate that large, regional beef producers have found it profitable to exploit this niche[4] and accept the changing reality of changing customers, lending support to the relevance of these findings and discussions.

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[4] King Soopers, the Colorado Kroger chain, recently introduced Maverick Lean Natural Beef.

Table 5.4: Significant Variables from Probit Equations

SUPERMARKET				
	Coefficient	**T-Ratio**	**Marginal Effects**	**P-value**
CONSTANT	1.786	3.214	23.97%	0.001
URBAN	0.254	2.164	3.41%	0.030
FRQBF	0.075	1.816	1.00%	0.069
INC4	-0.373	-2.424	-5.01%	0.015
INC5	-0.431	-2.524	-5.79%	0.012
PENS	-0.174	-3.082	-2.33%	0.002
GRASSFED	-0.104	-2.051	-1.40%	0.040
AGED	0.075	1.679	1.01%	0.093
GBPAY1	0.077	1.880	1.04%	0.060
ALTSHOP	-1.002	-11.844	-13.45%	0.000
MEAT SHOP				
	Coefficient	**T-Ratio**	**Marginal Effects**	**P-value**
CONSTANT	-1.606	-3.331	-36.79%	0.001
GEN	-0.178	-1.887	-4.09%	0.059
RETOCPL	0.402	1.928	9.20%	0.054
DNBFYES	0.421	3.853	9.63%	0.000
INC5	0.310	2.287	7.10%	0.022
GRASSFED	0.097	2.295	2.22%	0.022
LOCAL	-0.088	-2.239	-2.02%	0.025
STKPAY1	0.080	1.974	1.84%	0.048
NATURAL FOOD STORE				
	Coefficient	**T-Ratio**	**Marginal Effects**	**P-value**
CONSTANT	-2.013	-3.163	-15.74%	0.002
GEN	-0.230	-1.726	-1.80%	0.084
EXP1	-0.591	-2.097	-4.62%	0.036
FRQBF	-0.187	-3.769	-1.46%	0.000
DNBFYES	0.978	7.512	7.64%	0.000
HORMONES	0.141	1.770	1.10%	0.077
LOCAL	0.109	1.951	0.85%	0.051
PRODUCER				
	Coefficient	**T-Ratio**	**Marginal Effects**	**P-value**
CONSTANT	-1.366	-2.423	-20.27%	0.015
AGE9CAT	-0.082	-1.696	-1.22%	0.090
URBAN	-0.425	-4.004	-6.31%	0.000
FRQBF	0.172	4.058	2.55%	0.000
DNBFYES	0.262	2.052	3.89%	0.040
PENS	0.114	2.253	1.69%	0.024
ANTIBIOT	-0.092	-1.810	-1.37%	0.070
HORMONES	0.133	2.316	1.98%	0.021
GRASSFED	0.144	2.961	2.13%	0.003
GBPAY1	-0.129	-2.979	-1.91%	0.003

The oversampling of rural areas may contribute to the results seen in the supermarket and producer equations. The issue of geographic location was one of the driving concerns behind the oversampling of rural areas, since direct sales from producers of sides of beef were considered to be one of the potentially profitable strategies under investigation.

Though the rating of some production concerns are significant in each equation, the marginal effect of any is relatively small. Demographic information seems to have some value, but past purchases of natural beef, frequency of beef purchases and willingness to pay a premium for natural beef are significant predictors for store choice across all equations. This supports the *Progressive Grocer's* study which shows that the meat counter is the most important non-service store characteristic, as well as the most frequently used department at the grocery store.

This analysis has shown that the majority of all consumers shop at a conventional supermarket. It has also shown some attributes and past beef purchasing practices were important to the decision to shop at each of the four stores where meat was purchased. Finally, the significance of a measure of alternate markets frequented in the supermarket equation demonstrates that consumers who choose to shop at a supermarket for meat may choose to purchase meat from other stores to maximize their utility.

To attract or retain consumers, the supermarket needs to utilize an approach that embraces all customers, not just the *average*. Customers already shopping at the supermarket can be encouraged to increase their purchases by the availability of products that had to be purchased elsewhere before the product line extension. Customers not normally inclined to purchase meat at the supermarket can be attracted by the emphasis on production practice differentiated meats, thereby increasing sales. Overall, the current trend in supermarkets to "promote products that address mind/body balance (through use of natural ingredients, herbs or vitamins)," illustrates the changing shopping experience at the market (Hauptman and Cavanaugh, 2001). Markets that move from promoting service attributes of their stores to, "selling stories behind their products," will continue to attract customers and be well prepared for the changing nature of consumer demand (Rolf Jensen from T*he Dream Society* as quoted by Hauptman and Cavanaugh, 2001).

Table 5.5a: Results of the Probit Equation for Supermarkets

SUPERMARKET				
Variable	**Coefficient**	**Marginal Effects**	**T-Ratio**	**P-value**
CONSTANT	1.786	0.240	3.214	0.001
GEN	-0.069	-0.009	-0.576	0.565
AGE9CAT	-0.024	-0.003	-0.508	0.612
YCOUPLE	-0.132	-0.018	-0.398	0.691
WRKOCPL	-0.250	-0.034	-0.935	0.350
RETOCPL	0.195	0.026	0.717	0.473
YPARENT	-0.169	-0.023	-0.479	0.632
MPARENT	-0.160	-0.022	-0.477	0.633
OPARENT	0.062	0.008	0.206	0.837
YSINGLE	-0.051	-0.007	-0.198	0.843
OSINGLE	0.327	0.044	1.194	0.233
FEMEDU	-0.015	-0.002	-0.628	0.530
EXP1	0.217	0.029	0.797	0.425
EXP2	0.120	0.016	0.369	0.712
URBAN	0.254	0.034	2.164	0.030
FRQBF	0.075	0.010	1.816	0.069
DNBFYES	0.051	0.007	0.379	0.705
INC3	-0.132	-0.018	-0.908	0.364
INC4	-0.373	-0.050	-2.424	0.015
INC5	-0.431	-0.058	-2.524	0.012
PENS	-0.174	-0.023	-3.082	0.002
ANTIBIOT	-0.040	-0.005	-0.727	0.467
HORMONES	0.056	0.007	0.918	0.358
STREAMS	0.048	0.006	0.688	0.491
ENDANG	0.055	0.007	0.858	0.391
GRASSFED	-0.104	-0.014	-2.051	0.040
LOCAL	-0.040	-0.005	-0.852	0.394
AGED	0.075	0.010	1.679	0.093
GBPAY1	0.077	0.010	1.880	0.060
STKPAY1	-0.040	-0.005	-0.840	0.401
ALTSHOP	-1.002	-0.134	-11.844	0.000
Percent Predicted Correctly		87.2%		
Modified R^2		.455		

Table 5.5b: Results of the Probit Equation for Natural Food Stores

NATURAL FOOD STORE				
Variable	**Coefficient**	**Marginal Effects**	**T-Ratio**	**P-value**
CONSTANT	-2.013	-3.143	-3.163	0.002
GEN	-0.230	-1.729	-1.726	0.084
AGE9CAT	-0.001	-0.027	-0.027	0.979
YCOUPLE	0.037	0.101	0.101	0.920
WRKOCPL	-0.093	-0.303	-0.303	0.762
RETOCPL	-0.196	-0.645	-0.646	0.518
YPARENT	-0.231	-0.581	-0.582	0.561
MPARENT	-0.258	-0.673	-0.674	0.501
OPARENT	-0.165	-0.505	-0.505	0.613
YSINGLE	0.019	0.073	0.073	0.942
OSINGLE	-0.247	-0.841	-0.840	0.401
FEMEDU	0.026	0.909	0.906	0.365
EXP1	-0.591	-2.074	-2.097	0.036
EXP2	-0.358	-1.045	-1.051	0.293
URBAN	0.134	0.896	0.892	0.372
FRQBF	-0.187	-3.697	-3.769	0.000
DNBFYES	0.978	6.219	7.512	0.000
INC3	-0.072	-0.428	-0.428	0.669
INC4	0.142	0.806	0.805	0.421
INC5	0.109	0.552	0.552	0.581
PENS	-0.065	-1.036	-1.037	0.300
ANTIBIOT	0.051	0.752	0.754	0.451
HORMONES	0.141	1.801	1.770	0.077
STREAMS	-0.038	-0.482	-0.483	0.629
ENDANG	0.075	1.066	1.067	0.286
GRASSFED	0.050	0.843	0.840	0.401
LOCAL	0.109	1.962	1.951	0.051
AGED	0.000	0.002	0.000	.9998
GBPAY1	0.052	1.188	1.198	0.231
STKPAY1	0.076	1.435	1.445	0.148
ALTSHOPN	0.149	1.292	1.298	0.194
Percent Predicted Correctly		92.9%		
Modified R^2		.503		

Table 5.5c: Results of the Meat Shop Equation

MEAT SHOP				
Variable	**Coefficient**	**Marginal Effects**	**T-Ratio**	**P-value**
CONSTANT	-1.606	-0.368	-3.331	0.001
GEN	-0.178	-0.041	-1.887	0.059
AGE9CAT	-0.001	0.000	-0.038	0.970
YCOUPLE	0.062	0.014	0.216	0.829
WRKOCPL	0.157	0.036	0.691	0.490
RETOCPL	0.402	0.092	1.928	0.054
YPARENT	0.020	0.005	0.067	0.947
MPARENT	0.155	0.035	0.546	0.585
OPARENT	0.218	0.050	0.905	0.365
YSINGLE	0.148	0.034	0.679	0.497
OSINGLE	-0.178	-0.041	-0.841	0.401
FEMEDU	0.013	0.003	0.669	0.504
EXP1	0.102	0.023	0.417	0.677
EXP2	0.118	0.027	0.415	0.678
URBAN	0.170	0.039	1.641	0.101
FRQBF	0.035	0.008	0.981	0.327
DNBFYES	0.421	0.096	3.853	0.000
INC3	-0.004	-0.001	-0.035	0.972
INC4	0.023	0.005	0.180	0.857
INC5	0.310	0.071	2.287	0.022
PENS	0.002	0.001	0.055	0.956
ANTIBIOT	-0.033	-0.008	-0.710	0.478
HORMONES	-0.017	-0.004	-0.340	0.734
STREAMS	-0.059	-0.014	-1.046	0.295
ENDANG	0.067	0.015	1.269	0.205
GRASSFED	0.097	0.022	2.295	0.022
LOCAL	-0.088	-0.020	-2.239	0.025
AGED	0.019	0.004	0.515	0.607
GBPAY1	-0.019	-0.004	-0.556	0.578
STKPAY1	0.080	0.018	1.974	0.048
ALTSHOPS	0.081	0.019	0.783	0.434
Percent Predicted Correctly		84.2%		
Modified R^2		.501		

Table 5.5d: Results of the Producer Equation

PRODUCER				
Variable	**Coefficient**	**Marginal Effects**	**T-Ratio**	**P-value**
CONSTANT	-1.366	-0.203	-2.423	0.015
GEN	0.138	0.020	1.163	0.245
AGE9CAT	-0.082	-0.012	-1.696	0.090
YCOUPLE	-0.018	-0.003	-0.051	0.959
WRKOCPL	-0.208	-0.031	-0.741	0.459
RETOCPL	-0.443	-0.066	-1.597	0.110
YPARENT	-0.328	-0.049	-0.904	0.366
MPARENT	-0.327	-0.049	-0.949	0.343
OPARENT	-0.490	-0.073	-1.581	0.114
YSINGLE	0.399	0.059	1.614	0.107
OSINGLE	-0.252	-0.037	-0.971	0.332
FEMEDU	0.010	0.001	0.434	0.664
EXP1	-0.026	-0.004	-0.097	0.923
EXP2	0.139	0.021	0.439	0.661
URBAN	-0.425	-0.063	-4.004	0.000
FRQBF	0.172	0.025	4.058	0.000
DNBFYES	0.262	0.039	2.052	0.040
INC3	0.134	0.020	1.017	0.309
INC4	0.264	0.039	1.819	0.069
INC5	0.149	0.022	0.885	0.376
PENS	0.114	0.017	2.253	0.024
ANTIBIOT	-0.092	-0.014	-1.810	0.070
HORMONES	0.133	0.020	2.316	0.021
STREAMS	-0.058	-0.009	-0.908	0.364
ENDANG	-0.090	-0.013	-1.522	0.128
GRASSFED	0.144	0.021	2.961	0.003
LOCAL	0.033	0.005	0.720	0.472
AGED	-0.071	-0.010	-1.612	0.107
GBPAY1	-0.129	-0.019	-2.979	0.003
STKPAY1	0.008	0.001	0.168	0.867
ALTSHOPP	-0.013	-0.002	-0.117	0.907
Percent Predicted Correctly		89.3%		
Modified R^2		.471		

CHAPTER VI
WILLINGNESS TO PAY FOR NATURAL BEEF: ESTIMATION OF PAYMENT CARD RESULTS AND MARKET SEGMENTS

Willingness to pay for a new product is essential market information that is used to position a product. Since the introduction of a new product is both a costly and risky undertaking, accurate pricing information is essential (Bloom, Gundlach and Cannon, 2000). WTP studies are one method for gathering pricing and potential sales information, and the method is flexible enough to evaluate both non-market goods and potential (new) products. However, traditional CV methods often collect WTP values that are imprecise. This paper presents a bounded payment card method of surveying that can be conducted through a mail survey. An estimation of the payment card values is presented and a model of the potential target groups for the new product is also derived from the payment card results.

Bounded WTP information was collected for both natural ground beef and steak using a three-tiered payment card. The three tiers of the payment card elicited values for *Reasonable to Pay*, *Begins to Be Expensive* and *Too Expensive to Pay* prices for each product. The *Reasonable to Pay* value can be considered a lower bound while *Too Expensive to Pay* corresponds to an upper bound. To establish if the bounded values produce a better average WTP estimate than the middle tier, two econometric models are presented. The first model uses the observed responses for the second-tier of the payment card (*Begins to be Expensive*) while the second model uses the calculated mean WTP across the first and third tier responses of the bounded payment card.

A model of targeted customers in a segmented market is also presented. This is included since a study for a new market product needs to evaluate both pricing schedules and target customers to produce an effective marketing campaign. Traditionally, target markets or market segments are established using statistical inference (cluster analysis) that is not guided by testable hypotheses. While cluster analysis can allow one to infer important group relationships, it only establishes statistical relationships and cannot be used to evaluate causality. An approach rooted in economic theory, however, can impose the *ceteris parabus* assumptions that can be tested based on the results of the statistical model. The Therefore, this data is evaluated using an approach that utilizes the utility maximizing compatible logit modeling of WTP results, but provides information on target markets similar to cluster analysis[5]. The advantage of using the logit-based clustering method is that significant predictor variables can be identified, further simplifying the amount of information necessary to effectively describe a target market.

Interval Models of Mean WTP

It is hypothesized that the price respondents are willing to pay for a new natural beef product depends on their store choice, demographic characteristics, revealed preference for meat consumption at home and rating of the importance placed on natural beef's production characteristics. In any WTP analysis, the accurate identification of an average, and therefore, representative WTP for the hypothetical product is essential.

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[5] This method was developed by John McKenzie in his thesis titled: Organic Produce in Colorado Supermarkets: Consumer Willingness to Pay a Premium.

Difficulties arise when the dichotomous choice format advocated by the Arrow NOAA panel is used (Arrow, et al., 1993). It is assumed that if a respondent was willing to pay the offered premium, then the actual bound on their WTP is somewhere between the randomly suggested value and infinity. The bounded payment card used here allows respondents to provide three prices that describe their WTP for the product.

Cost Per Lb.	**$1.70**	**$1.89**	**$2.09**	**$2.29**	**$2.49**	**$2.69**
a) Reasonable to Pay						
b) Begin to be Expensive						
c)Too Expensive						

Figure 6.1: Willingness to Pay Question Grid (Sample for Ground Beef)

A truncated version of the survey's payment card is seen in Figure 6.1. Answers may be clustered so that the value for each successively higher tier corresponds to the next higher premium level. This would be indicated by a respondent choosing premium level 2 for the first tier, a 3 for the second tier and a 4 for the third tier (Figure 6.2). In this situation it can be inferred that the price that exactly identifies the true willingness to pay for the product is the premium level three. This argument can be made since the first level is *Reasonable to Pay* and the third level is identified with *Too Expensive to Pay.* Since their premium selection for the second tier *Begins to be Expensive* is the value 3, which lies exactly between 2 and 4, no assumptions have to be made about whether or not the true WTP is closer to the premium level two or the premium level four. However, if a respondent chooses values of 2-6-7 (Figure 6.2) for the three tiers of responses, the analysis of the true WTP is not as straightforward. Figure 6.3 contains a frequency count of respondents who would be willing to pay at least the 10 percent premium level for natural steak in the *Reasonable to Pay* line, and their associated second and third tier responses. It can be seen that the most frequent response pattern was (2,3,4). The same information is presented for natural ground beef in Figure 6.4, but there are both more total respondents willing to pay the 10% premium and more varied response patterns.

The fact that the payment card values used for this analysis are not continuous complicates analysis of the examples in Figure 6.2. For each product of interest, natural ground beef and natural steak, the increments increase approximately 10 percent from an initial premium level that is 1 cent higher than the base price and reflect the prevailing market prices at the time of the survey. These offered meat prices correspond to the standard practice of ending meat prices with "9". Thus, the premia (in percentages) for ground beef were: 0.59, 11.8, 23.7, 35.5, 47.3. 59.2, 71.0, 82.8, 94.7, 106.5, and 112.4. For steak, those same premium level percentages, starting from a base of $4.99, were 0.2, 10.0, 20.0, 30.1, 40.1, 50.1, 60.1, 70.1, 80.2, 92.2 and 102.2.

Premium Level	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Cost Per Lb.	**$1.70**	**$1.89**	**$2.09**	**$2.29**	**$2.49**	**$2.69**	**$2.89**
a) Reasonable to Pay	□	■	□	□	□	□	□
b) Begin to be Expensive	□	□	■	□	□	□	□
c) Too Expensive	□	□	□	■	□	□	□

Cost Per Lb.	**$1.70**	**$1.89**	**$2.09**	**$2.29**	**$2.49**	**$2.69**	**$2.89**
a) Reasonable to Pay	□	■	□	□	□	□	□
b) Begin to be Expensive	□	□	□	□	□	■	□
c) Too Expensive	□	□	□	□	□	□	■

Figure 6.2: Sample Completed Willingness to Pay Grids

Since this method allows for the collection of bounded responses, the respondent has provided a mean WTP, but the appropriate value to use for the mean in estimation can still be difficult to identify. For an example like choice-combination levels 2, 6, 7, three possibilities arise: 1.) the mean value is located between two and six, 2.) The mean value is between six and seven, and, 3.) The true mean is the response to the second tier of the payment card though the question did not exactly identify that response as a mean WTP. For the example pattern, if it is assumed that the mean is between 2 and 6 then more emphasis is placed on the lower WTP. This would correspond to the CV convention of always using the most conservative estimate of mean WTP to avoid overvaluation of benefits or costs. If, however, the difference between the *Too Expensive to Pay* response and the *Begins to be Expensive* is assumed to contain the mean WTP, then emphasis is placed on the higher premium. Finally, if the true mean WTP is the answer recorded in the second tier, then those responses should be used in estimating WTP.

Figures 6.5 and 6.6 show the cumulative WTP responses for the three tiers of the payment card, and the values for the calculated average WTP from the first and third tiers. These charts show that the estimated cumulative average WTP for ground beef and steak are very close to the actual response values for the second tier of the payment card. However, in both cases the calculated mean results in a larger number of respondents at the lower premium levels than the number returned from the true responses. To evaluate the best method for estimating a mean WTP from these options, two models incorporating demographic information, store choice, past meat consumption practices and concern about production characteristics are estimated. In the first model, the *Begins to be Expensive* line of the three-tiered payment card is the dependent variable (DOLGB2 and DOLSTK2) and in the second model the dependent variable is the calculated mean of the first and third levels (*Reasonable to Pay* and *Too Expensive to Pay;* AVGBDOL, AVSTKDOL). Estimation of the models (truncated-censored), which included ordinal

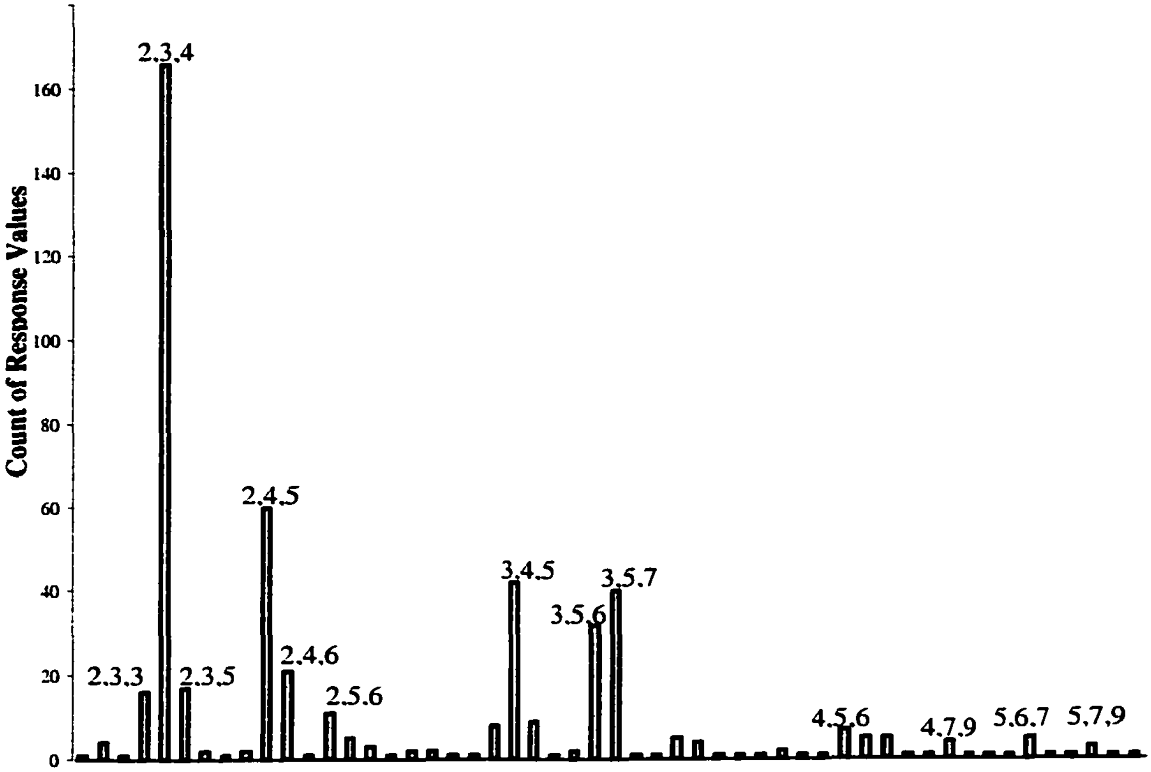

Figure 6.3: WTP Response Patterns for Natural, Local Steak

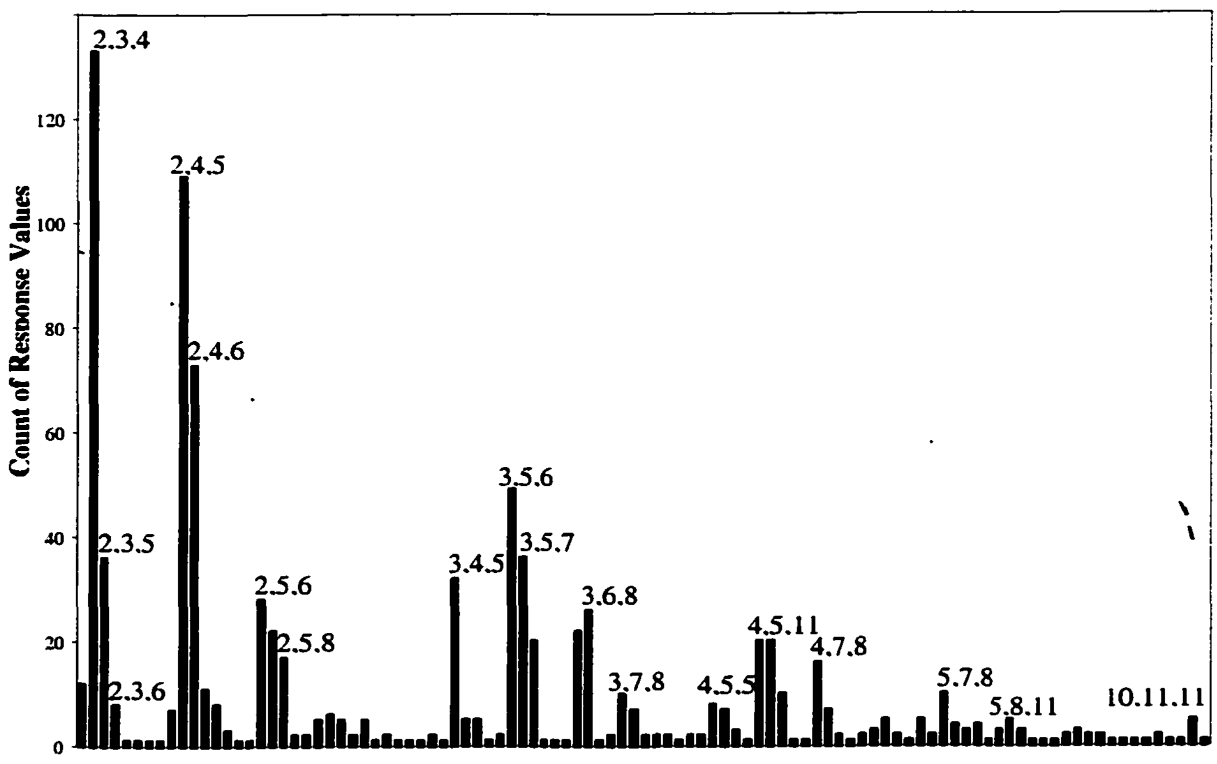

Figure 6.4: WTP Response Patterns for Natural Ground Beef

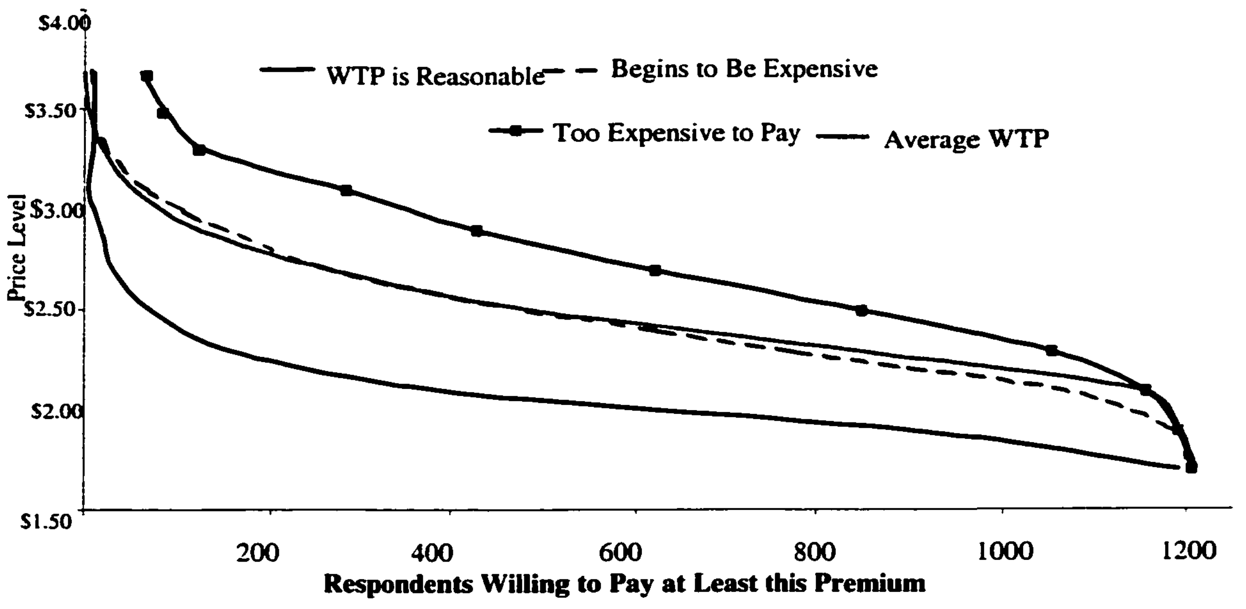

Figure 6.5: WTP Curves for Natural Ground Beef

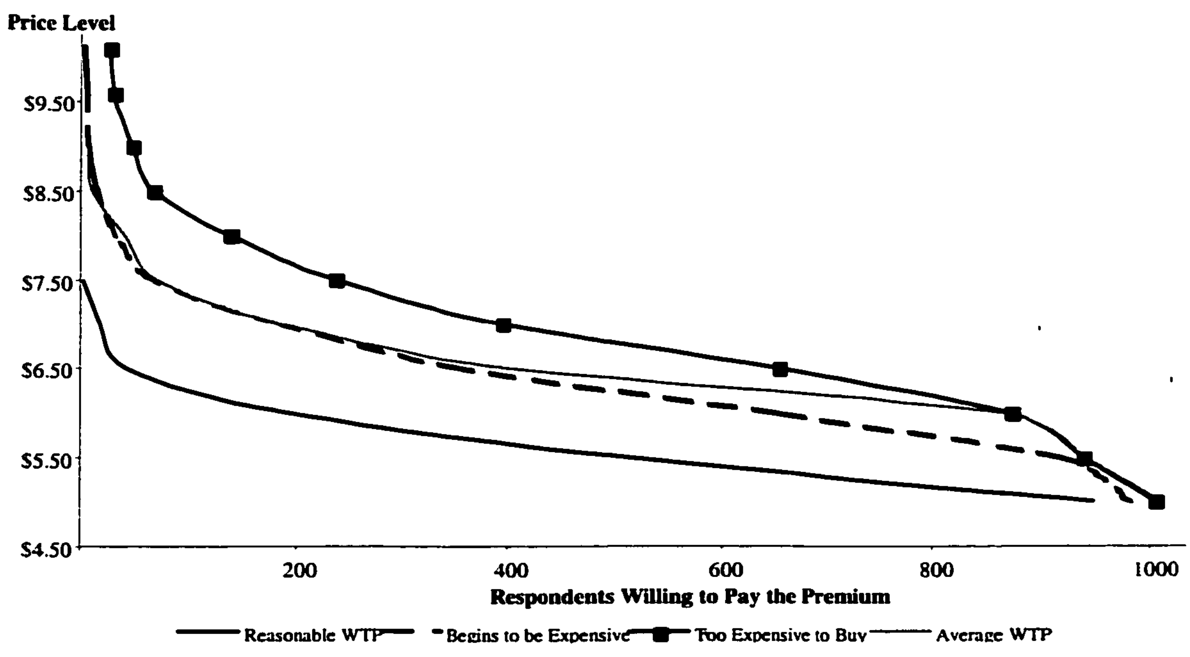

Figure 6.6: WTP Curves for Natural Steak

data that correspond to the premium values from the payment card, is completed in LIMDEP using the GROUPED DATA procedure.

The truncated-censored model is similar to a TOBIT model, except the data are censored throughout their values not just at the endpoints (Greene, 1998). This model is especially useful for payment card responses, since the available responses are censored to limit the respondent's choices to a manageable set. The probability that y_i falls between the upper and lower thresholds can be written as:

$$\Pr(Y_i \subseteq (t_{li}, t_{ui})) = \Pr\left(\left(\log t_{li} - x_i'\beta\right)/\sigma\right) < z_i < \left(\left(\log t_{ui} - x_i'\beta\right)/\sigma\right) \qquad 6.1$$

where z_i is a standard normal random variable (Cameron and Huppert, 1989). This can be rewritten as the difference between two standard normal cumulative densities. Then the log-likelihood function can be written with the unknown parameters β and σ implicit in the upper and lower bounds: z_{ui} and z_{li}.

$$\log L = \sum_{i=1}^{n} \log[\Phi(z_{ui}) - \Phi(z_{li})] \qquad 6.2$$

In this data set, respondents checked values as seen in the sample charts above (Figure 6.2). The results were recorded as 0 (not willing to pay any premium), 1, 2, …, 11 and these limits were defined prior to the estimation. This differs from an ordered probit specification, where the limits would be determined within the estimation, but σ would be set to 1. In the truncated-censored model, σ is estimated, but the limits are provided for the estimation. Another difference from the ordered probit model is that the dependent variable must begin with a non-zero value ($y = 1, 2, \ldots, 12$). To accommodate this requirement, the data are recoded so that the values correspond to the dollar values from the payment card. The lowest value y takes on for ground beef is \$1.69 and for steak, $4.99. The dollar values from the payment card are used as the limit values in the estimation (instead of 1, 2,.., 11). The results are compared for DOLGB2 (STKDOL2) and AVGBDOL (AVSTKDOL) and the issue of sensitivity is considered by comparing the differing significance of variables and fit in the two models.

The variables included in the models are defined in Table 6.1. The data set from the NFO contained demographic information that was collected prior to this survey and matched to our sample by the NFO. Two groups were over sampled, Hispanic households and rural residents. This was done to investigate the potential market for pork products sold to Hispanic households through meat shops and demand for sides of beef in rural areas. Neither a variable accounting for urban residency nor a variable representing Hispanic households had any significant predictive power in these models and were, therefore, excluded[6]. Other variables included are past shopping behavior and ratings of the respondent's concern about various production characteristics. Shopping behavior is included to investigate the relationship between store choice and WTP for individual natural beef products.

Results

The models of willingness to pay for steak seem to describe the ordinal WTP responses well, but the results of the ground beef equations are not as robust (results in Table 6.2). However, this indicates that these may be two distinct markets, with differing WTP premiums based on the underlying characteristics of their target markets. In the averaged WTP model for ground beef, incomes higher than $30,000 are significant and

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[6] This would also suggest that oversampling of these populations is not overly problematic, although it is non-optimal.

positive, but are insignificant in the observed (DOLGB2) model. In both ground beef equations, *most* shopping direct from a producer is negatively related to the dependent variable. In the DOLGB2 equation, most shopping at a natural food store is positively related to WTP and marginally insignificant in the AVGBDOL equation. Finally, past purchases of natural beef are positively related to a willingness to pay a premium for natural ground beef.

In the steak equations, past purchases of natural beef and incomes higher than $30,000 are both positively related to the WTP for natural steak. In both equations, older respondents and parents have a negative relationship to WTP for natural steak. A higher rating for *aged* beef is associated positively with paying a premium for natural steak, and *no use of antibiotics* is positively related to WTP in the AVGSTKDOL equation. In both equations *most* shopping at a natural food store is positively related to WTP for natural steak, and *some* shopping at a natural food store is significant in the averaged WTP equation. Finally, *most* meat shopping at a meat shop is positively related to paying a premium for natural steak in the STKDOL2 equation.

For each product the coefficient estimates are similar, and significance is only marginally affected when the averaged mean values are used as the dependent variable. When investigating average predicted WTP values, both dependent variables under-predict the average WTP collected in the three tier-payment card for ground beef, while for steak the predicted WTP values are larger than the observed values. These predicted WTP values are the averages of the predicted WTP values calculated in the model estimation retrieved from the truncated-censored procedure, and not calculated from the significant variables. The predicted WTP values for both ground beef and steak are not significantly different from each other.

While the ground beef equation did not seem to be well defined by the variables used here, the steak equations do seem to be described by the included demographic information and past meat shopping behavior. This difference may indicate that there is a difference in the potential target markets for these two products, and this difference is investigated in the next section. This investigation demonstrates that the second tier responses can be interpreted as the mean WTP for these products, while sacrificing only a little of the information collected from the three-tier payment card method. The truncated-censored model provides an option for estimating payment card data. The collection process used here for WTP values has shown to be an effective and relatively easy way for respondents to provide accurate WTP valuations of new products.

Table 6.1: Variable Descriptions and Means/Share

Variable	Mean/Share	Variable Description
		Demographics
YSINGLE	5.26%	Young Single, <35 (no children)
MSINGLE	12.26%	Middle Single, 35-65
OSINGLE	9.34%	Old Single, >65 (no children at home)
YPARENT	14.53%	Young Parent, <45, child <6
MPARENT	11.24%	Middle Parent, <45, child >6
OPARENT	12.99%	Older Parent, >45, any child
YCOUPLE	6.79%	Young Couple, <45, no children
WRKOCPL	13.21%	Working Old Couple, >45, no children
RETOCPL	11.75%	Retired Old couple, no children
HHSZ5CAT	2.385	Household size (1-5)
INC2	23.21%	$15,000-$30,000 annual income
INC3	25.77%	$30,000 - 50,000 annual income
INC4	19.34%	$50,000 - 75,000 annual income
INC5	16.13%	Greater than $75,000 annual income
AGE9CAT	4.67	Average age of respondent (1-9)
FEMEDU	3.76	Average education level (3= college, 4=graduate)
		Revealed Preference for Meat
DNBFYES	16.93%	One if bought natural beef in the past
FRQBF	3.162	Average beef meals eaten at home
		Attribute Ratings
AGED	2.993	Meat aged at least 14 days
GRASSFED	2.944	Grass Fed
LOCAL	2.399	Animal born and raised within 250 miles
PENS	3.039	No small or crowded pens
ANTIBIOT	3.393	No use of antibiotics
HORMONES	3.727	No use of growth hormones
STREAMS	3.374	Grazing managed to preserve streams
ENDANG	3.205	Grazing managed to protect endangered species
		Past Shopping Information
SMKT1	87.88%	Most meat shopping at a supermarket
NAT1	1.17%	Most meat shopping at a natural foods store
NAT2	5.99%	Some meat shopping at a natural foods store
SHOP1	1.82%	Most meat shopping at a meat shop
SHOP2	14.31%	Some meat shopping at a meat shop
PROD1	4.82%	Most meat purchased direct from a producer
PROD2	6.06%	Some meat purchased direct from a producer

Table 6.2: Results of GROUPED DATA Estimates for Ground Beef

Variable	DOLGB2				AVGBDOL		
	Coefficient	T-ratio	P-value		Coefficient	T-ratio	P-value
Constant	1.6910*	968.735	0.000		1.6898*	1025.990	0.000
YSINGLE	0.0007	0.673	0.501		0.0003	0.337	0.736
MSINGLE	0.0005	0.526	0.599		-0.0003	-0.292	0.770
OSINGLE	0.0009	0.856	0.392		0.0006	0.586	0.558
YPARENT	0.0012	0.979	0.327		0.0008	0.654	0.513
MPARENT	0.0007	0.609	0.542		0.0004	0.364	0.716
OPARENT	0.0014	1.307	0.191		0.0008	0.728	0.466
YCOUPLE	0.0003	0.252	0.801		-0.0006	-0.528	0.598
WRKOCPL	-0.0002	-0.224	0.822		-0.0006	-0.576	0.565
RETOCPL	0.0006	0.633	0.527		-0.0002	-0.166	0.869
DNBFYES	0.0012*	3.151	0.002		0.0009*	2.484	0.013
HHSZ5CAT	-0.0003	-1.438	0.150		-0.0003	-1.278	0.201
INC2	-0.0004	-0.812	0.417		0.0001	0.128	0.898
INC3	0.0005	0.993	0.321		0.0010*	2.198	0.028
INC4	0.0002	0.317	0.751		0.0008*	1.671	0.095
INC5	0.0005	0.923	0.356		0.0010*	1.894	0.058
FRQBF	0.0000	-0.062	0.950		0.0000	-0.287	0.774
AGED	0.0000	-0.099	0.921		0.0000	0.342	0.732
GRASSFED	0.0001	0.527	0.598		0.0000	0.365	0.715
LOCAL	-0.0001	-1.011	0.312		-0.0001	-0.683	0.494
PENS	0.0004*	2.647	0.008		0.0002	1.499	0.134
ANTIBIOT	0.0002	1.542	0.123		0.0002	1.549	0.121
HORMONES	0.0002	1.045	0.296		0.0001	0.526	0.599
STREAMS	-0.0001	-0.588	0.556		0.0001	0.595	0.552
ENDANG	0.0001	0.649	0.516		0.0002	1.260	0.208
AGE9CAT	-0.0001	-0.835	0.404		-0.0001	-0.732	0.464
FEMEDU	0.0000	0.431	0.667		0.0000	0.282	0.778
SMKT1	0.0002	0.379	0.704		0.0003	0.521	0.602
NAT1	0.0028*	2.038	0.042		0.0020	1.547	0.122
NAT2	0.0008	1.387	0.165		0.0008	1.344	0.179
SHOP1	-0.0003	-0.299	0.765		-0.0004	-0.407	0.684
SHOP2	-0.0003	-0.886	0.376		-0.0003	-0.763	0.445
PROD1	-0.0023*	-2.672	0.008		-0.0015*	-1.842	0.065
PROD2	-0.0006	-1.026	0.305		-0.0005	-0.848	0.396
SIGMA	0.0039*	36.256	0.000		0.0036*	31.849	0.000
	Average WTP DOLGB2:		$2.28		Average WTP (DOLGB1+DOLGB3)/2:		$2.24
	Average Predicted WTP DOLGB2		$1. 69		Average Predicted WTP AVGBDOL		$1.69

Predicted WTP are not statistically different from each other, though observed values are.
* indicate significance at the 10% level

Table 6.3: Results of GROUPED DATA Estimates for Steak

Variable	DOLSTK2				AVSTKDOL		
	Coefficient	T-ratio	P-value		Coefficient	T-ratio	P-value
Constant	6.234*	41.366	0.000		6.275*	43.061	0.000
YSINGLE	0.029	0.320	0.749		0.039	0.443	0.658
MSINGLE	-0.078	-0.946	0.344		-0.105	-1.314	0.189
OSINGLE	-0.220*	-2.540	0.011		-0.209*	-2.500	0.012
YPARENT	-0.167	-1.542	0.123		-0.147	-1.407	0.159
MPARENT	-0.245*	-2.360	0.018		-0.244*	-2.432	0.015
OPARENT	-0.219*	-2.303	0.021		-0.221*	-2.403	0.016
YCOUPLE	-0.172*	-1.676	0.094		-0.179*	-1.805	0.071
WRKOCPL	-0.219*	-2.438	0.015		-0.187*	-2.153	0.031
RETOCPL	-0.209*	-2.389	0.017		-0.208*	-2.455	0.014
DNBFYES	0.134*	4.084	0.000		0.136*	4.262	0.000
HHSZ5CAT	-0.018	-0.875	0.382		-0.022	-1.143	0.253
INC2	0.029	0.726	0.468		0.037	0.964	0.335
INC3	0.071*	1.751	0.080		0.070*	1.792	0.073
INC4	0.135*	3.081	0.002		0.126*	2.973	0.003
INC5	0.205*	4.348	0.000		0.200*	4.396	0.000
FRQBF	0.004	0.388	0.698		0.007	0.745	0.456
AGED	0.022*	2.216	0.027		0.017*	1.753	0.080
GRASSFED	0.017	1.478	0.139		0.009	0.821	0.412
LOCAL	-0.012	-1.128	0.259		-0.007	-0.716	0.474
PENS	0.000	-0.032	0.975		-0.004	-0.320	0.749
ANTIBIOT	0.018	1.415	0.157		0.021*	1.706	0.088
HORMONES	0.007	0.481	0.631		0.005	0.352	0.725
STREAMS	-0.007	-0.461	0.645		-0.007	-0.486	0.627
ENDANG	0.018	1.316	0.188		0.020	1.536	0.124
AGE9CAT	-0.019*	-1.730	0.084		-0.022*	-2.045	0.041
FEMEDU	-0.008	-1.434	0.152		-0.006	-1.156	0.248
SMKT1	0.031	0.573	0.567		0.011	0.218	0.827
NAT1	0.287*	2.412	0.016		0.308*	2.678	0.007
NAT2	0.081	1.596	0.111		0.096	1.940	0.052
SHOP1	0.056	0.574	0.566		0.107	1.136	0.256
SHOP2	0.056*	1.665	0.096		0.041	1.277	0.202
PROD1	-0.102	-1.375	0.169		-0.097	-1.344	0.179
PROD2	-0.020	-0.411	0.681		-0.029	-0.598	0.550
SIGMA	0.396*	46.845	0.000		0.381*	46.120	0.000
	Average WTP DOLSTK2:		$5.81		Average WTP (DOLSTK1+DOLSTK3)/2:		$5.76
	Average Predicted WTP STKGB2		$6.26		Average Predicted WTP AVSTKDOL		$6.26

Predicted WTP are not statistically different from each other, though observed values are. * indicate significance at the 10% level

Logit Clustering Technique to Develop Target Market Segments

While the results of the previous section focus on the appropriate estimation procedure for a three-tiered payment card, there is a need to focus the results in a way that allows one to develop a target market for the new product. The use of data mining procedures to develop descriptions of target market groups is well documented (Katsaras, et al., 2001). However, this method is not often applied by economists because of its basis in purely statistical relationships, without the guiding hand of the *ceteris parabus* precept. Unfortunately, this often limits the practical application of many otherwise valid econometric studies. In the previous section, it was demonstrated that WTP for steak was related to the included demographic information, though WTP for ground beef was only significantly related to income levels of the respondents. However, this information is only a starting point when promotion and marketing materials need to be developed for a new product. To further describe the potential consumers for natural beef, a further investigation of predicted market segments suggested by the results of their WTP responses is presented here. The dependent variable is the respondent's WTP at least a 10 percent premium for natural beef (steak and ground beef) and target segments are developed from those predictions.

In his 2001 thesis, John McKenzie developed a method for creating market segments from the results of a logit model. Many CV studies end with an estimation of a mean or median WTP as their conclusions. McKenzie's logit clustering technique provides another tool to address the issues of new product placement and to target the most easily reached potential customers. McKenzie's method is simple, and adds two additional steps once a logit estimation of the probability of purchasing the product in question is completed.

In the first step, the logit model is computed and the predicted probabilities are saved. Then these predicted probabilities are used to form market segments. The market segments (in this case, quintiles) are created according to the predicted probability of purchase from the logit model. The logit model predicts the log of the odds ratio, and probability values above .50 are assigned a 1 and probabilities below .50 are assigned a 0. A predicted probability of WTP of less than 20 percent is interpreted in McKenzie's method as indicating that the respondent is quite unlikely to pay the premium. However, a predicted probability greater than 80 percent indicates the respondent is a likely consumer. These probabilities are used to form quintiles based on the predicted probability calculated in the logit model. Then in the third step, the means of the descriptive variables in the equation are compared to the sample mean as is done in the analysis of target markets in a cluster analysis.

This method of modeling target segments is completed for a logit model with the dependent variables BUYGB and BUYSTK. Both dependent variables are a 1 if the respondent would pay at least a 10 percent premium for the natural beef products. The descriptive variables are the same list as those included in truncated-censored analysis, and include those demographic, shopping behavior and production characteristics ratings that are believed to be important in describing both the magnitude and probability of purchasing natural beef at a premium. The results of the logit estimation are contained in

Table 6.4 and the corresponding market segment descriptions are in Table 6.5. Figures 6.7 through 6.15 are graphical representations of the numerical values from Table 6.5[7].

As can be seen, this model of WTP is not as effective as the truncated-censored model, which incorporates both the censored nature of the payment card and the increasing premium levels. The steak model outperforms the ground beef model when significant variables are considered. For both steak and ground beef, at least 67 percent of the probabilities are predicted correctly

Significant variables in the ground beef equation are incomes over $30,000, which is also positively related to the probability of purchasing natural steak. Doing *most* meat shopping at a supermarket, and *some* at a natural food store are also significant and both contribute positively to the probability of purchasing natural ground beef. Each of these significant variables has magnitudes of 10 percent or higher, with *some* natural store shopping exhibiting the highest effect at 14.8 percent.

In the steak equation, shopping some of the time at a natural food store increased the probability of paying the premium by 16 percent, but respondents purchasing some meat direct from a producer are less likely (by 10 percent) to buy the natural steak at a premium. Incomes greater than $15,000 and past purchases of natural beef also contributed positively to the probability of purchasing natural steak. Respondents in the highest income category were 33 percent more likely to pay 10 percent premium than if they were in one of the other income categories, while respondents in the other categories were 13, 18 and 30 percent more likely to pay the premium than if they fell in the other categories. Older respondents, whether single or retired, were less likely to purchase

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[7] The first quintile for ground beef is excluded, since no probabilities under 20 percent are predicted.

Table 6.4: Results of the Logit Estimation

Variable	BUYGB				BUYSTK			
	Coefficient	T-ratio	P-value	Marginal Effects	Coefficient	T-ratio	P-value	Marginal Effects
CONSTANT	-1.052	-1.356	0.175	-0.229	-1.418*	-1.795	0.073	-0.329
YSINGLE	0.650	1.362	0.173	0.141	0.343	0.740	0.459	0.080
MSINGLE	0.187	0.446	0.655	0.041	-0.673	-1.596	0.110	-0.156
OSINGLE	0.429	0.976	0.329	0.093	-0.952*	-2.083	0.037	-0.221
YPARENT	0.585	1.045	0.296	0.127	-0.169	-0.306	0.759	-0.039
MPARENT	0.447	0.835	0.404	0.097	-0.689	-1.301	0.193	-0.160
OPARENT	0.589	1.206	0.228	0.128	-0.446	-0.921	0.357	-0.103
YCOUPLE	0.057	0.108	0.914	0.012	-0.493	-0.941	0.346	-0.114
WRKOCPL	0.160	0.350	0.727	0.035	-0.791*	-1.725	0.084	-0.183
RETOCPL	0.272	0.609	0.543	0.059	-0.973*	-2.164	0.030	-0.226
DNBFYES	0.258	1.426	0.154	0.056	0.451*	2.706	0.007	0.105
HHSZ5CAT	-0.131	-1.224	0.221	-0.029	-0.133	-1.296	0.195	-0.031
INC2	0.094	0.477	0.634	0.021	0.588*	2.591	0.010	0.136
INC3	0.447*	2.150	0.032	0.097	0.806*	3.487	0.000	0.187
INC4	0.483*	2.131	0.033	0.105	1.271*	5.179	0.000	0.295
INC5	0.634*	2.584	0.010	0.138	1.451*	5.570	0.000	0.337
FRQBF	-0.014	-0.279	0.780	-0.003	-0.023	-0.463	0.643	-0.005
AGED	0.035	0.658	0.510	0.008	0.025	0.471	0.637	0.006
GRASSFED	0.011	0.194	0.846	0.002	-0.020	-0.331	0.741	-0.005
LOCAL	-0.033	-0.603	0.547	-0.007	0.044	0.790	0.429	0.010
PENS	0.094	1.526	0.127	0.021	0.078	1.234	0.217	0.018
ANTIBIOT	0.053	0.815	0.415	0.012	0.088	1.302	0.193	0.020
HORMONES	0.017	0.243	0.808	0.004	-0.052	-0.711	0.477	-0.012
STREAMS	0.118	1.551	0.121	0.026	0.109	1.386	0.166	0.025
ENDANG	0.044	0.617	0.537	0.010	0.079	1.092	0.275	0.018
AGE9CAT	-0.073	-1.303	0.193	-0.016	-0.056	-0.997	0.319	-0.013
FEMEDU	0.041	1.467	0.142	0.009	0.006	0.196	0.845	0.001
SMKT1	0.512*	1.866	0.062	0.111	0.071	0.257	0.797	0.016
NAT1	1.089	1.337	0.181	0.237	0.407	0.652	0.514	0.094
NAT2	0.678*	2.169	0.030	0.148	0.703*	2.653	0.008	0.163
SHOP1	0.014	0.029	0.977	0.003	0.386	0.783	0.434	0.089
SHOP2	-0.042	-0.235	0.814	-0.009	0.127	0.743	0.457	0.030
PROD1	-0.185	-0.497	0.619	-0.040	-0.510	-1.305	0.192	-0.118
PROD2	-0.205	-0.811	0.417	-0.045	-0.450*	-1.736	0.082	-0.104
	Percent Predicted Correctly: 68.97%				Percent Predicted Correctly: 67.45%			

Table 6.5: Predicted Market Segments (Shading Indicates Significance)

STEAK						
Variable	**Whole Sample Mean/SHARE**	**0-20%**	**20-40%**	**40-60%**	**60-80%**	**80-100%**
YSINGLE	5.26%	0.00%	2.11%	6.32%	20.7%	21.74%
MSINGLE	12.26%	17.13%	16.34%	7.73%	3.7%	0.00%
OSINGLE	9.34%	**38.43%**	**7.21%**	**0.94%**	**0.0%**	**0.00%**
YPARENT	14.53%	1.85%	10.54%	22.48%	24.4%	26.09%
MPARENT	11.24%	9.26%	13.71%	10.77%	6.7%	4.35%
OPARENT	12.99%	5.56%	14.06%	17.10%	9.6%	0.00%
YCOUPLE	6.79%	1.39%	4.57%	9.13%	14.1%	26.09%
WRKOCPL	13.21%	**8.33%**	**13.71%**	**15.93%**	**11.9%**	**4.35%**
RETOCPL	11.75%	**17.59%**	**16.52%**	**6.79%**	**0.0%**	**0.00%**
DNBFYES	16.93%	**2.78%**	**8.44%**	**22.48%**	**46.67%**	**82.61%**
HHSZ5CAT	2.385	1.694	2.424	2.700	2.348	2.304
INC2	23.21%	**22.22%**	**32.69%**	**16.39%**	**9.63%**	**4.35%**
INC3	25.77%	**12.96%**	**33.57%**	**25.29%**	**16.30%**	**17.39%**
INC4	19.34%	**2.31%**	**12.48%**	**32.08%**	**33.33%**	**30.43%**
INC5	16.13%	**0.00%**	**9.31%**	**24.12%**	**40.00%**	**47.83%**
FRQBF	3.162	3.426	3.323	3.005	2.667	2.522
AGED	2.993	2.833	2.933	3.066	3.156	3.696
GRASSFED	2.944	2.347	2.953	3.080	3.319	3.609
LOCAL	2.399	2.157	2.316	2.501	2.719	2.913
PENS	3.039	2.130	2.946	3.351	3.756	3.870
ANTIBIOT	3.393	2.583	3.302	3.635	4.178	4.174
HORMONES	3.727	2.972	3.649	3.981	4.326	4.522
STREAMS	3.374	2.227	3.299	3.738	4.207	4.391
ENDANG	3.205	2.051	3.058	3.621	4.178	4.261
AGE9CAT	4.67	6.46	4.76	3.83	4.16	4.35
FEMEDU	3.76	3.50	3.83	3.80	3.85	3.39
SMKT1	87.88%	88.89%	89.10%	88.99%	78.52%	82.61%
NAT1	1.17%	0.00%	0.18%	0.23%	9.63%	4.35%
NAT2	5.99%	**0.93%**	**0.53%**	**8.20%**	**15.56%**	**91.30%**
SHOP1	1.82%	0.46%	1.23%	1.87%	6.67%	0.00%
SHOP2	14.31%	7.41%	11.07%	18.97%	22.22%	26.09%
PROD1	4.82%	9.26%	5.27%	3.28%	0.74%	4.35%
PROD2	6.06%	**6.94%**	**7.73%**	**4.45%**	**3.70%**	**0.00%**

Table 6.5 (Continued): Predicted Market Segments (Shading Indicates Significance)

GROUNDBEEF						
Variable	**Whole Sample Mean/SHARE**	**0-20%**	**20-40%**	**40-60%**	**60-80%**	**80-100%**
YSINGLE	5.26%	0	0.00%	3.10%	5.2%	11.05%
MSINGLE	12.26%	0	18.75%	21.98%	10.0%	2.91%
OSINGLE	9.34%	0	31.25%	14.24%	7.6%	2.33%
YPARENT	14.53%	0	2.08%	8.05%	16.0%	23.26%
MPARENT	11.24%	0	4.17%	8.98%	12.5%	11.63%
OPARENT	12.99%	0	2.08%	7.43%	15.1%	16.28%
YCOUPLE	6.79%	0	6.25%	7.43%	6.3%	8.14%
WRKOCPL	13.21%	0	16.67%	12.38%	13.5%	12.21%
RETOCPL	11.75%	0	16.67%	12.07%	11.7%	9.88%
DNBFYES	16.93%	0	6.25%	7.74%	14.15%	50.58%
HHSZ5CAT	2.385	0	1.688	2.093	2.505	2.552
INC2	23.21%	0	29.17%	32.51%	22.01%	9.88%
INC3	25.77%	0	6.25%	18.89%	28.90%	29.07%
INC4	19.34%	0	6.25%	13.00%	21.16%	26.16%
INC5	16.13%	0	0.00%	10.53%	15.96%	31.98%
FRQBF	3.162	0	3.271	3.263	3.201	2.756
AGED	2.993	0	2.771	2.935	2.979	3.233
GRASSFED	2.944	0	0.938	2.307	3.179	3.570
LOCAL	2.399	0	2.208	2.365	2.408	2.471
PENS	3.039	0	0.521	2.149	3.322	4.052
ANTIBIOT	3.393	0	0.750	2.601	3.645	4.413
HORMONES	3.727	0	0.917	2.969	3.993	4.657
STREAMS	3.374	0	0.688	2.300	3.736	4.401
ENDANG	3.205	0	0.646	2.195	3.518	4.314
AGE9CAT	4.67	0	6.48	5.65	4.37	3.76
FEMEDU	3.76	0	3.02	3.35	3.84	4.40
SMKT1	87.88%	0	81.25%	78.95%	91.90%	87.21%
NAT1	1.17%	0	0.00%	0.00%	0.00%	9.30%
NAT2	5.99%	0	0.00%	0.62%	3.14%	31.40%
SHOP1	1.82%	0	0.00%	2.48%	1.93%	0.58%
SHOP2	14.31%	0	6.25%	13.62%	13.42%	22.09%
PROD1	4.82%	0	10.42%	11.46%	2.66%	1.16%
PROD2	6.06%	0	4.17%	7.12%	6.05%	4.65%

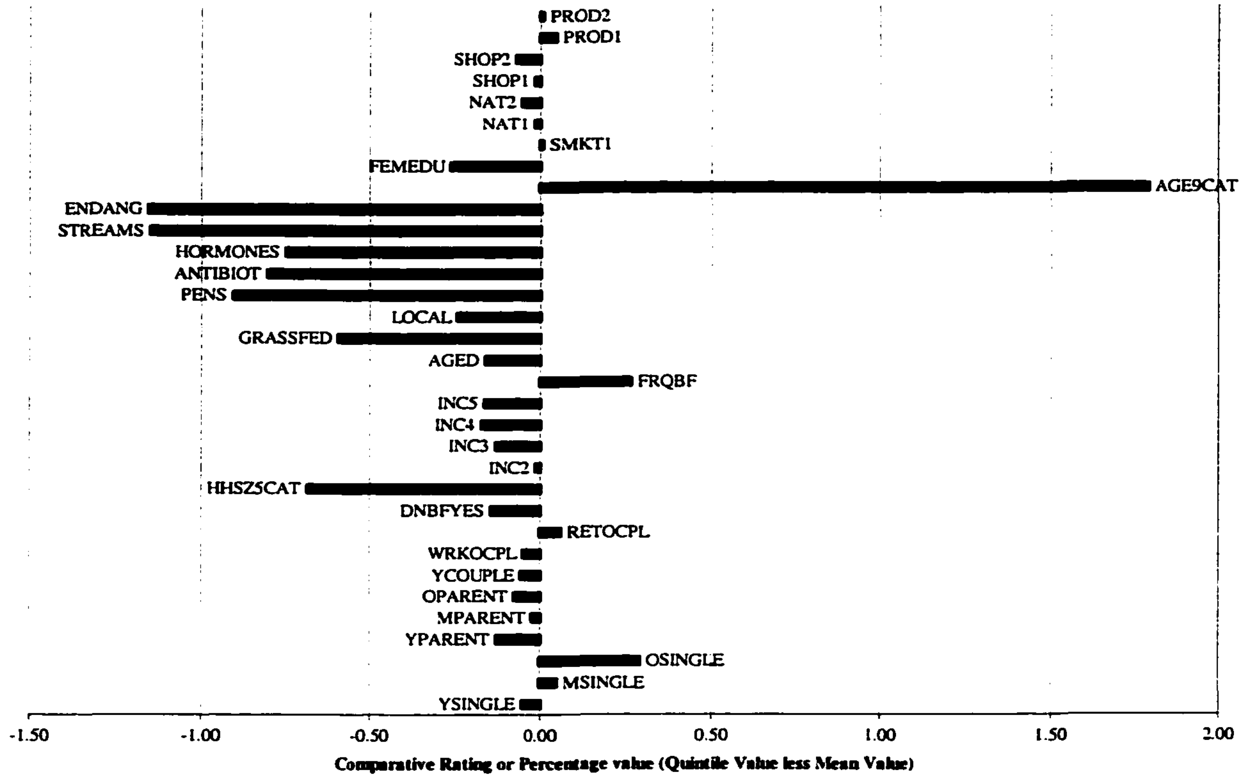

Figure 6.7: Quintile I for Steak: Comparative Quintile Values (n=216)

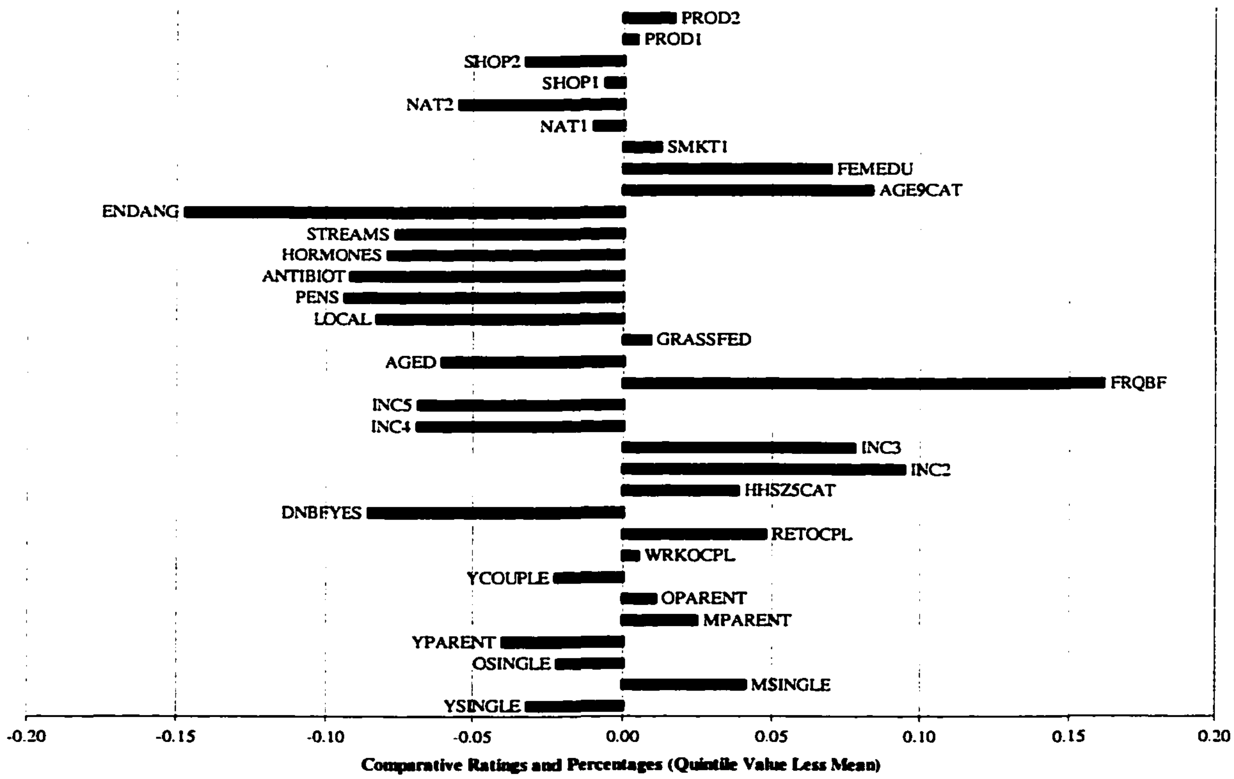

Figure 6.8: Quintile II for Steak: Comparative Quintile Value (n=569)

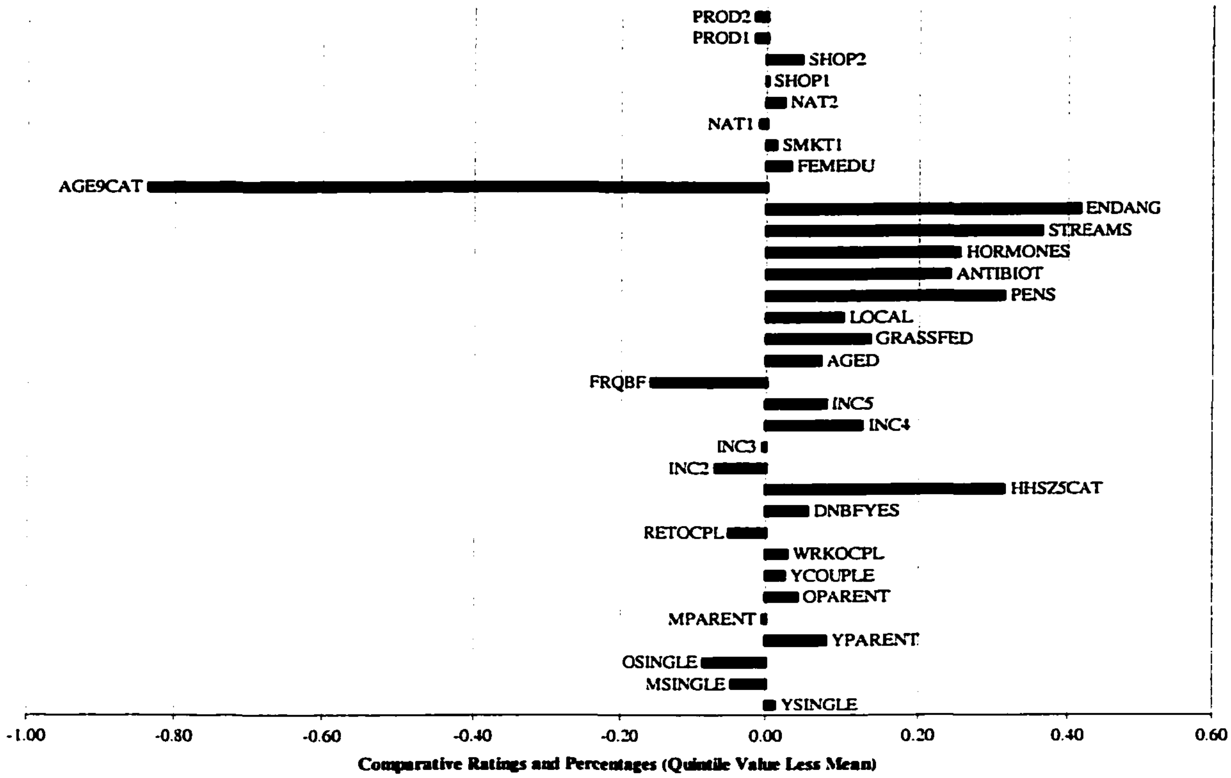

Figure 6.9: Quintile III for Steak: Comparative Quintile Values (n=427)

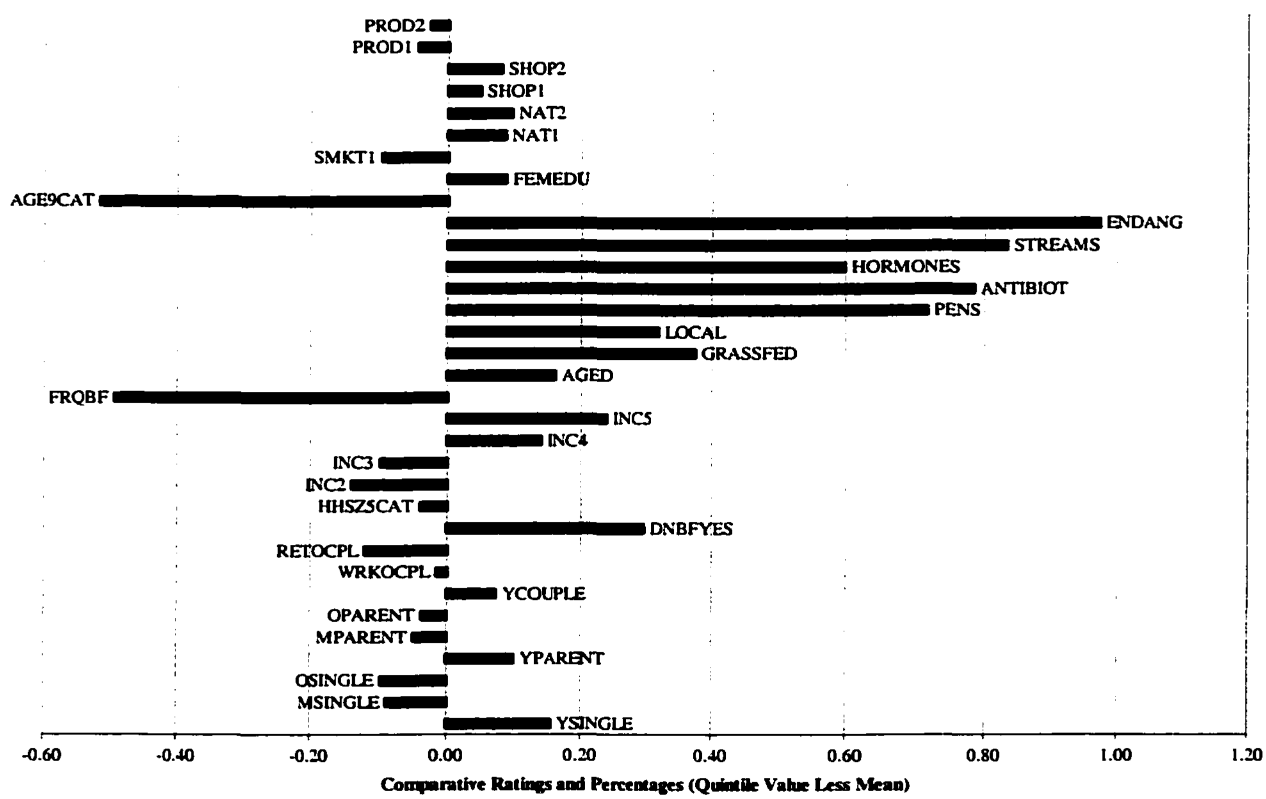

Figure 6.10: Quintile IV for Steak: Comparative Quintile Values (n=135)

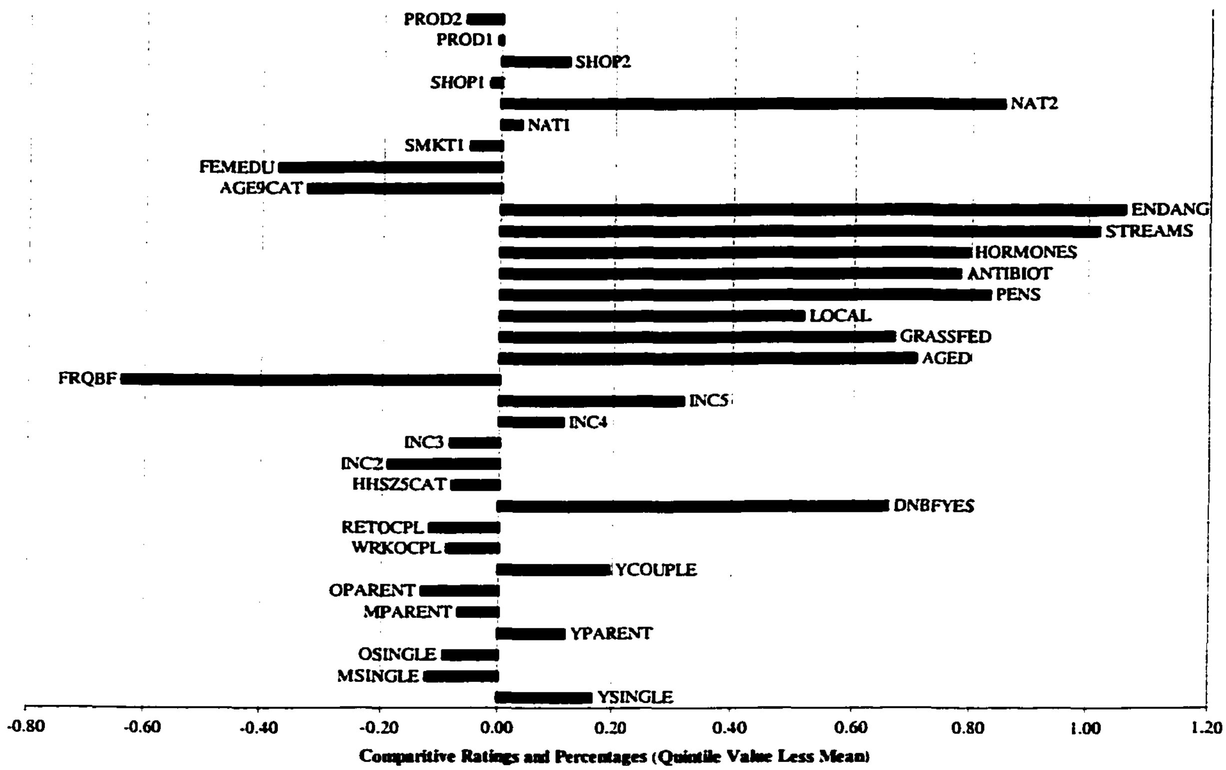

Figure 6.11: Quintile V for Steak: Comparative Quintile Values (n=23)

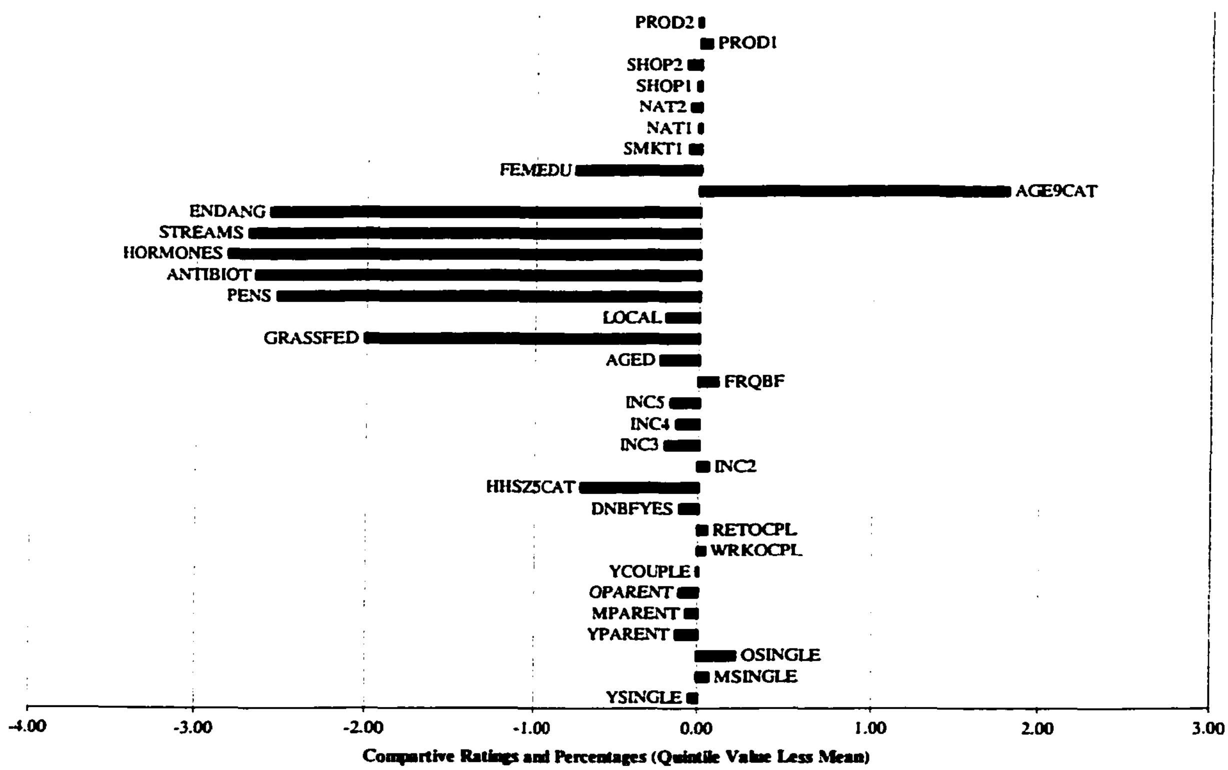

Figure 6.12: Quintile II for Ground Beef: Comparative Quintile Values (n=48)

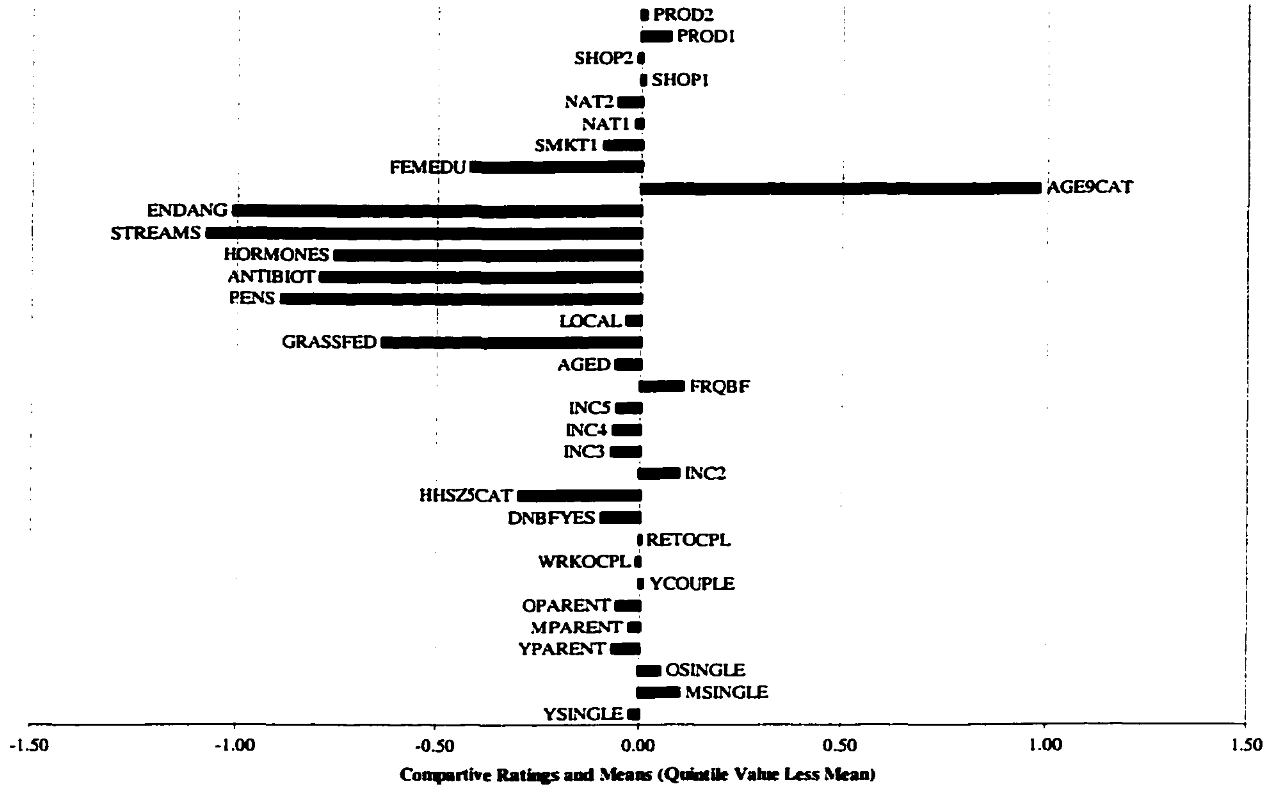

Figure 6.13: Quintile III for Ground Beef: Comparative Quintile Values (n=323)

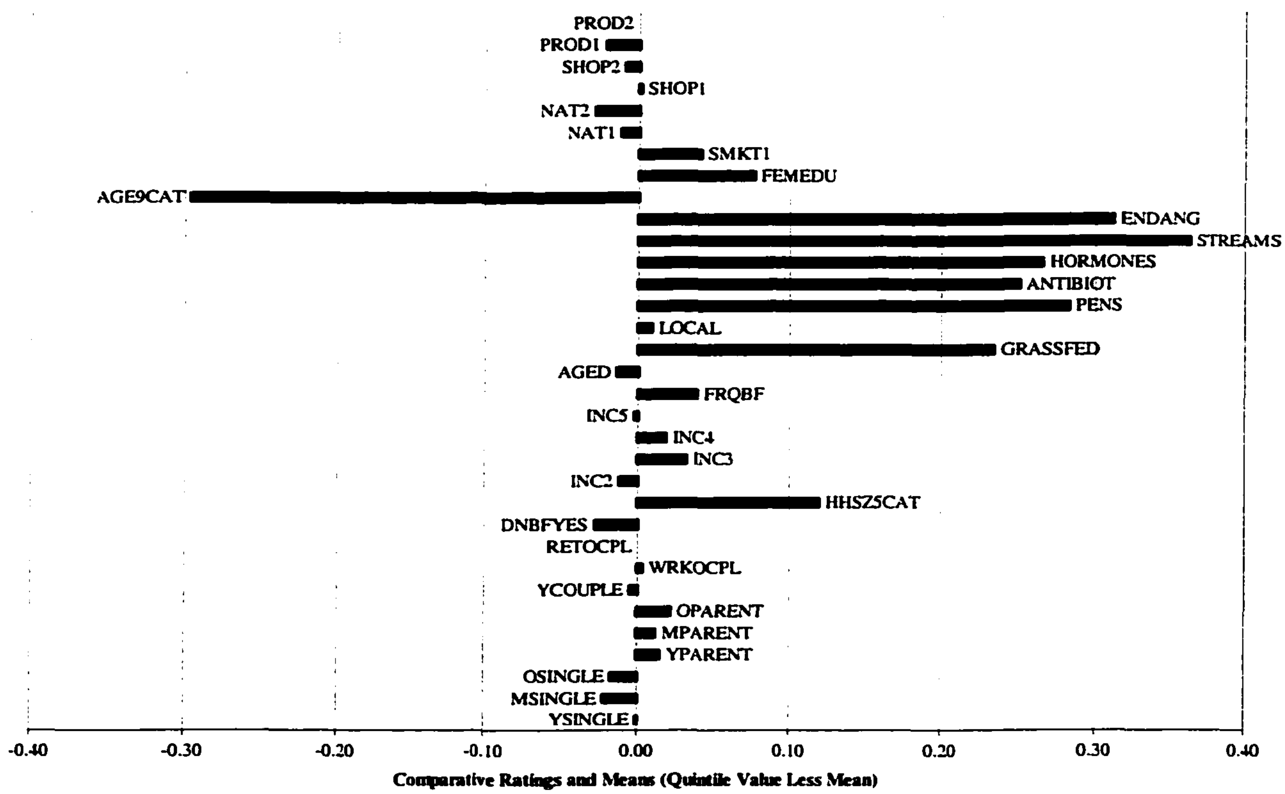

Figure 6.14: Quintile IV for Ground Beef: Comparative Quintile Values (n=827)

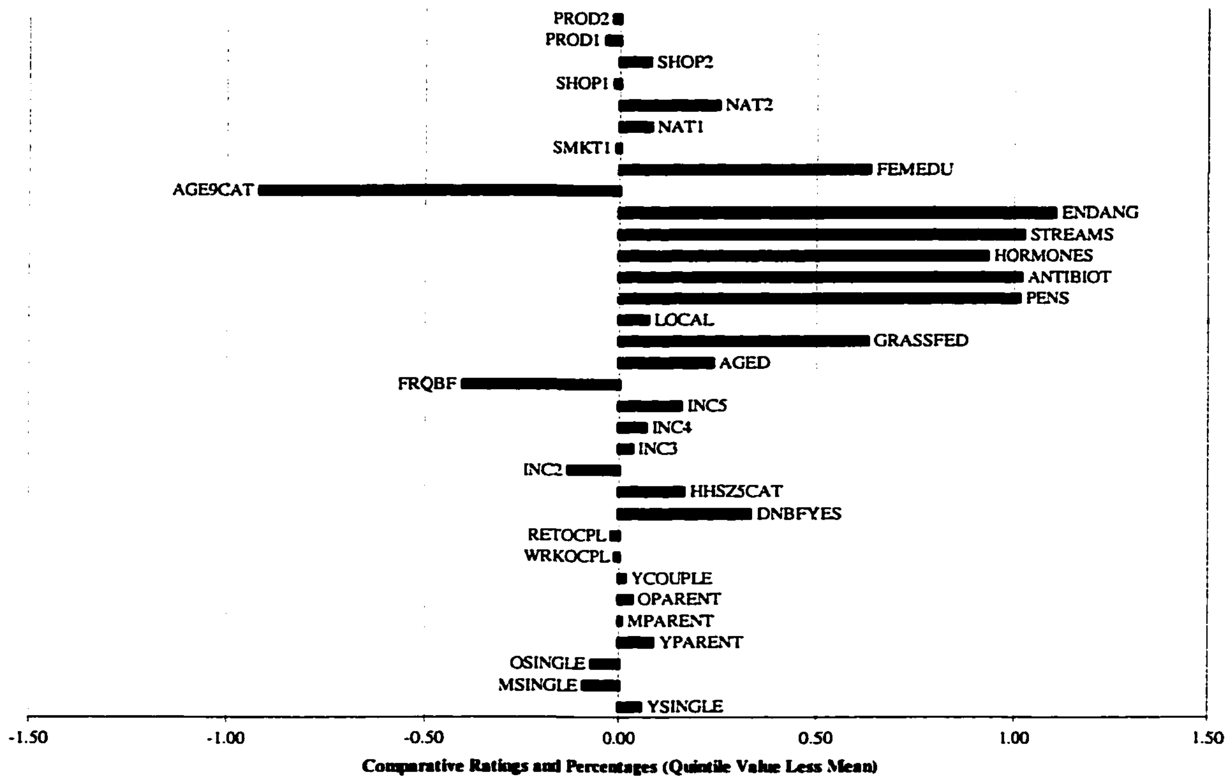

Figure 6.15: Quintile V for Ground Beef: Comparative Mean Values (n=172)

natural steak at a premium and membership in one of those demographic segments reduced the probability of paying the premium by at least 18 percent.

The next step is to develop the target markets. The target groups are presented numerically in Table 6.6 and the Figures 6.7 – 6.15 show the difference between the quintile value and the mean value for the whole sample. These comparative figures can be used to describe the target groups resulting from a cluster analysis (Katsaras, et al., 2001). The quintiles were created from the predicted probability estimated in the logit model. This was accomplished by sorting the data into probability categories (0-20, 20-40, 40-60, 60-80 and 80-100 percent), and calculating the mean of all the descriptive variables for each quintile. A normal cluster analysis would not, however, be able to show which variables are significant predictors in the probability of purchasing the product at a premium. This information, gleaned from the underlying logit estimation based upon the ceteris parabus assumption, can reduce the amount of total information that is needed to provide an accurate profile of likely consumers.

Respondents falling into quintile I for steak are older, eat beef more frequently, have smaller household sizes and rate all attributes lower than the entire sample. People falling into quintile II for steak, have no differences larger than .20 (20 percent for dummy variables) from the mean of the sample, but do eat beef more frequently, have incomes less than $50,000 more often and rated all production attributes lower than the entire sample. In quintile III respondents are younger, have larger households, more frequently have incomes greater than $50,000, and rated all production attributes higher than the entire sample. Respondents falling into quintiles IV and V rated all attributes higher than the mean and the production attribute ratings increased over the mean by .25 from quintile IV to V. Natural beef consumption and some shopping at a natural food store were also higher shares for quintiles IV and V than the mean.

Quintiles II and III for ground beef both had respondents rating all production attributes lower than the mean and older respondents than the mean. In quintiles IV and V respondents rated all production attributes higher, and each quintile had younger respondents than the entire sample. Quintile IV had respondents eating beef more frequently than the mean, more respondents with incomes between $30,000 and $75,000, more highly educated women and larger households. In quintile V respondents ate beef less frequently at home, had larger households and had more respondents with incomes greater than $30,000 than the whole sample.

However, the underlying logit model shows that OSINGLE, WRKOCPL, RETOCPL, DNBFYES, INC2, INC3, INC4, INC5, NAT2, and PROD2 were the significant predictors of the probability of purchasing natural steak. These variables may be all that may be necessary to evaluate when describing the target market for steak. Table 6.6 describes the natural steak and ground beef quintiles concentrating only on the significant variables. The table shows that more respondents have incomes higher than $50,000 in quintiles IV and V for steak, and are more likely to do some of their meat shopping at a natural food store (by 85% over the mean). The information from this chart can be used to develop the marketing campaign since the underlying logit model shows that these variables are significant predictors of the probability of purchasing these natural beef products at a premium.

Examining the results of a logit model in this way provides an opportunity to describe not only the probability of a respondent purchasing the new product, but also a predicted profile of those respondents. In this case, the analysis has concentrated only on the significant variables from the logit equations, but the entire panel of estimated probabilities can be used to describe the market for the new product. Cluster analysis is often presented as a way to parse data for retailers so that they may quickly understand the important key demographics or concerns of their respondents, and this approach provides the same information (Katsaras, et. al, 2001). In addition, one can concentrate on the significant variables based on the statistical relationship developed from the logit model. It seems that income characteristics and store preferences may be the most important descriptors of consumers of natural ground beef, while age can be added to

Table 6.6: Significant Variables Compared to Means by Quintiles

Steak Significant Variables Compared to Means					
Variables	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
OSINGLE	+29%	-2%	-8%	-9%	-9%
WRKOCPL	-5%	+0%	+3%	-1%	-9%
RETOCPL	+6%	+5%	-5%	-2%	-2%
DNBFYES	-0.14	-0.08	+0.06	+0.30	+0.66
INC2	-1%	+9%	-7%	-14%	-19%
INC3	-13%	+8%	+0%	-9%	-8%
INC4	-17%	-7%	+13%	14%	+11%
INC5	-16%	-7%	+8%	+24%	+32%
NAT2	-5%	-5%	+2%	+10%	+85%
PROD2	+1%	+2%	-2%	-2%	-6%

Ground Beef Significant Variables Compared to Means					
Variables	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
INC3	0	-19%	-7%	3%	3.%
INC4	0	-13%	-6%	2%	7%
INC5	0	-16%	-6%	0%	16%
SMKT1	0	-7%	-9%	4%	-1%
NAT2	0	-6%	-5%	-3%	25%

income and store preference to describe consumers of natural steak. The importance of shopping behavior is a challenge, since retailers already know they must compete with a shop choice specifically geared to those individuals most interested in natural foods. However, these findings together with the other analyses in this thesis could provide the underpinnings of a marketing strategy by other retailers that hope to retain business while facing increased competition from alternative markets.

This analysis has investigated two questions raised by the data set. First, the question of the simplest way to deal with the results of the three-tiered payment card suggested that a truncated-censored model estimated using the GROUPED DATA procedure provides enough information to describe the value of demographic information, shopping preferences and concern about production characteristics. The second section presented an alternative to cluster analysis to address the empirical question of creating a target market. It uses the results of logit estimation and produces market segments that can be interpreted analogously to the results of clustering techniques. These results show that, as expected, the higher the predicted probability, the higher the concern about production attributes and income, but only income proved significant in predicting the probability of purchasing natural ground beef. Aging was negatively correlated with purchasing natural steak, a result that is reinforced by the fact that older respondents are over-represented in the lower quintiles of the target markets. Overall, the results from this survey provide the opportunity to estimate a model of ordered WTP results and to describe the consumers who would pay those premiums.

CHAPTER VII
CONCLUSIONS AND MARKETING IMPLICATIONS

The objective of this research was to establish a model of consumer demand for retail stores, their products, and the interdependencies between product demand and store choice. Two empirical chapters tested a portion of the theoretical model and investigated the relationship between willingness to pay and a variety of descriptive characteristics. The complete and integrated discussion of findings on consumer demand for retail stores and natural meat is summarized here. The empirical information developed can be used to facilitate the development of relationships between producers and potential retailers. Marketing and promotion strategies appropriate to securing retail shelf space, as inferred from the graphical and econometric results are outlined in the Marketing Implications section. Further research suggestions and final remarks complete the conclusions chapter.

Research Conclusions

The theory developed in Chapter III provides a framework for the empirical analysis presented in Chapter V. The theoretical construct hypothesizes that consumers shop at multiple outlets when the products needed to complete their optimal product basket are not available at a single retail source (the supermarket). This occurs if the costs of shopping at an additional outlet do not outweigh the benefits of optimal product mix for each consumer. Additionally, the theory assumes that both the store itself and the food within the store are two independent, but interrelated products. The store is *purchased* when the decision is made to enter the store to make purchases, while the product is purchased directly, even though the choice of product is limited by the products carried within that particular store. Defining the store as a product, with the items on the shelf representing characteristics of the store (in addition to physical and service characteristics), allows demand theory to be applied to both the store and individual products. This innovation is important since no product can be purchased without frequenting a retail outlet. Securing shelf space in stores is a challenge to food producers, but stores are beginning to adopt diverse and unique product lines as consumers are lost to other food outlets and vendors (Lohr and Semali, 2000).

This study reports empirical tests of the role of underlying characteristics of meat products on the choice of store, or indirectly, the willingness of the consumers to travel to multiple outlets (the disutility concept) in Chapter V. Disutility is used in the theoretical model to demonstrate why a consumer would shop at multiple outlets. The disutility definition includes τ which is analogous to travel costs in a spatial industrial organization model, as it represents the cost to consumers of frequenting a variety of shops when one outlet does not provide the optimal product mix. For this particular market study, the majority of respondents did most of their meat shopping at supermarkets, and the alternate markets were frequented at least some of the time by 27 percent of respondents. If the costs of shopping at the other outlets outweigh the increase in realized utility, the alternate markets gain a share of the supermarket's business.

The empirical model for multiple outlet shopping behavior assumes that socio-demographic information, concern about beef production practices and past shopping behavior are important determinants of demand for a particular retail outlet. The inclusion of the ALTSHOP variable in the probit model for supermarket proxies for whether a consumer's survey responses indicates a pattern of shopping in multiple outlets. ALTSHOP's negative and significant relationship to the probability of shopping at a supermarket demonstrates that the cost of traveling to alternate markets is borne by the consumer. It can be inferred that as consumers were willing to bear the travel cost of visiting multiple markets, supermarkets were less likely to receive their business for meat purchases.

Chapter VI explores an additional area of importance for introducing new products into a marketplace: target markets for premium priced natural beef identifiable through demographic characteristics. This information is essential for marketing purposes, either for selling the product to the retailer or for point-of-sale information when the product is offered in the store. The analysis in Chapter VI defines an empirical model of WTP for natural beef and describes market segments for those products. The first half of the chapter evaluates the best use of the data collected in the three-tier payment card and determines that averaging the values from the first and third tier produce similar results to using the observed responses for the second tier. This suggests that the value respondents entered for the second tier can be interpreted as their mean WTP, though that was not the value elicited. The market clusters defined in the second half of the chapter describe consumer groups based on their probability of paying a premium. As in the store choice probit equations, production characteristics are important in describing consumers most likely to purchase natural ground beef and steak. There are also important differences across target market groups for both beef products related to age, past meat shopping choices and income. The target groups most likely to purchase natural ground beef and steak at a premium also differ, suggesting that these are two distinct markets. In the next section, the results from the empirical analyses are integrated into a discussion of marketing implications for retailers or producers looking to place their differentiated meat products with retailers.

Marketing Implications

Information from the grocery industry (*The Progressive Grocer*) indicates that the meat case is the most important product consumers consider when choosing a particular grocery outlet. The beef industry, in the past, has shown a reluctance to adopt new marketing strategies. Innovations that take into consideration the time constraints of today's home-cooks and their unfamiliarity with beef products are slowly being incorporated in the meat case. Unfortunately, the marketing advances made by beef producers remain behind other meat products. The adoption of characteristic based meat promotions is a potential avenue that can be exploited by the beef industry as they compete in the new supermarket industry (Hauptman and Cavanaugh, 2001).

For a supermarket to utilize the information developed in this study, either to retain customers making some meat purchases elsewhere, or to attract shoppers making all meat purchases elsewhere, targeted marketing and promotion campaigns need to be developed. The conventional supermarket may see benefits from extending their product lines to include natural beef, but only if targeted marketing campaigns are also employed. Today, natural beef is being sold in conventional supermarkets, however, other types of differentiated beef (i.e. grassfed) are marketed almost exclusively through natural products store. Grassfeeding was a significant variable in the probit model for supermarkets, and graphical analysis showed that respondents willing to pay high premiums for natural steak valued grassfeeding above many other production characteristics. supermarkets are beginning to carry natural beef products, but additional product differentiation remains an option for increasing beef sales in the supermarket.

The finding that 99% of all organic food consumers also shop at supermarkets could be used to target those customers who buy their meat at other outlets while they are inside the supermarket (Lohr and Semali, 2000). The negative and significant nature of the ALTHSOP variable in the supermarket probit equation, suggests that consumers are willing to travel to multiple stores to gather their optimal product mix. What specific type of product differentiation they are searching for is not clear, but it seems apparent that something may be missing from supermarket meat cases. Supermarkets can promote natural beef that has not been confined in pens and has been grassfed, potentially increasing the probability that a natural food store shopper could make most of their purchases at a supermarket by 5 percent.

Information about factors that may affect level of purchases and the potential value of a customer to supermarkets can be drawn from the information presented in Chapter V. This information will be valuable when business plans are presented to retailers and new marketing relationships are developed. There is a positive relationship between groups with over $50,000 annual income in the alternate store probit models, though significance is marginal in most cases. Low average weekly grocery expenditures (less than $200.00 per household) are only significant in the probit model for the Natural food store and those households show a 5 percent lower probability of shopping at a natural foods store than if they spent more than $200.00 per week. These factors can be incorporated into promotion strategies and to determine which retailer to approach with the differentiated beef product.

The target marketing results developed in Chapter VI are also valuable in describing potential consumers and how likely they will be to purchase natural beef. Simply by concentrating on the 80-100 percent quintiles for ground beef and steak a clear and concise picture of expected consumers is readily available. Both quintiles have relatively young consumers, and high average ratings of production characteristics. Therefore, any packaging considerations can concentrate on the fact that grazing practices are not harmful to the environment or that hormone use is not permitted in the production practice.

Though the production characteristics are not always significant or large in magnitude in the probit models, combining the information from graphical analysis and the WTP model may demonstrate that production characteristics are valuable marketing tools. Chapter IV shows that as a respondent's WTP for natural ground beef or steak rises, their valuation of most attributes also rises. Only the AGED production characteristic is discounted by respondents willing to pay the highest premiums for steak. The market research presented in the empirical sections of this study can be used in the preparation of marketing and promotion materials required when approaching a retailer to establish a business relationship (Thilmany and Grannis, 1999).

In addition to providing market research on likely purchasers, this study may be convincing evidence to supermarkets that a more unique product mix will improve customer retention. Producers seeking to enter the retail distribution supply chain can use the logit-based clustering technique to guide the development of promotional materials and to develop retail relationships. Effective supermarket promotions, like taste tests and cooking demonstrations can also be used to educate the customer that the supermarket now carries a variety of beef products differentiated by production practice. Posters, recipes and labeling all need to be developed to inform consumers and appeal to their broader interests in the food system. Finally, the store choice information can be used to direct the producer to approach the appropriate retail outlet for the product.

Retailers also need to be educated about the limitations of niche-meat products. Often, because of the volume driven nature of supermarket sales, the use of pricing strategies to manage demand is rejected without proper consideration. Information like that developed in Chapter VI can be used to show how higher prices could restrict demand. The graphical information presented in Chapter IV outlines potential market shares based solely on willingness to pay premiums but without information about expected individual purchase amounts. For steak, expected market share at a 30 percent premium is 12.8 percent and 21.2 percent for natural ground beef; a 20 percent premium for steak results in a 21.5 percent market share for steak.

The characteristic linkages suggested in the theoretical model indicates that promotions for individual stores can be developed around the products that the stores carry. Whole Foods, Wild Oats and Vitamin cottage have all successfully applied this strategy to attract customers. Supermarkets can benefit from adoption of similar programs by highlighting unique or innovative product lines they carry. In the case of meat, the supermarket's most important product, they can implement promotions highlighting the unique and progressive production methods associated with their meat products to attract new customers and maintain customers who make some of their meat purchases at alternate outlets.

Though this research was not able to show that any single beef production characteristic had a large effect on the probability of shopping at one store instead of another, it did demonstrate the importance of linking production differentiation with pricing strategies. The store choice models demonstrate that consumers are willing to travel to multiple outlets to satisfy their demand for differentiated products. The pricing models in Chapter VI showed that consumers who are most likely to pay a premium for natural ground beef or steak also rated all production characteristics higher than the entire sample. By retaining those shoppers currently purchasing some meat at other outlets, supermarkets may increase sales through larger, higher value food baskets by individual consumers.

Future Research

One future topic of research is a study that elicits more complete information about store choices. The data elicited here only concerned meat shopping and did not link these choices in any way to the rest of the food purchasing decisions made at the supermarket. The current store choice data can be more fully modeled in a system, but that system would need to have two discrete levels per store choice making the model that much more complicated. The WTP elicitation format seemed to provide valuable information, some of which was not utilized here. The development of a model that can calculate the full bounded nature of the WTP responses is needed.

Conclusions

The theoretical and empirical consumer demand models presented here offer a picture of today's supermarket shopper. The models rely on the underlying precept that each consumer is an individual and with heterogeneous tastes. The industrial organization models explored here provide an opportunity to describe a consumer's shopping behavior, based on utility maximizing behavior but without necessitating a measure of utility. The empirical models show both the real cost of offering homogenous products to heterogeneous consumers and the difficulty in accurately defining the target market segments for a new product. The completed research establishes a framework for viewing consumer shopping behavior, linked to demand for individual product characteristics, and how that information can be valuable in defining consumers and what may trigger their purchases. The empirical sections also provide the information needed for producers to secure sales relationships with retailers, and to develop and implement effective marketing and promotions campaigns.

This analysis has shown that the majority of all consumers shop at a conventional supermarket. It has also shown what attributes and demographic characteristics were important to the decision to shop at each of the four stores where meat was purchased. Finally, the significance of a measure of competing markets demonstrates that consumers can choose to shop at a supermarket for some meat, and purchase some meat from other stores to maximize their utility. Target market groups, based only on their willingness to pay a premium for natural beef, also show that consumers most likely to purchase natural beef valued production characteristics unavailable from supermarket beef. Targeting promotions and packaging according to these results can attract customers to natural beef while they are in the supermarket. The supermarket is a viable niche for natural ground beef, and there is an opportunity to attract the 27 percent of respondents buying at least some the their meat at alternate outlets.

To attract these consumers the supermarket needs to utilize an approach that embraces all customers, not just the *average* consumer. Customers already shopping at the supermarket can be encouraged to increase their purchases by the increasing the variety of product lines available across a broader set of characteristics. Specifically, customers not normally inclined to purchase meat at the supermarket can be attracted by the emphasis on production practice differentiated meats, thereby increasing sales. Overall, the current trend in supermarkets to "promote products that address mind/body balance (through use of natural ingredients, herbs or vitamins)," illustrates the changing shopping experience at the market (Hauptman and Cavanaugh, 2001). Markets that move from promoting service attributes of their stores to, "selling stories behind their products," will continue to attract customers and be well prepared for the changing nature of consumer demand (Rolf Jensen from T*he Dream Society* as quoted by Hauptman and Cavanaugh, 2001).

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