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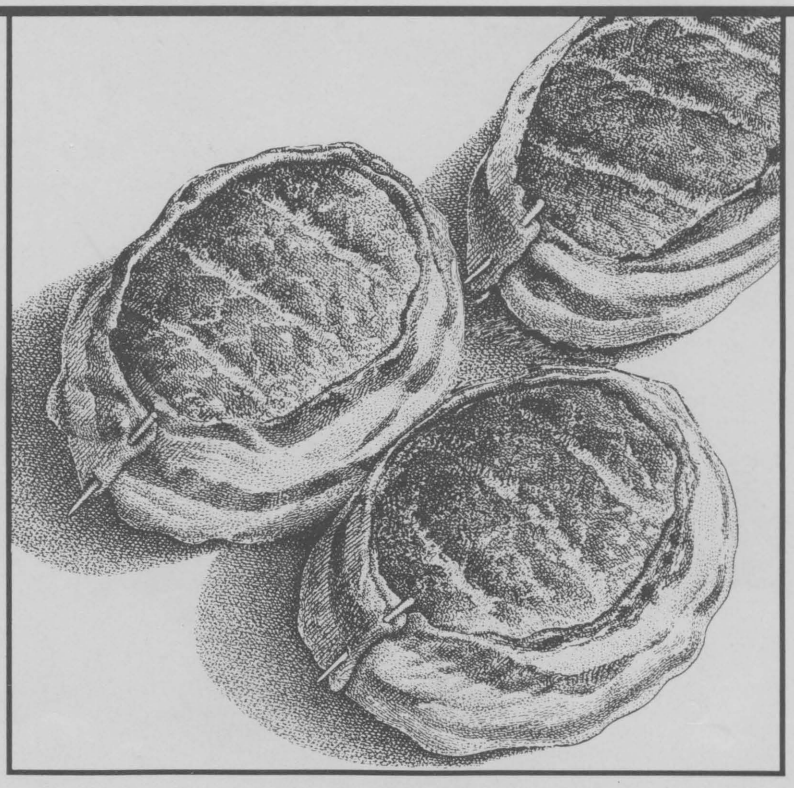

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Leanness and Convenience Dimensions of Beef Products: an Exploratory Analysis Using Scanner Data

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Executive Summary

Although scanner data have been available for several years to marketers, such data represent a new form of information for the meat industry. Marketers and researchers are just beginning to learn how to utilize this information source to make decisions about the meat case. Issues of convenience as well as of diet and health currently are major concerns for consumers. Industry studies show that most consumers now choose foods that are quick to prepare (Morris, 1985). Moreover, today's consumers are more conscious about diet, health, and nutrition than were yesterday's (Yankelovich et al., 1983, 1985; Burke Marketing Research, 1987).

To meet consumer demands, arising in part from health concerns and salient lifestyle changes, the red meat industry is taking steps to foster the development of products that are not only lean but also quick, easy, and convenient to prepare. For instance, the industry is acknowledging these changes in consumer preferences by making available lean beef products, precooked meats, boneless cuts, and microwaveable entrees. Retailers, likewise, moved to reduce fat trim from one-half inch to one-quarter inch (Branson et al., 1986).

In this light, this study constitutes a pilot test of the use of scanner data to investigate the demand for lean, nonlean, and convenience beef products for a local market in Houston, Texas. Although the beef industry recognizes the new realities of the marketplace, little information exists on the factors affecting the demand for lean products and convenience products. More specific knowledge of consumer preferences is essential so that suitable production and marketing adjustments can be made. The determination of key demand variables will allow producers, processors, and distributors to analyze trends in retail markets, improve planning, and provide better service to consumers.

In this report, the investigation of lean as well as convenience beef products rests on the use of scanner data from a retail firm in Houston. The time frame is the period January 1986 to November 1988. This particular pilot study reveals much about the potential utility of scanner data in market research on beef products. In particular, this research demonstrates the feasibility of scanner data in developing econometric models to analyze sales of beef products at the retail level.

Traditional analyses of retail demand have generally depended upon aggregate annual, quarterly, or monthly time-series data of purchases and prices. These data often do not represent current market conditions and are too general for product-specific decision making. Consumer panels and consumer surveys provide more detailed data for specific products as well as provide socio-demographic information but are expensive methods of data collection. Scanner data, however, constitute a readily available, current, and timely source of product-specific information. Scanner data are not without limitations, which are (1) the sheer volume of information, (2) the lack of demographic and income information, and (3) the provision of information only for food eaten at home.

Because of problems of data integrity and of too much detail, creating "data overload," empirical practitioners have been less than enthusiastic about the value of scanner data in economic research. Further, despite providing voluminous information, scanner data files must be augmented to monitor advertising or promotional activities as well as to monitor customer counts. Importantly, for beef items, food stores supplying the data must have the equipment to generate labels enabling the products to be electronically scanned. In regard to data integrity, it is unrealistic to expect the scanner to capture 100 percent of all sales. Information on most sales, however, with proper scrutiny from the retail food industry can be captured, and, consequently, these data may be used for market analysis.

Work with scanner data is not a trivial task. Much careful and organized computation is necessary to conduct any analysis successfully using scanner data. Data anomalies are most certainly the rule rather than the exception, particularly for fresh products.

This study rests on weekly point-of-sale purchases of 147 individual beef products: 30 lean fresh products, 70 nonlean fresh products, and 47 convenience products (prepared entrees). Additionally, this study considers aggregate commodities, namely, brisket, chuck, ground, loin, rib, round, and all other beef as well as convenience (prepared entrees) steak products, beef entrees, ground beef, beef ribs, and roasts. The weekly observations (150 in all) began on Wednesday and ended on Tuesday to conform to store sales and advertising patterns. The number of supermarkets in operation by this firm over the time interval of this study was 43. Importantly, the retail food firm in this study caters to relatively high-income customers.

Customer counts per week at this firm (43 supermarkets) ranged from 505,164 to 861,844 over the study period. The average customer count at this firm per week is on the order of 680,000. The advertisement information gathered over the period relates only to *fresh* beef products, not to convenience beef products. Consequently, in the analysis of convenience beef products (prepared entrees), no assessment of the impact of advertising on convenience beef item movement can be made.

Advertisement space (in terms of square centimeters) for the respective beef products varied considerably from week to week. Ground beef was the most frequently advertised product, whereas beef rib was the least frequently advertised product. On the basis of print space, ground beef received the most attention (on average 62 square centimeters), and rib received the least attention (on average 11 square centimeters). The advertisement frequency of nonlean beef products is three times that of lean beef products. As well, the print space for nonlean items is, on average, slightly more than 10 times that for lean items. Advertisement space for the aggregate of fish, pork, poultry, lamb, and veal items averaged almost 830 square centimeters weekly, roughly 2.5 times that for fresh beef products.

As a general rule, lean beef products are more expensive than nonlean products. In this study, both lean and nonlean products correspond to Choice grades. The lean brand for the firm studied is a Choice grade beef from which fat is trimmed. Lean line brands for other retail firms are generally no-roll, Good (Select) equivalent grades (e.g., "Giant Lean"). Good (Select) grades of meat products are typically priced below equivalent cuts.

The average price of lean beef items in the aggregate is $3.47 per pound; in comparison, the average price of nonlean beef is $2.42 per pound. Put another way, the price premium for lean beef is on the order of 40 percent in this retail firm. Except for loin, the price of lean products exceeds the price of nonlean products. The price for lean brisket is about 1.4 times that of nonlean brisket; for rib, the price premium is 80 percent; for round, 30 percent; for ground, 50 percent; and for chuck, 20 percent.

The top five lean line products in terms of average purchases per 1,000 customers are (1) gourmet ground round, (2) tailless T-bone steaks, (3) eye round roast, (4) sirloin tip fillets, and (5) beef cube steaks. The top five nonlean products are (1) ground beef chuck #079, (2) ground beef #078, (3) ground beef #080, (4) Choice boneless brisket #062, and (5) chuck boneless pot roast. Similarly, the top five convenience products are, respectively, (1) Armour Chicken Fry Beef Patties, (2) Armour Salisbury Steak, (3) Budget Sirloin Beef, (4) Budget Gourmet Oriental Beef, and (5) Budget Gourmet Pepper Steak with Rice.

In the aggregate for this retail firm, the average purchase per 1,000 customers for lean products is almost 14 pounds per week. In comparison, the average purchase per 1,000 customers for nonlean products is about 336 pounds per week. The principal fresh beef product in terms of purchases per 1,000 customers is ground beef (nearly 170 pounds per week), whereas the least important product is rib (almost 20 pounds per week). The average purchase of convenience products (prepared entrees) per 1,000 customers is roughly 23 units. For convenience products, the key items in terms of movement are steak, ground beef, and entrees. The least important convenience items in terms of product movement are roasts and ribs.

Budget shares represent the proportion of beef sales attributable to individual products. Within the class of convenience beef products, roughly 58 percent of dollar sales is attributable to steak items; 19 percent to entree items; 16 percent to ground beef items; 6 percent to roast beef items; and less than 1 percent to beef rib items. Collectively, 10 items account for slightly more than 48 percent of the sales of convenience beef products: (1) Armour Chick Fry Beef Patties, (2) Le Menu Sirloin Tips, (3) Le Menu Yankee Potroast, (4) Le Menu Chop Sirloin, (5) Stouffer Oriental Beef Lean Cuisine, (6) Budget Sirloin Beef, (7) Le Menu Pepper Steak, (8) Budget Gourmet Oriental Beef, (9) Classic Lite Steak Diane Mignonette, and (10) Le Menu Beef Stroganoff.

Within the class of fresh beef products, by carcass section, ground beef constitutes roughly 37 percent of dollar sales; loin, 19 percent; round, 12 percent; rib, 10 percent; chuck, 6 percent; and brisket, 4 percent. Importantly, roughly 6 percent of fresh dollar sales is attributable to lean beef items, whereas 94 percent is attributable to nonlean beef items. Collectively, 10 products account for approximately 65 percent of the sales of fresh nonlean beef products: (1) lean ground beef chuck #079, (2) fresh ground beef #078, (3) extra lean ground beef #080, (4) beef rib eye steak #037, (5) top sirloin steak boneless #032, (6) beef loin T-bone steak #029, (7) boneless strip steak #028, (8) beef chuck boneless pot roast #054, (9) beef round steak boneless #007, and (10) ground beef gourmet #081. Collectively, 10 products account for almost 77 percent of the sales of fresh lean beef products: (1) Lean Line Gourmet Ground, (2) Lean Line Extra Lean Boneless Stew Meat, (3) Lean Line Eye Round Roast, (4) Lean Line Sirloin Tip Fillets, (5) Lean Line Flank Steaks, (6) Lean Line Beef Cube Steaks, (7) Lean Line Sandwich Steaks, (8) Lean Line Shish Kabob, (9) Lean Line Ranch Broils, and (10) Lean Line Eye Round Steaks.

Convenience beef products (prepared entrees) generate nearly $36,000 in sales per week. Fresh beef products, however, yield almost $600,000 in sales on a weekly basis. Lean beef products constitute $34,000 per week in sales, whereas nonlean beef products constitute $564,000 per week in sales.

With few exceptions, purchases of beef products vary tremendously on a weekly basis. The purpose of econometric analysis in this study is to develop models to explain such variation in product movement.

The dependent variable in the respective retail demand relationships is units of movement per 1,000 customers. The respective exogenous (independent) variables are (1) own-price, (2) prices of competing products, (3) advertisement variables, (4) seasonality, and (5) holidays. The purpose of the econometric analysis is to *identify* and *assess* factors affecting purchases per 1,000 customers. Emphasis is on price and advertisement elasticities. Price elasticities refer to percentage changes in purchases caused by unit percentage changes in prices; similarly, advertising elasticities refer to percentage changes in purchases caused by unit percentage changes in advertising. Observations of elasticities reveals the sensitivity of purchases to price changes and/or to promotion efforts.

Remarkably, the models capture significant amounts of variation in purchases per 1,000 customers. Given the relatively large amount of variation to be explained as well as the absence of serial correlation, the econometric models are indeed satisfactory.

In this study, own-price elasticities for lean, nonlean, and convenience beef products are negative to correspond to the inverse relationship between purchases (movement) and price. Further, most of the elasticities are significantly different from zero and have magnitudes greater than 1 in absolute value. Consequently, considerable sample evidence exists to indicate that own-price exerts a notable influence on purchases if everything else is held constant. Technically speaking, the response to price changes is elastic. In fact, the magnitude of the price elasticities is much higher for convenience beef products than for fresh beef products, as expected.

By carcass section, lean all other beef and lean round meat are particularly sensitive to changes in own-price. Nonlean brisket, nonlean chuck, nonlean rib, and nonlean round are also sensitive to changes in own-price as well. Finally, convenience rib, roast, ground beef, entree, and steak products are highly sensitive to changes in own-price.

In regard to competing prices, purchases of lean beef products are generally not responsive to changes in the price of nonlean beef products. On the other hand, except for brisket, ground, loin, and rib cuts, purchases of nonlean beef are generally sensitive to changes in the price of lean beef. The price of nonlean beef is thus not a key determinant of purchases of lean beef, but the price of lean beef is a prime determinant of chuck, round, and all other beef. As well, the price of convenience products generally bears no relationship to purchases of lean and nonlean beef products. Likewise, except for convenience roast products, the prices of lean and nonlean beef do not significantly influence purchases of convenience beef products. The prices of nonbeef products (pork, poultry, and fish) affect only particular cuts of fresh beef (notably lean brisket, lean loin, and nonlean brisket). The price of poultry negatively influences purchases of convenience ground beef, and the price of fish positively influences purchases of entrees. For fresh beef products as well as convenience beef products, cross-cut prices thus have a relatively minor effect on purchase patterns.

Own-advertisement elasticities are positive and in most cases statistically significant. Positive own-advertisement elasticities correspond to the *direct* relationship between purchases and advertising. Own-advertisement elasticities have more influence on purchases of nonlean beef products than on purchases of lean beef products. The magnitude of the own-advertisement elasticities is much smaller than the magnitude of price elasticities.

The effect of cross-advertising is marginal. Advertising for fish, pork, poultry, lamb, and veal on purchases of fresh beef products is, in fact, not statistically significant.

Similar to those of fresh lean beef, purchases of convenience beef products during holidays are smaller than purchases during nonholidays. However, purchases of nonlean beef during holidays are not significantly different from purchases during nonholidays.

Finally, holding everything else constant, seasonal purchase patterns are evident for convenience beef groups (except entrees) and lean beef groups (except chuck and loin). However, only nonlean chuck and nonlean all other beef are subject to seasonality in purchases among the nonlean beef groups.

Overall, this research encourages prospects of using scanner data in market research. Despite the apparent success of using scanner data to analyze retail demand relationships, concern lies with generalizing the results to regional or national levels. Scanner data from supermarkets in a particular location represent a "controlled" experimental situation. The community-specific results may not contribute to defensible, broad regional or nationwide inferences. Because of this potential limitation, the results of this analysis should be used not on a stand-alone basis but as supporting evidence in conjunction with a research approach designed to conduct analyses with scanner data on a regional or national basis.

Though much recent empirical and theoretical work exists on demand and market analyses, reliable estimates of demand parameters for individual beef commodities are few. With the use of scanner data, retail demand relationships for beef products can be effectively analyzed.

Use of scanner data can expand demand analyses. The realization of benefits from the use of scanner data is in the embryonic stage of development, however. In the next decade, analysts will concentrate on scanner data assembly, management, and analysis. Scanner data hold great promise for developing insights in market research. Conceivably, with proper management, scanner data may well be the ultimate data source of demand and market analyses at the retail level. This particular pilot study highlights the potential utility of scanner data in market research on beef products.

Introduction

Issues of convenience as well as diet and health (especially those related to fat content) warrant attention in the investigation of the appeal of beef to consumers in the United States. Today, consumers want the food they buy to be easy and quick to prepare, a dramatic change from previous times. New technology in food preparation, especially microwave ovens, and concomitant innovations in food processing continue to decrease the time needed for at-home meal preparation. Industry studies show that most consumers now choose foods that can be prepared in less than 20 minutes (Morris, 1985). Consumer national attitudinal research, sponsored by the National Live Stock and Meat Board, indicates that today's consumers are more conscious about diet, health, and nutrition (Yankelovich et al., 1983, 1985; Burke Marketing Research, 1987).

To meet consumer demands, caused in part by health concerns and lifestyle changes, the red meat industry is taking steps to foster the development of products that are not only lean but also quick, easy, and convenient to prepare. The industry acknowledges changes in consumer preferences by making available lean beef products (closely trimmed choice beef or beef cut from carcasses having less fat), precooked meats, boneless cuts, and microwaveable entrees. Motivated by the 1985 National Consumer Retail Beef (NCRB) study (Branson et al., 1986), retailers reduced fat trim from 1/2 inch to 1/4 inch. Packers followed suit by reducing the standard 1 inch of outside fat to 1/2 inch. Increasingly more meat departments are offering consumers a lean "house brand" in addition to Choice grades (Decisions Center, Inc., 1987). Montford of Colorado has been developing "high-quality, convenient" products for the past several years (Wall Street Journal, 1985). The Beef Industry Council currently lists the development of value-added beef products resulting from innovations in preparation or packaging as a key research area (personal communication).

Increases in real income, declines in household size, and increases in the proportion of women in the work force have contributed to the outward shift in demand for added convenience (products that transfer the time and activities of preparation from the consumer to the processor) in foods purchased for home use (Stafford and Wills, 1979; Capps et al., 1985). Convenience attributes of poultry and seafood products are highly evident in the marketplace. The poultry industry in particular, which increasingly sells processed forms that are easy to prepare, has been in the forefront of this development (The Food Institute, 1986).

Recent trends in food consumption indicate an increased awareness about nutrition and an increased interest in convenience foods. Not surprisingly then, consumer segments exist that prefer lean, low-fat products (Menkhaus et al., 1988; Skaggs et al., 1987) and/or convenience products (Capps and Pearson, 1986; Capps, 1989). Although the beef industry recognizes the new realities of the marketplace, little information exists on the factors affecting the demand for lean beef products and convenience beef products. This research reported herein attempts to fill this void. More specific knowledge of consumer preferences is essential so that suitable production and marketing adjustments can be made. The determination of demand variables will allow producers, processors, and distributors to anticipate trends in retail markets, to improve planning, and to provide better consumer service.

Literature Review

This section documents the sparse number of studies dealing with the demand for lean and/or convenience beef products. Several studies have been conducted recently to examine consumer attitudes and preferences toward beef. The NCRB (Branson et al., 1986) study concentrated on the effects of different degrees of beef leanness on consumer demand. Skaggs et al. (1987) and Menkhaus et al. (1988) analyzed the potential of marketing branded, low-fat, fresh beef. The results of these studies indicated that (1) consumer health concerns pertaining to the ingestion of animal fats were evident, (2) for a product that was perceived to be more healthy, consumers were willing to compromise on taste, and (3) health-related factors influenced the decision to purchase leaner meats.

A study prepared by Decisions Center, Inc. (1987) for the American Meat Institute focused on the awareness and usage of the lean brand of beef (Giant Lean) offered by Giant Foods, Inc., a chain of stores in the Baltimore, Maryland, and Washington, D.C., area. The particular brand under study was popular with customers who were women, employed, under 40 years old, who had children, and who were concerned about health and nutrition. This study, conducted in November 1986, was based on 300 telephone interviews of customers of the firm.

Capps et al. (1985) identified several demographic and psychographic characteristics of consumers who buy lean meat products from a particular retail food chain in Houston, Texas. The source of data was survey information, gathered by telephone interviews, from 200 shoppers. The analysis was performed using a Probit model. The survey indicated that consumers more than 30 years of age were more likely to buy lean meat products than were consumers 20-29 years of age. Residents of Texas for more than 10 years were more likely to buy lean meat products than were residents of Texas for less that 10 years. Consumers who attended college were more likely to buy lean meat products than were consumers who had not attended college. Household size and the probability of buying lean meat products were positively associated. Fat-conscious consumers were more likely to buy lean meat products than were nonfat-conscious consumers. There was, however, no statistically significant link between income class of consumers and the likelihood of buying lean meat products. Furthermore, no statistically significant relationship was evident between price consciousness and the likelihood of buying lean meat products.

The National Academy of Sciences (Lemieux and Wohlgenant, 1988) suggests that the real solution to human consumption of excessive dietary fat, saturated fatty acids, and cholesterol lies in the production of leaner animals. Using market survey data from a national telephone survey of 200 consumers, Lemieux and Wohlgenant (1988) estimated that the premium consumers would be willing to pay for 10 percent leaner pork was, on the average, 16.6 cents (with a standard deviation of 4.3 cents).

Using the 1977-78 Nationwide Food Consumption Survey (NFCS) as the data source, Capps (1989a) addressed the issue of added convenience on the at-home demand for beef, steaks, roasts, and ground beef. The average weekly money value per household for convenience products was roughly $0.37 for beef, $0.11 for steaks, $0.06 for roasts, and $0.09 for ground beef. For nonconvenience beef products, the average weekly money value per household was $5.82 for beef, $2.27 for steaks, $1.45 for roasts, and $1.73 for ground beef. For convenience beef products, more than 90 percent of the sample households reported zero expenditure levels. This descriptive evidence confirms that convenience beef products for at-home consumption were scarce even in the late 1970s.

Income was statistically important in affecting household expenditures on convenience and nonconvenience beef products. Except for roasts, income elasticities were greater in magnitude in the nonconvenience class than in the convenience class. In the convenience class, the income elasticity for beef was 0.0939; for steaks, roasts, and ground beef, the income elasticities were, respectively, 0.1270, 0.1418, and -0.2261. In the nonconvenience class, the income elasticities for beef w 0.2404; for steaks, roasts, and ground beef, the inco elasticities were, respectively, 0.1644, 0.0997, and 0.0446. Household expenditures on beef products were, however, more sensitive to changes in household size then to changes in income. Household size elasticities for beef products in the convenience class were as follows: 0.3737 for beef, 0.5866 for steaks, 0.2737 for roasts, and 0.5980 for gound beef. In the nonconvenience class, the household size elasticities were 0.7542 for beef, 0.4621 for steaks, 0.3310 for roasts, and 0.6179 for ground beef.

In general, various demographic variates greatly influenced the demand for convenience and nonconvenience beef products. College-educated household managers, unemployed household managers, female household managers, and household managers less than 35 years of age spent significantly less on beef products than their counterparts. Regional and seasonal purchase patterns were evident. Finally, the purchase patterns of nonwhite households were noticeably different from the purchase patterns of white households.

Capps (1989a) also forecasted percentage changes of nominal expenditures for convenience and noncon venience beef products over the period from 1980 t 2000. Growth in convenience beef expenditures was projected to be almost 40 percent, 2.5 times the growth in nonconvenience beef expenditures. Convenience steak and roast expenditures were expected to grow by roughly 35 percent, about 1.5 times the increase in nonconvenience steak and roast expenditures. Finally, growth in expenditures on both nonconvenience and convenience ground beef was projected to be on the order of 40 percent.

During the 1980s, a myriad of convenience foods have been introduced into the marketplace. Further research in the area of convenience dimensions in food products is certainly desirable, especially given Capps' (1989a) projections for beef products.

In this report, the investigation of lean as well as convenience beef products rests on the use of scanner data from a retail food firm in Houston. The time frame in question is the period from January 1986 to November 1988. Although the application of scanner data for demand analyses is in the embryonic stage of development, scanner data have been used in market research to investigate brand differentiation (Blattberg and Wisniewski, 1986; Shugan, 1987; Guadagni and Little, 1983) and to investigate promotional effects on sales of performance (Wittink et al., 1988; Moriarty, 1985).

Of particular interest to the beef industry are several prior applications of scanner data (although very recent). First, retail demand relationships for steak, ground beef, roast beef, chicken, pork chops, ham, and pork lion were examined by Capps (1989b) using scanner data. This research demonstrated the feasibility of scanner data in developing short-run predictive models to anticipate sales of meat products. As well, the Center for Agricultural and Rural Development (CARD) at Iowa State University, under contract with the Beef Industry Council of the National Live Stock and Meat Board (NLSMB), conducted analyses of behavior scan data (Schroeter, 1988). This scanner information was compiled for the NLSMB by the Chicago-based marketing reseach firm Information Resources, Inc. The motivation of the use of such data was to measure beef consumption responses to television promotion and advertising. Using scanner data, fresh beef purchases of approximately 1,800 households were monitored in Grand Junction, Colorado, over the period from October 1985 to July 1987. Combined with the detailed demographic information available for each of the households, scanner data provide a unique capability to assess the impact of the experimental television advertising. The beef products under investigation were (1) steaks for braising (chuck steak, round steak), (2) steaks for broiling (most loin steaks, rib steaks), (3) roasts for braising (chuck roast, round roast), (4) roasts for roasting (tenderloin roasts, rib roasts), (5) ground beef (all ground beef including ground round and chuck), and (6) beef for stewing/simmering (stew meat, brisket).

Nature of Scanner Data

General Description

Demand analyses require the existence of high-quality data bases. Fundamental elements affecting quality include adequate measures of response variables (sales or consumption levels as well as budget shares), adequate measures of exogenous variables, sufficient number of observations, and appropriate time interval.

The introduction of scanning check-out systems into U.S. supermarkets in the mid-1970s opened tremendous possibilities for generating new data and for using such data in economic research and managerial decision making. According to the Food Marketing Institute (FMI), slightly more than 50 percent of the supermarkets in the United States currently employ scanner check-out systems (*Progressive Grocer*, 1989). Importantly, use of scanner data as a basis for demand analysis has been very limited. Only since 1979 have scanner data, through refinements by manufacturers of electronic scanning check-out systems by retail users, been generated with enough reliability and consistency for application in economic research (Jourdan, 1981).

Scanner information constitutes a nontraditional data source for economic applications. The richness of scanner data lies in the daily available information on quantity, price, and hence expenditure for a multitude of products. The 35,000 to 40,000 items currently available in retail food stores testify to the vastness of scanner data.

Scanner data, however, are not within the realm of the public sector. Scanner data series useful for demand analyses are developed and maintained by private sources and are available from several firms who provide primarily information services (e.g., Information Resources, Inc; The Text Marketing Group; Burgoyne, Inc; A.C. Nielsen; The NPD Group). Scanner data are also available from retail food firms (e.g., Kroger and Safeway).

Traditional analysis of consumer demand has generally depended upon aggregate annual, quarterly, or monthly time-series data of consumer purchases and prices. These data often do not represent current market conditions and typically are too general for product-specific decision making. Time-series data, in short, lack disaggregate product and price detail. Consumer panels and consumer surveys provide more detailed data for specific products as well as provide socio-demographic information but are expensive methods of data collection. A key limitation of consumer panels or surveys is their lack of price information. Prices must be imputed from reported quantity and expenditure figures. Analysts question the use of such imputations, particularly estimation of cross-sectional demand functions (Cox and Wohlgenant, 1986). Another key limitation of the use of consumer surveys (not necessarily panels) is the lack of time continuity. To illustrate, the U.S. Department of Agriculture sponsors the National Food Consumption Survey (NFCS). Since its inception in 1936, this survey takes place only once approximately every 10 years (e.g., 1965-66, 1977-78, 1987-88). The U.S. Bureau of Labor Statistics (BLS) sponsors continuing consumer expenditure surveys (making available household panel data since 1980) on a quarterly basis. This source of data from the public sector, a landmark for consumer demand analysis, circumvents the time continuity problem, but nonetheless,

data sets from BLS lack price information and product-specific quantity information.

Scanner data, on the other hand, constitute a readily available current and timely source of product-specific information. To quote Tomek (1985), "existing secondary data seem especially inadequate for studying product demand in retail markets, and fundamental work needs to be done to obtain relevant data" (pp. 913-914). "The data associated with computerized checkout systems in grocery stores could become an important source of information for studying retail demand" (p. 913). Scanner data are not without limitations, however. The limitations of scanner data are threefold: (1) the sheer volume of information, (2) the lack of demographic and income information, and (3) the provision of information only for food eaten at home.

Problems and Pitfalls

Because of problems of data integrity and of too much detail, creating "data overload," empirical practitioners have been less than enthusiastic about the value of scanner data in economic research. Each *week* as few as 10 to 20 supermarkets will generate the equivalent amount of data as would a panel of 10,000 households. Consequently, considerable resources are necessary to reduce the mass of data to useful summary figures for demand analyses. Additionally, data from public agencies are readily available to researchers; data from private firms are not, or if available, only at considerable cost.

Despite the volume of price, quantity, and expenditure information, scanner data, at least from retail food firms, lack the dimension of consumer sociodemographic data. This socio-demographic information is essential to the derivation of income elasticities. For demand analyses based on scanner data from food stores, the experimental unit is the individual food store (aggregation over consumers), not the individual consumer. This aggregation problem may not necessarily be negligible. If the food store corresponds to a more or less homogeneous group of consumers, however, this aggregation problem is virtually of no consequence.

Further, despite their sheer volume of information, scanner data files need to be augmented to monitor advertising or promotional activities. Competitors' actions are also important but are extremely difficult to anticipate, measure, and evaluate. Additionally, difficulties exist in the representation of nonprice effects (merchandising schemes, coupons, services, cleanliness, product selection, and reputation for fresh meat or produce). Consequently, the *ceteris paribus* (all-other-things-held-constant) assumption (popular with economists) is in jeopardy with the use of scanner data.

Importantly, for meat, poultry, and fish items as well as for produce, food stores supplying the data must have the equipment to generate labels enabling t products to be electronically scanned. This equipme is expensive, sensitive, and may not always produce scannable labels. Thus, because of the inability of particular food stores to scan fresh meat or produce, scanner data for meat or produce may not be available or if available, not reliable. Fresh meat and produce, however, constitute a sizable chunk of the food dollar per consumer.

In regard to data integrity, food industry observer Richard E. Shulman makes this point: "...caveat about scanning data: It's not accurate. It is representative. Don't expect the scanner to capture 100 percent of all sales. There are dozens of reasons that sales are "lost": bad symbols, poorly trained checkers, etc. The important thing to understand is that most sales will be captured and the resulting data can be acted upon" (National Grocers Association Technology Newsletter, 1985).

Lesser and Smith point out (1986) that scanner data misrepresent item movement (quantity purchased) if the scanning file is not rigorously maintained or if the items cannot be or are not scanned and the Universal Product Codes (UPC) are not entered manually. Furthermore, scanner data may not provide accurate information stock shrink accounts for a substantial portion of the movement of a product. Because stock shrink generally contributes approximately 1 to 2 percent of supermarket sales, this factor should not be a major issue for the vast range of products. Consequently, the integrity of the data is a function of the level of discipline of the retail firm in capturing accurate information.

Along this line, Lesser and Smith (1986) conducted a study to evaluate the accuracy of scanner data. Their results suggested that "substantial error is possible when examining individual items on a weekly basis. This factor should be considered when using scanner data" (p. 71).

Present and Potential Uses in Economic Research

Tremendous possibilities exist for the generation and use of scanner data for applications to economic research. Examples of such applications include evaluation of shelf space allocation, evaluation of advertising and promotion schemes, evaluation of new items, and estimation of price and total expenditure elasticities. In fact, as Lesser and Smith (1986) point out, with scanner data, "it is possible to do retail-level analysis routinely which previously required special tabulations" (p. 69). Examples of retail-level analyses requiring special tabulations include in-store pricing experiments (Doyle

and Gidengil, 1977), the effects of promotional programs on individual items (Hoofnagle, 1965; Curhan, 1974), the measurement of price elasticities (Funk et al., 1977; Marion and Walker, 1978), the results of space allocation and display (Cox, 1964; Curhan, 1973; Chevalier, 1985), and the effects of interactions among short-run strategy variables such as advertising, space allocation, and pricing (Curhan, 1974; Wilkerson et al., 1982).

Except for the work by Jourdan (1981) as well as the work by McLaughlin and Lesser (1986), few analyses of consumer demand have been conducted using scanner data. Jourdan (1981) estimated own-price and cross-price elasticities of demand for specific retail cuts of beef (roasts, steaks, ground beef, and nonground beef) by using bi-weekly data over a 25-week period from four retail food stores in Houston.

McLaughlin and Lesser (1986) reported on the experiment of systematically varying prices and tracking, through the use of scanner data, subsequent movement of potatoes. With this approach, the researchers were able to calculate appropriate store-specific demand elasticities. For potatoes, data over a 42-week period from eight retail food stores in upstate New York indicated that consumer response to price changes was relatively elastic. Retailers could use store-specific elasticities to assess impacts of promotional activity, to determine optimal space allocation, and to develop sales management models. McLaughlin and Lesser's (1986) results also suggest that "pricing according to individual stores, rather than according to historical price zones, may be an appropriate profit-maximizing strategy" (p. 9). The common thread in the two-consumer demand applications is the interaction with a single firm (although multiple stores) in a local area.

Scanner data from the supermarkets in a particular location (for this analysis Houston) presumably represent a "controlled" experimental situation. Importantly, however, the community-specific results may not allow defensible, broad regional or nationwide inferences. Because of this potential limitation, the results of local analyses should be used not on a stand-alone basis but as supporting evidence in conjunction with a research approach designed to conduct demand analyses with scanner data on a regional or national basis.

Nevertheless, demand analyses can be expanded through the use of scanner data. Though much empirical and theoretical work exists with respect to demand analyses in recent years, reliable estimates of demand parameters for disaggregate food commodities are few. Scanner data may result in the most detailed and definitive source of retail food industry statistics available to researchers. However, the realization of benefits from the use of scanner data is in the embryonic stage of development. To paraphrase Branson et al. (1986), the mid-1980s to the mid-1990s will be the learning years for scanner data assembly, management, and analyses. Scanner data hold great promise for developing insights into both applied and theoretical research. Conceivably, with proper management, scanner data may well be the ultimate data source for demand analysis at the retail level.

Data Source

Scanner data are primary data that have properties similar to cross-sectional and time-series data. The observations exist over time, usually days, as well as across various cross-sectional units, typically food stores. The source of data for the analyses in this study, similar to the Jourdan (1981) study, is a retail food firm in Houston. The time frame is from January 1986 to November 1988. Weekly observations began on Wednesday and ended on Tuesday to conform to store sales and advertising patterns. The number of supermarkets in operation by this firm over this time interval was 43. Importantly, the retail food firm in this study caters to relatively high-income customers.

Assessment and evaluation of the use of scanner data applied to demand analyses involve several steps. Nearly 40,000 items are currently available in this retail food firm. To ensure computational feasibility, the data source used in this study involves only beef items. Nonetheless, this data source constitutes information for roughly 300 Universal Product Codes (UPCs). Importantly, beef products not only are key contributors of sales volume and profit to the firm but also are key elements of the consumer market basket of goods.

Scanner data are also available on a daily basis. Aggregation of daily information into weekly information is essential to make computations more manageable. This weekly information also allows for better representation of store operations. To illustrate, price changes are usually initiated once per week, and store merchandising activities such as newspaper advertisements and displays are also usually done weekly (Carmen and Figueroa, 1986). Aggregating observations into longer time intervals also tends to smooth out variability.

This study is based on point-of-sale purchases. Attention is centered on disaggregate beef products, par-

ticularly lean and convenience (prepared entrees) items. For documentation of individual UPCs for the respective beef products, see the section titled "Data Description." Pounds sold of the UPC as well as price of the UPC are reported by week for the period in question. For commodity aggregates, the quantities of the various items correspond to the sum of the respective quantities of the relevant UPCs. The implicit prices of the commodity aggregates are weighted averages of all individual UPC prices. The weighting mechanism is the ratio of the sum of all sales over the UPCs to the sum of all quantities.

Quality effects may result from such commodity aggregation (Houthakker, 1952; Cox and Wohlgenant, 1986). When distinct items are aggregated into commodity groups, variations occur in the implicit prices. Furthermore, the weighted average prices change with the quantities of the component goods consumed. Although the use of implicit prices potentially limits the analysis, given that the beef products in question are relatively homogeneous, quality effects attributable to commodity aggregation are assumed to be negligible.

Emphasis in our study is on demand relationships at the firm level in lieu of the store level. The prices for each UPC are the same across stores, and sales of meat items at the stores are reasonably similar. Hence, data from all stores in the firm are aggregated to form 150 weekly time-series observations. Funk et al. (1977) examined factors affecting weekly sales of carcass beef and individual beef cuts at two retail food chains in Toronto, Canada. Their analysis used data taken on shipments of beef carcasses, quarters, and primals during a 72-week period. Marion and Walker (1978) used data based on point-of-sale purchases to examine the sales of five meat products (beef round, beef chuck, beef loin, pork loin, and fryers) of two Ohio supermarkets during a 52-week period. The Funk et al. (1977) and Marion and Walker (1978) studies, however, were not dependent upon the use of scanner data. Our study, therefore, deviates from traditional analyses because it examines the potential utility of scanner data in market research on beef products.

Conceptual Framework for the Analysis

Holdren (1960, pp. 117-123) provides the conceptual framework for this analysis. Attention is on multiproduct retail demand functions. According to Holdren (1960, p. 123) "the multiple product retail demand function can be characterized by

$$q_i = f_i(p_1, p_2, \ldots, p_n, a_1, a_2, \ldots, a_m), \qquad (1)$$

where q represents quantity variables expressed in appropriate units, p represents price variables, and a represents attributes of the retailer's nonprice offer variation. Advertising, sales promotion activities, hours open, and customer services are concrete examples of nonprice offer variation. Additionally, equation 1 may be augmented by considering in-store and competitors' prices as well as in-store and competitors' advertising.

Changing effective demand related to nearness to payday is a well-known phenomenon in food retailing (Marion and Walker, 1978; Carmen and Figueroa, 1986). Marion and Walker (1978), for example, found that weekly retail meat sales tended to decrease as time since the last payday increased. Seasonal factors also may affect the quantity variables, all other things held constant (Marion and Walker, 1978; Funk et al., 1977; Carmen and Figueroa, 1986). Finally, because they are proxies for tastes and preferences of the collection of consumers who frequent retail stores, the socio-demographic influences in retail demand functions are worthy of consideration.

In light of the previous discussion, the generic specification of the respective demand models in this study is as follows:

$$Q_{it} = f(P_{it}, P_{jt}, PFISH_t, PPORK_t, PPOULT_t, SEASON, ADV_{it}, ADV_{jt}, ADVAOM_t). \qquad (2)$$

where Q_{it} is purchases per 1,000 customers (in pounds) of beef item i in week t; t = 1, . . ., 150; P_{it} is price of beef product i in week t ($/pound); P_{jt} corresponds to prices of competing beef products (j refers to the set of competing products) in week t ($/pound); $PFISH_t$, $PORK_t$, and $PPOULT_t$ correspond to weighted average prices of fish, pork, and poultry products, respectively, in the retail firm in week t. Wohlgenant (1985) argues for the inclusion of these price variables in demand relationships for beef. H refers to a binary variable for holidays (H = 1, if holiday; 0 otherwise); SEASON corresponds to a set of monthly binary variables to measure seasonality; ADV_{it} corresponds to the amount of print space given for beef product i in the weekly advertisement flier (square centimeters); ADV_{jt} corresponds to the amount of print space given for the set of competing beef products in the weekly advertisement flier (square centimeters); and $ADVAOM_t$ corresponds to the amount of print space given to fish, lamb, pork, poultry, and veal products (competing meat products) in the weekly advertisement flier (square centimeters).

Data are converted to a per customer basis. Consequently, the dependent variables reflect purchases per 1,000 customers. Because of unavailability of information, the model specification excludes competitors' prices and advertising as well as socio-demographic variables.

The variables P_{it} and P_{jt} capture own-price and cross-price effects. Own-price effects are hypothesized to be negative. Cross-price effects may be negative or positive to reflect substitutable or complementary relationships among the commodities in question. For disaggregate analyses, the identification of appropriate substitutes or complements *a priori* is a difficult task. In this study, cross-price effects are of two types: (1) cross-cut prices and (2) cross-product prices. The former refer to competing beef products, and the latter refer to competing meat products.

Because data are from only a single firm, some may argue from the following rationale that price elasticities are not estimable: (1) consumers can respond to price changes by shopping at different stores within a market area, and (2) no information in this study is available on purchases at other stores or on prices charged at other stores. According to the Food Marketing Institute, however, only 27 percent of shoppers compare prices from store to store (Cox and Foster, 1985). Additionally, Funk et al. (1977) reported that (p. 534) "multicollinearity between competitors' prices and in-store prices was too strong to allow for measurement of the separate effects of the variables." Therefore, in this study, the omission of competitors' prices may not be a limiting factor in estimating in-store price elasticities.

A dummy variable is used to capture the effects of holidays on per customer beef purchases. Unlike the Marion and Walker (1978) study, our study does not delete observations because of holidays. Monthly dummy variables capture the effects of seasonality. The coefficients associated with these variables may be either positive or negative.

As in the Funk et al. (1977) study as well as in the Marion and Walker (1978) study, local newspaper advertising is the only advertising mode considered in our study. Although television, radio, and in-store displays are used by the food store chain, these forms are primarily oriented toward creating a favorable corporate image. Newspaper advertising, on the other hand, is geared primarily to promoting specific products. The basic format and design of the newspaper advertisements used by the chain were the same throughout the period. Therefore no measure of "creative aspects" of advertising is necessary. In the Funk et al. (1977) study as well as the Marion and Walker (1978) study, advertising data corresponded to the number of advertised items. In our study, advertising data refer to the amount of print space devoted to each item.

This study allows the examination of own- and cross-advertisement effects. All other things held constant, own-advertisement effects are hypothesized to be positive, whereas cross-advertisement effects are hypothesized to be negative. The respective set of advertisement variables used in the retail demand relationships correspond to the set of price variables previously discussed. Competitors' advertising is excluded because of resource constraints. Furthermore, because Funk et al. (1977) reported that the impacts of competitors' advertisement were not statistically significant, this set of variables may be marginal.

Data Description

This section of the report deals with three components: (1) data for individual UPCs, (2) documentation of customer counts by week, and (3) documentation of advertisement space for beef products. Pulling together price/quantity information on individual UPCs, customer counts, and advertisement space was an exacting task.

Individual UPCs

Examples of data for individual UPCs are provided in Table 1 (for Lean Line Sirloin Strips) and Table 2 (for Le Menu Beef Stroganoff). The format for all UPCs is similar. Importantly, price and quantity information are not necessarily available for all UPCs for *all* weeks. Some products (especially microwaveable entrees) were not available until well after January 1986, the initial month of the period in question. Other products were available at week 1 of the analysis but were discontinued because of lack of demand.

A great number of UPCs correspond to beef products. For a description of the various UPCs, see Appendix A. For a schematic diagram of the UPCs, see Figure 1. According to this diagram, the number of fresh beef products is 100, and the number of convenience beef products is 47. Out of the 100 fresh products, 30 are lean products, whereas the remaining 70 are non-lean products. The numbers in parentheses below the beef types correspond to the number of UPCs in the category.

Table 1. Data for individual UPCs (example: Lean Line Sirloin Strips).

UPC	Units	Price	Cost	Date	Week	Description
20102000000	45	629	28605	12186	3	Lean Line Sirloin Strips
20102000000	890	769	684410	12886	4	Lean Line Sirloin Strips
20102000000	523	769	402187	20486	5	Lean Line Sirloin Strips
20102000000	278	769	213782	21186	6	Lean Line Sirloin Strips
20102000000	423	769	325287	21886	7	Lean Line Sirloin Strips
20102000000	503	769	386807	22586	8	Lean Line Sirloin Strips
20102000000	366	769	281454	30486	9	Lean Line Sirloin Strips
20102000000	252	769	193788	31186	10	Lean Line Sirloin Strips
20102000000	248	769	190712	31886	11	Lean Line Sirloin Strips
20102000000	143	769	109967	32586	12	Lean Line Sirloin Strips
20102000000	162	769	124578	40186	13	Lean Line Sirloin Strips
20102000000	218	769	167642	40886	14	Lean Line Sirloin Strips
20102000000	147	769	113043	41586	15	Lean Line Sirloin Strips
20102000000	85	769	65365	42286	16	Lean Line Sirloin Strips
20102000000	221	769	169949	42986	17	Lean Line Sirloin Strips
20102000000	164	769	126116	50686	18	Lean Line Sirloin Strips
20102000000	154	769	118426	51386	19	Lean Line Sirloin Strips
20102000000	174	769	133806	52086	20	Lean Line Sirloin Strips
20102000000	239	769	183791	52786	21	Lean Line Sirloin Strips
20102000000	173	769	133037	60386	22	Lean Line Sirloin Strips
20102000000	214	769	164566	61086	23	Lean Line Sirloin Strips
20102000000	187	769	143803	61786	24	Lean Line Sirloin Strips
20102000000	146	769	112274	62486	25	Lean Line Sirloin Strips
20102000000	222	699	155178	70186	26	Lean Line Sirloin Strips
20102000000	216	699	150984	70886	27	Lean Line Sirloin Strips
20102000000	314	709	222626	71586	28	Lean Line Sirloin Strips
20102000000	164	709	116276	72286	29	Lean Line Sirloin Strips
20102000000	180	699	125820	72986	30	Lean Line Sirloin Strips
20102000000	212	699	148188	80586	31	Lean Line Sirloin Strips
20102000000	180	699	125820	81286	32	Lean Line Sirloin Strips
20102000000	214	699	149586	81986	33	Lean Line Sirloin Strips
20102000000	151	699	105549	82686	34	Lean Line Sirloin Strips
20102000000	280	699	195720	90286	35	Lean Line Sirloin Strips
20102000000	227	699	158673	90986	36	Lean Line Sirloin Strips
20102000000	199	699	139101	91686	37	Lean Line Sirloin Strips
20102000000	32	699	22368	92386	38	Lean Line Sirloin Strips
20102000000	31	679	21049	93086	39	Lean Line Sirloin Strips
20102000000	34	639	21726	100786	40	Lean Line Sirloin Strips
20102000000	41	639	26199	101486	41	Lean Line Sirloin Strips
20102000000	30	639	19170	102186	42	Lean Line Sirloin Strips
20102000000	30	639	19170	102886	43	Lean Line Sirloin Strips
20102000000	36	639	23004	110486	44	Lean Line Sirloin Strips
20102000000	28	639	17892	111186	45	Lean Line Sirloin Strips
20102000000	34	639	21726	111886	46	Lean Line Sirloin Strips
20102000000	41	639	26199	113086	47	Lean Line Sirloin Strips
20102000000	9	639	5751	120286	48	Lean Line Sirloin Strips
20102000000	39	639	24921	120986	49	Lean Line Sirloin Strips
20102000000	18	639	11502	121686	50	Lean Line Sirloin Strips
20102000000	21	639	13419	122386	51	Lean Line Sirloin Strips
20102000000	21	639	13419	123086	52	Lean Line Sirloin Strips
20102000000	31	639	19809	10687	53	Lean Line Sirloin Strips
20102000000	31	639	19809	11387	54	Lean Line Sirloin Strips
20102000000	38	639	24282	12087	55	Lean Line Sirloin Strips
20102000000	37	639	23643	12787	56	Lean Line Sirloin Strips

(continued)

Table 1 (continued).

UPC	Units	Price	Cost	Date	Week	Description
20102000000	18	639	11502	20387	57	Lean Line Sirloin Strips
20102000000	21	639	13419	21087	58	Lean Line Sirloin Strips
20102000000	31	639	19809	21787	59	Lean Line Sirloin Strips
20102000000	43	639	27477	22487	60	Lean Line Sirloin Strips
20102000000	22	699	14058	30387	61	Lean Line Sirloin Strips
20102000000	23	699	16077	31087	62	Lean Line Sirloin Strips
20102000000	22	699	15378	31787	63	Lean Line Sirloin Strips
20102000000	17	699	11883	32487	64	Lean Line Sirloin Strips
20102000000	11	699	7689	33187	65	Lean Line Sirloin Strips
20102000000	16	699	11184	40787	66	Lean Line Sirloin Strips
20102000000	24	699	16776	41487	67	Lean Line Sirloin Strips
20102000000	35	689	24115	42187	68	Lean Line Sirloin Strips
20102000000	33	689	22737	42887	69	Lean Line Sirloin Strips
20102000000	31	689	21359	50587	70	Lean Line Sirloin Strips
20102000000	43	689	29627	51287	71	Lean Line Sirloin Strips
20102000000	29	689	19981	51987	72	Lean Line Sirloin Strips
20102000000	27	729	19683	52687	73	Lean Line Sirloin Strips
20102000000	17	749	12733	60287	74	Lean Line Sirloin Strips
20102000000	18	769	13842	60987	75	Lean Line Sirloin Strips
20102000000	14	799	11186	61687	76	Lean Line Sirloin Strips
20102000000	16	799	12784	62387	77	Lean Line Sirloin Strips
20102000000	16	709	11344	63087	78	Lean Line Sirloin Strips
20102000000	17	709	12053	70787	79	Lean Line Sirloin Strips
20102000000	27	709	19143	71487	80	Lean Line Sirloin Strips
20102000000	28	709	19852	72887	82	Lean Line Sirloin Strips
20102000000	24	689	16536	80487	83	Lean Line Sirloin Strips
20102000000	17	689	11713	81187	84	Lean Line Sirloin Strips
20102000000	16	789	12624	81887	85	Lean Line Sirloin Strips
20102000000	20	799	15980	82587	86	Lean Line Sirloin Strips
20102000000	12	799	9588	90187	87	Lean Line Sirloin Strips
20102000000	18	799	14382	90887	88	Lean Line Sirloin Strips
20102000000	24	799	19176	91587	89	Lean Line Sirloin Strips
20102000000	13	799	10387	92287	90	Lean Line Sirloin Strips
20102000000	21	759	15939	92987	91	Lean Line Sirloin Strips
20102000000	10	759	7590	100687	92	Lean Line Sirloin Strips
20102000000	23	759	17457	101387	93	Lean Line Sirloin Strips
20102000000	20	759	15180	102087	94	Lean Line Sirloin Strips
20102000000	11	759	8349	102787	95	Lean Line Sirloin Strips
20102000000	17	759	12903	110387	96	Lean Line Sirloin Strips
20102000000	17	759	12903	111087	97	Lean Line Sirloin Strips
20102000000	13	729	9477	111787	98	Lean Line Sirloin Strips
20102000000	6	739	4434	112487	99	Lean Line Sirloin Strips
20102000000	9	739	6651	120187	100	Lean Line Sirloin Strips
20102000000	15	739	11085	120887	101	Lean Line Sirloin Strips
20102000000	19	739	14041	121587	102	Lean Line Sirloin Strips
20102000000	37	739	27343	122287	103	Lean Line Sirloin Strips
20102000000	6	739	4434	122987	104	Lean Line Sirloin Strips
20102000000	35	739	25865	10588	105	Lean Line Sirloin Strips
20102000000	25	739	18475	11288	106	Lean Line Sirloin Strips
20102000000	12	709	8508	11988	107	Lean Line Sirloin Strips
20102000000	14	709	9926	12688	108	Lean Line Sirloin Strips
20102000000	12	709	8508	20288	109	Lean Line Sirloin Strips
20102000000	19	709	13471	20988	110	Lean Line Sirloin Strips
20102000000	19	709	13471	21688	111	Lean Line Sirloin Strips
20102000000	24	709	17014	22388	112	Lean Line Sirloin Strips
20102000000	39	709	27651	30188	113	Lean Line Sirloin Strips

(continued)

Table 1 (continued).

UPC	Units	Price	Cost	Date	Week	Description
20102000000	48	709	34032	30888	114	Lean Line Sirloin Strips
20102000000	41	709	29069	31488	115	Lean Line Sirloin Strips
20102000000	39	709	27651	32288	116	Lean Line Sirloin Strips
20102000000	18	709	13302	32988	117	Lean Line Sirloin Strips
20102000000	35	709	25865	40588	118	Lean Line Sirloin Strips
20102000000	41	759	31119	41288	119	Lean Line Sirloin Strips
20102000000	40	759	30360	41988	120	Lean Line Sirloin Strips
20102000000	18	759	13662	42688	121	Lean Line Sirloin Strips
20102000000	22	759	16698	50388	122	Lean Line Sirloin Strips
20102000000	26	759	19734	51088	123	Lean Line Sirloin Strips
20102000000	19	809	15371	51788	124	Lean Line Sirloin Strips
20102000000	12	809	9708	52488	125	Lean Line Sirloin Strips
20102000000	22	829	18238	53188	126	Lean Line Sirloin Strips
20102000000	15	829	12435	60788	127	Lean Line Sirloin Strips
20102000000	24	829	19896	61488	128	Lean Line Sirloin Strips
20102000000	27	829	22383	62188	129	Lean Line Sirloin Strips
20102000000	13	869	11297	83088	139	Lean Line Sirloin Strips
20102000000	11	829	9119	62888	130	Lean Line Sirloin Strips
20102000000	23	829	19067	70588	131	Lean Line Sirloin Strips
20102000000	18	829	14922	71288	132	Lean Line Sirloin Strips
20102000000	16	829	13264	71988	133	Lean Line Sirloin Strips
20102000000	10	829	8290	72688	134	Lean Line Sirloin Strips
20102000000	21	829	17409	80288	135	Lean Line Sirloin Strips
20102000000	21	829	17409	80988	136	Lean Line Sirloin Strips
20102000000	30	829	24870	81688	137	Lean Line Sirloin Strips
20102000000	7	829	5803	82388	138	Lean Line Sirloin Strips
20102000000	8	869	6952	90688	140	Lean Line Sirloin Strips
20102000000	10	869	8690	91388	141	Lean Line Sirloin Strips
20102000000	11	869	9559	92088	142	Lean Line Sirloin Strips
20102000000	18	869	15642	92788	143	Lean Line Sirloin Strips
20102000000	10	809	8090	100488	144	Lean Line Sirloin Strips
20102000000	16	809	12944	101188	145	Lean Line Sirloin Strips
20102000000	12	809	9708	101888	146	Lean Line Sirloin Strips
20102000000	21	809	16989	102588	147	Lean Line Sirloin Strips
20102000000	10	809	8090	110188	148	Lean Line Sirloin Strips
20102000000	25	809	20225	110888	149	Lean Line Sirloin Strips
20102000000	2	809	1618	111588	150	Lean Line Sirloin Strips

Table 2. Data for individual UPCs (example: Le Menu Beef Stroganoff).

UPC	Units	Price	Cost	Date	Week	Description
5100006313	486	357	173502	10786	1	Le Menu Beef Stroganoff
5100006313	482	357	172074	10786	2	Le Menu Beef Stroganoff
5100006313	515	357	183885	11486	3	Le Menu Beef Stroganoff
5100006313	443	357	158151	12186	4	Le Menu Beef Stroganoff
5100006313	356	357	127092	12886	5	Le Menu Beef Stroganoff
5100006313	418	357	149226	20486	6	Le Menu Beef Stroganoff
5100006313	437	357	156009	21186	7	Le Menu Beef Stroganoff
5100006313	348	357	124236	21886	8	Le Menu Beef Stroganoff
5100006313	514	357	183498	22586	9	Le Menu Beef Stroganoff
5100006313	351	357	125307	30486	10	Le Menu Beef Stroganoff
5100006313	395	357	141015	31186	11	Le Menu Beef Stroganoff
5100006313	310	357	110670	31886	12	Le Menu Beef Stroganoff
5100006313	316	357	112812	32586	13	Le Menu Beef Stroganoff
5100006313	379	357	135303	40186	14	Le Menu Beef Stroganoff
5100006313	339	357	121023	40886	15	Le Menu Beef Stroganoff
5100006313	357	357	127449	41586	16	Le Menu Beef Stroganoff
5100006313	379	357	135303	42286	17	Le Menu Beef Stroganoff
5100006313	346	357	123522	42986	18	Le Menu Beef Stroganoff
5100006313	371	357	132447	50686	19	Le Menu Beef Stroganoff
5100006313	344	357	122808	51386	20	Le Menu Beef Stroganoff
5100006313	298	357	106386	52086	21	Le Menu Beef Stroganoff
5100006313	357	357	127449	52786	22	Le Menu Beef Stroganoff
5100006313	396	357	141372	60386	23	Le Menu Beef Stroganoff
5100006313	266	379	100814	61086	24	Le Menu Beef Stroganoff
5100006313	306	379	115974	61786	25	Le Menu Beef Stroganoff
5100006313	274	379	103846	62486	26	Le Menu Beef Stroganoff
5100006313	261	379	98919	70886	27	Le Menu Beef Stroganoff
5100006313	311	379	117869	71586	28	Le Menu Beef Stroganoff
5100006313	294	379	111426	72286	29	Le Menu Beef Stroganoff
5100006313	273	379	103467	72986	30	Le Menu Beef Stroganoff
5100006313	271	379	102709	80586	31	Le Menu Beef Stroganoff
5100006313	314	379	119006	81286	32	Le Menu Beef Stroganoff
5100006313	299	379	113321	81986	33	Le Menu Beef Stroganoff
5100006313	230	379	87170	82686	34	Le Menu Beef Stroganoff
5100006313	238	379	90202	90286	35	Le Menu Beef Stroganoff
5100006313	242	379	91718	90986	36	Le Menu Beef Stroganoff
5100006313	267	379	101193	81686	37	Le Menu Beef Stroganoff
5100006313	303	379	114837	92386	38	Le Menu Beef Stroganoff
5100006313	298	379	112942	83086	39	Le Menu Beef Stroganoff
5100006313	351	379	133029	100786	40	Le Menu Beef Stroganoff
5100006313	286	379	108394	101486	41	Le Menu Beef Stroganoff
5100006313	281	379	106499	102186	42	Le Menu Beef Stroganoff
5100006313	361	352	127072	102886	43	Le Menu Beef Stroganoff
5100006313	383	352	134816	110486	44	Le Menu Beef Stroganoff
5100006313	308	352	108416	111186	45	Le Menu Beef Stroganoff
5100006313	332	379	125828	111886	46	Le Menu Beef Stroganoff
5100006313	247	379	93613	113086	47	Le Menu Beef Stroganoff
5100006313	183	379	69357	120286	48	Le Menu Beef Stroganoff
5100006313	265	379	100435	120986	49	Le Menu Beef Stroganoff
5100006313	258	379	97782	121686	50	Le Menu Beef Stroganoff
5100006313	196	379	74284	122386	51	Le Menu Beef Stroganoff
5100006313	154	379	58366	123086	52	Le Menu Beef Stroganoff
5100006313	196	379	74284	10687	53	Le Menu Beef Stroganoff
5100006313	278	379	105362	11387	54	Le Menu Beef Stroganoff
5100006313	290	379	109910	12087	55	Le Menu Beef Stroganoff
5100006313	259	379	98161	12787	56	Le Menu Beef Stroganoff

(continued)

Table 2 (continued).

UPC	Units	Price	Cost	Date	Week	Description
5100006313	296	379	112184	20387	57	Le Menu Beef Stroganoff
5100006313	235	379	89065	21087	58	Le Menu Beef Stroganoff
5100006313	243	379	92097	27187	59	Le Menu Beef Stroganoff
5100006313	256	379	97024	22487	60	Le Menu Beef Stroganoff
5100006313	224	379	84896	30387	61	Le Menu Beef Stroganoff
5100006313	229	379	86791	31087	62	Le Menu Beef Stroganoff
5100006313	213	379	80727	31787	63	Le Menu Beef Stroganoff
5100006313	216	379	81864	32487	64	Le Menu Beef Stroganoff
5100006313	188	379	71252	33187	65	Le Menu Beef Stroganoff
5100006313	190	379	72010	40787	66	Le Menu Beef Stroganoff
5100006313	182	379	68978	41487	67	Le Menu Beef Stroganoff
5100006313	160	379	60640	42187	68	Le Menu Beef Stroganoff
5100006313	221	379	83759	42887	69	Le Menu Beef Stroganoff
5100006313	237	379	89823	50587	70	Le Menu Beef Stroganoff
5100006313	195	379	73905	51287	71	Le Menu Beef Stroganoff
5100006313	188	379	71252	51987	72	Le Menu Beef Stroganoff
5100006313	176	379	66704	52687	73	Le Menu Beef Stroganoff
5100006313	197	379	74663	60287	74	Le Menu Beef Stroganoff
5100006313	185	379	70115	60987	75	Le Menu Beef Stroganoff
5100006313	223	379	84517	61687	76	Le Menu Beef Stroganoff
5100006313	174	379	65946	62387	77	Le Menu Beef Stroganoff
5100006313	194	379	73526	63087	78	Le Menu Beef Stroganoff
5100006313	185	379	70115	70787	79	Le Menu Beef Stroganoff
5100006313	208	379	78832	71487	80	Le Menu Beef Stroganoff
5100006313	209	379	79211	72187	81	Le Menu Beef Stroganoff
5100006313	164	379	62156	72887	82	Le Menu Beef Stroganoff
5100006313	211	379	79969	80487	83	Le Menu Beef Stroganoff
5100006313	194	379	73526	81187	84	Le Menu Beef Stroganoff
5100006313	200	379	75800	81887	85	Le Menu Beef Stroganoff
5100006313	190	379	72010	82587	86	Le Menu Beef Stroganoff
5100006313	210	379	79590	90187	87	Le Menu Beef Stroganoff
5100006313	179	379	67841	90887	88	Le Menu Beef Stroganoff
5100006313	181	379	68599	91587	89	Le Menu Beef Stroganoff
5100006313	186	379	70494	92287	90	Le Menu Beef Stroganoff
5100006313	173	379	65567	92987	91	Le Menu Beef Stroganoff
5100006313	166	379	62914	100687	92	Le Menu Beef Stroganoff
5100006313	214	361	77254	101387	93	Le Menu Beef Stroganoff
5100006313	209	361	75449	102087	94	Le Menu Beef Stroganoff
5100006313	599	299	179101	102787	95	Le Menu Beef Stroganoff
5100006313	280	379	106120	110387	96	Le Menu Beef Stroganoff
5100006313	245	379	92855	111087	97	Le Menu Beef Stroganoff
5100006313	290	379	109910	111787	98	Le Menu Beef Stroganoff
5100006313	289	379	109531	112487	99	Le Menu Beef Stroganoff
5100006313	176	379	66704	120187	100	Le Menu Beef Stroganoff
5100006313	294	379	111426	120887	101	Le Menu Beef Stroganoff
5100006313	238	379	90202	121587	102	Le Menu Beef Stroganoff
5100006313	269	379	101951	122287	103	Le Menu Beef Stroganoff
5100006313	103	379	39037	122987	104	Le Menu Beef Stroganoff
5100006313	245	379	92855	10588	105	Le Menu Beef Stroganoff
5100006313	237	379	89823	11288	106	Le Menu Beef Stroganoff
5100006313	262	379	99298	11988	107	Le Menu Beef Stroganoff
5100006313	236	379	89444	12688	108	Le Menu Beef Stroganoff
5100006313	244	379	92476	20288	109	Le Menu Beef Stroganoff
5100006313	227	379	86033	20988	110	Le Menu Beef Stroganoff
5100006313	174	379	65946	21688	111	Le Menu Beef Stroganoff
5100006313	198	379	75042	22388	112	Le Menu Beef Stroganoff
5100006313	186	379	70494	30188	113	Le Menu Beef Stroganoff

(continued)

Table 2 (continued).

UPC	Units	Price	Cost	Date	Week	Description
5100006313	212	379	80348	30888	114	Le Menu Beef Stroganoff
5100006313	172	379	65188	31588	115	Le Menu Beef Stroganoff
5100006313	193	379	73147	32288	116	Le Menu Beef Stroganoff
5100006313	195	379	73905	32988	117	Le Menu Beef Stroganoff
5100006313	131	379	49649	40588	118	Le Menu Beef Stroganoff
5100006313	*158*	*379*	*59882*	*41288*	*119*	*Le Menu Beef Stroganoff*
5100006313	153	379	57987	41988	120	Le Menu Beef Stroganoff
5100006313	138	379	52302	42688	121	Le Menu Beef Stroganoff
5100006313	162	379	61398	60388	122	Le Menu Beef Stroganoff
5100006313	137	379	51923	51088	123	Le Menu Beef Stroganoff
5100006313	155	379	58745	51788	124	Le Menu Beef Stroganoff
5100006313	130	379	49270	52488	125	Le Menu Beef Stroganoff
5100006313	151	379	57229	53188	126	Le Menu Beef Stroganoff
5100006313	153	379	57987	60788	127	Le Menu Beef Stroganoff
5100006313	176	379	66704	61488	128	Le Menu Beef Stroganoff
5100006313	181	379	68599	62188	129	Le Menu Beef Stroganoff
5100006313	193	357	68901	83088	139	Le Menu Beef Stroganoff
5100006313	162	379	61019	62888	130	Le Menu Beef Stroganoff
5100006313	159	379	60261	70588	131	Le Menu Beef Stroganoff
5100006313	174	379	65946	71288	132	Le Menu Beef Stroganoff
5100006313	161	379	61019	71988	133	Le Menu Beef Stroganoff
5100006313	203	379	76937	72688	134	Le Menu Beef Stroganoff
5100006313	192	379	72768	80288	135	Le Menu Beef Stroganoff
5100006313	172	379	65188	80988	136	Le Menu Beef Stroganoff
5100006313	168	379	63672	81688	137	Le Menu Beef Stroganoff
5100006313	244	357	87108	82388	138	Le Menu Beef Stroganoff
5100006313	176	357	62832	90688	140	Le Menu Beef Stroganoff
5100006313	186	379	70494	91388	141	Le Menu Beef Stroganoff
5100006313	117	379	44343	92088	142	Le Menu Beef Stroganoff
5100006313	153	379	57987	92788	143	Le Menu Beef Stroganoff
5100006313	182	379	68978	100488	144	Le Menu Beef Stroganoff
5100006313	164	379	62156	101188	145	Le Menu Beef Stroganoff
5100006313	154	379	58366	101888	146	Le Menu Beef Stroganoff
5100006313	158	379	59882	102588	147	Le Menu Beef Stroganoff
5100006313	174	379	65946	110188	148	Le Menu Beef Stroganoff
5100006313	176	379	66704	110888	149	Le Menu Beef Stroganoff
5100006313	168	379	63672	111588	150	Le Menu Beef Stroganoff

Customer Counts

Figure 2 plots customer counts per week, which for the retail firm studied ranged from 505,164 to 861,844 over the time frame. The average customer count for this firm per week was on the order of 680,000.

Advertisement Space

The advertisement information gathered over the period relates only to *fresh* beef products, not convenience beef products. Consequently, in the analysis of convenience beef products, no assessment of the impact of advertising on item movement per 1,000 customers can be made. Importantly, information on customer counts and advertisement space must be *augmented* to the price and quantity information of the individual UPCs. That is, data pertaining to advertisement space and customer counts are not automatically part of the scanner data pertaining to the individual UPCs collected at the point of sale.

Advertisement space (in terms of square centimeters) for the respective beef products varied considerably from week to week (Figures 3-11). Descriptive statistics of the advertisement variables are exhibited in Table 3. Of all the carcass sections (brisket, chuck, ground, loin, rib, and round), ground beef is the most frequently advertised product (46 out of 113 weeks), whereas beef rib is the least frequently advertised product (18 out of 113 weeks). On the basis of print space, ground beef receives the most attention (on average 62 square centimeters), whereas rib receives the least attention (on average 11 square centimeters). The advertisement frequency for nonlean beef products is three times that for lean beef products. As well, the

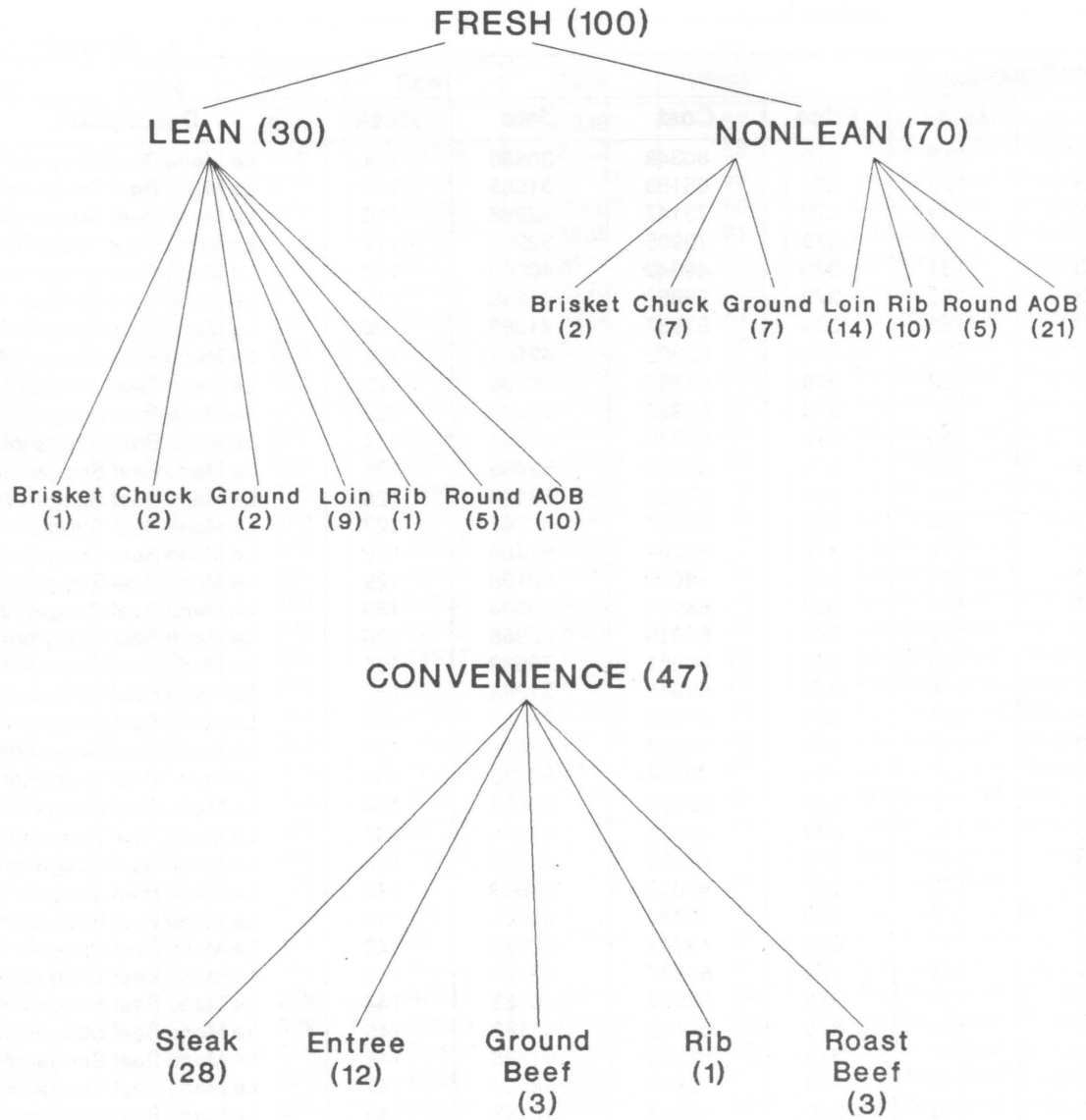

Figure 1. Schematic diagram of the UPCs.

Table 3. Advertisement space[a] for beef products by carcass section.

Variable	Mean	Std. Dev.	Median	Minimum	Maximum	Frequency	N
ADLEAN	26.6776	53.0243	0	0	252	31	113
ADNOLEAN	290.927	283.731	221.13	0	1343.72	96	113
ADBRISK	40.9891	98.7422	0	0	555.65	32	113
ADCHUCK	54.1262	133.099	0	0	557	21	113
ADGBEEF	62.539	139.916	0	0	825.6	46	113
ADLOIN	49.2113	108.059	0	0	598	29	113
ADRIB	11.2954	34.831	0	0	256	18	113
ADROUND	52.1808	138.014	0	0	695.2	22	113
ADAOB	47.2527	67.4795	2.75	0	277.2	57	113
ADVAOM[b]	829.34	387.306	769.93	197.2	2108.82	113	113

[a]In square centimeters.
[b]Fish, pork, poultry, lamb, and veal.

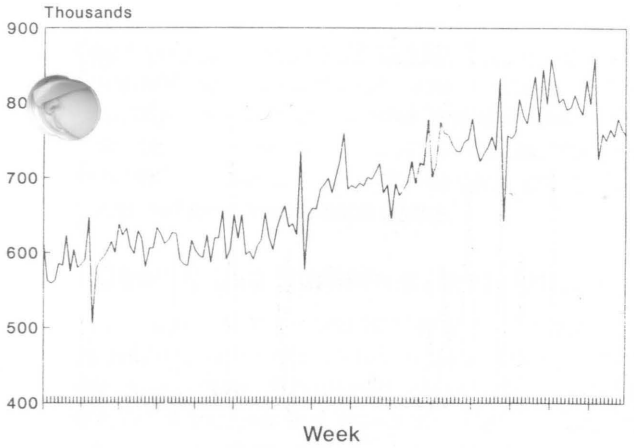

Figure 2. Customer counts.

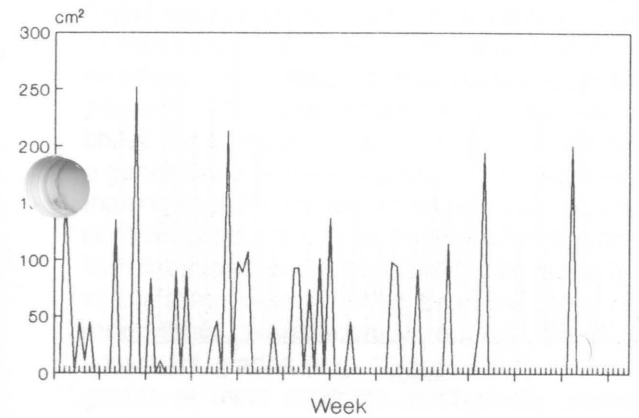

Figure 3. Advertisement space for lean beef products.

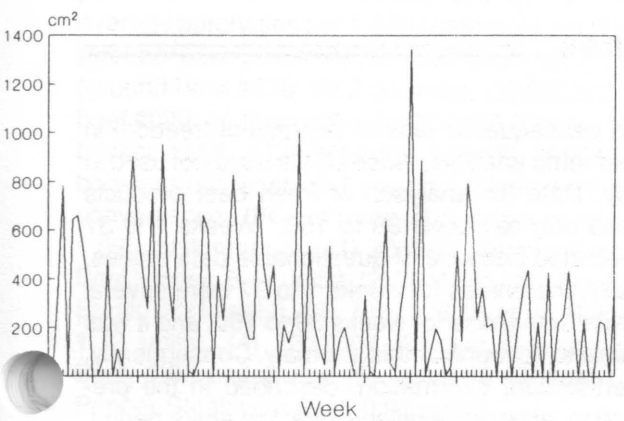

Figure 4. Advertisement space for nonlean beef products.

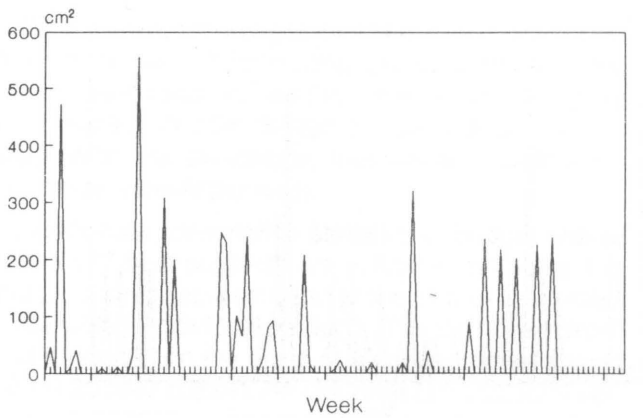

Figure 5. Advertisement space for brisket.

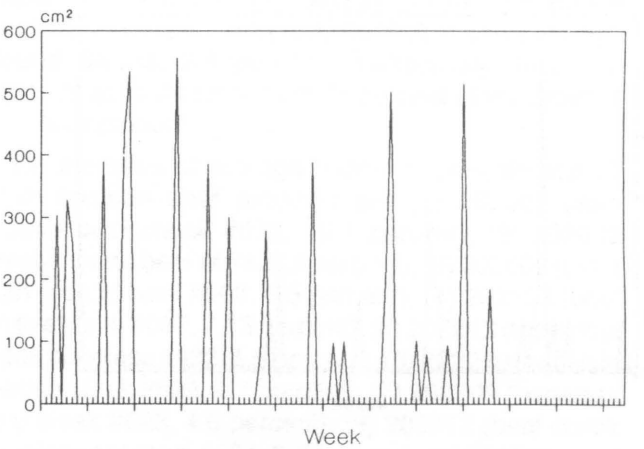

Figure 6. Advertisement space for chuck.

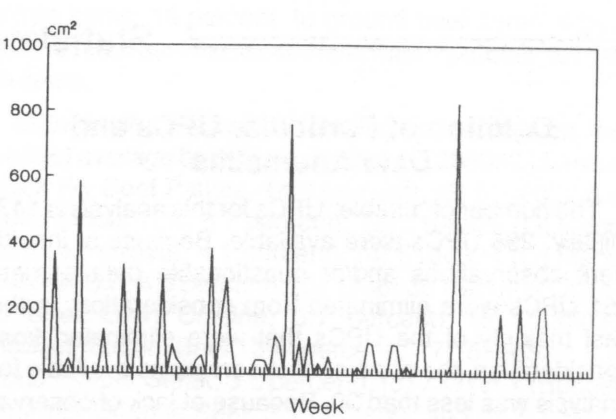

Figure 7. Advertisement space for ground beef.

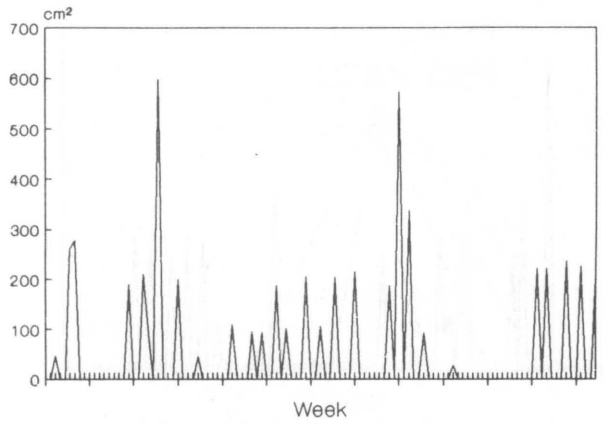

Figure 8. Advertisement space for loin.

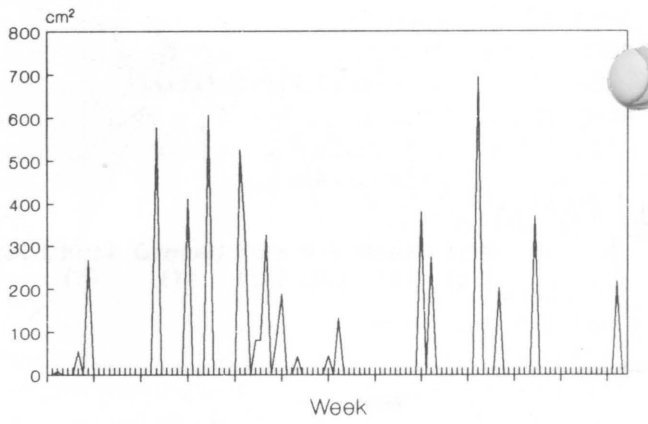

Figure 10. Advertisement space for round.

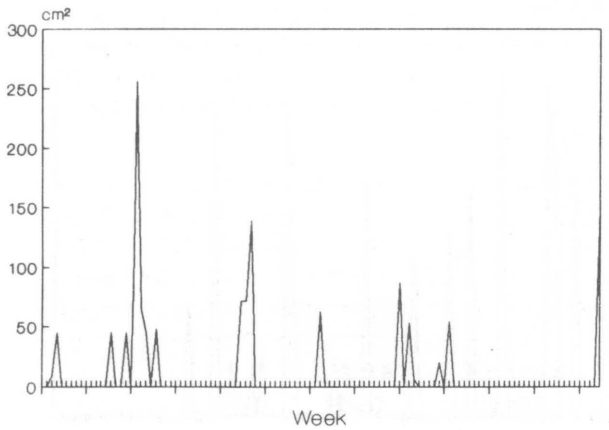

Figure 9. Advertisement space for rib.

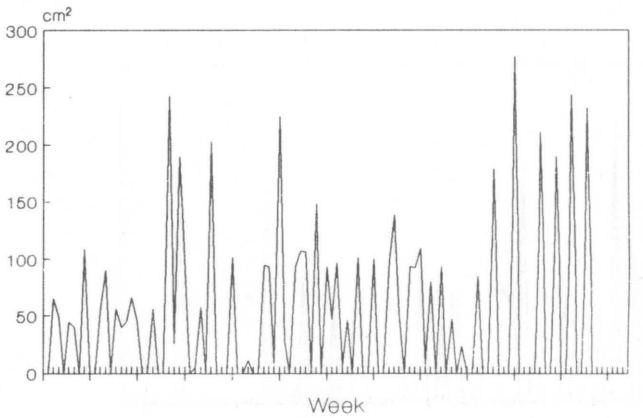

Figure 11. Advertisement space for all other beef.

print space for nonlean items is, on average, slightly more than 10 times that for lean items. Advertisement space for fish, pork, poultry, lamb, and veal items average almost 830 square centimeters weekly, roughly 2.5 times that for fresh beef products.

Statistical Procedures

Deletion of Particular UPCs and Data Anomalies

The number of "usable" UPCs for this analysis is 147. Initially, 298 UPCs were available. Because of insufficient observations and/or questionable data entries, 151 UPCs were eliminated from consideration. In the vast majority of the UPCs that were eliminated from consideration, the number of observations available for analysis was less than 30. Because of lack of observations and consequently lack of degrees-of-freedom in the econometric analysis, these UPCs were not used in this study. Data for analyses of fresh beef products correspond only to weeks 38 to 150. Weeks 1 to 37 were eliminated because of questionable data entries. Specifically, the entries for weeks 1 to 37 were several times larger than those for weeks 38 to 150, and it was not possible to account for this anomaly. Consequently, the advertisement information, described in the previous section, although available over the entire period,

deals only with weeks 38 to 150. This truncation of the advertisement information was necessary for compatibility with the price and quantity data. Data for analyses of convenience beef products, however, correspond to weeks 1 to 150. No data anomalies were observed for convenience items.

Descriptive Statistics (Individual UPCs)

Because of the confidentiality of the data, it is *not* possible to report observations for all beef products over the time frame in question. Descriptive statistics and graphical analysis are, however, used primarily to chart customer purchases of the various beef items over time.

Detailed descriptive statistics of prices and purchases per 1,000 customers for the 147 individual beef products are exhibited in Appendix B. Descriptive statistics correspond to the mean, median, standard deviation, minimum, and maximum. The mean and median relate to measures of central tendency, the standard deviation corresponds to a measure of dispersion, and the minimum and maximum define the range of the data. To illustrate, consider the UPC 2024500000 (Choice boneless brisket #062). The average price is $1.27 per pound (or 127 cents per pound), and the average purchase per 1,000 customers is roughly 17.6 pounds. As a general rule, lean beef products are more expensive than nonlean beef products. In this study, both lean and nonlean products correspond to *Choice* grades. The lean line brand for this firm is a Choice grade beef from which fat has been trimmed. Lean line brands for other retail firms are generally no-roll, Good (Select) equivalent grades (e.g. "Giant Lean"). Good (Select) grades of meat products are typically priced below equivalent cuts.

The top five lean line UPCs in terms of average purchases per 1,000 customers are (1) 201047 (gourmet ground round, 4.8 pounds), (2) 201023 (tailless T-bone steaks, 1.3 pounds), (3) 201029 (eye round roast, 0.9 pounds), (4) 201031 (sirloin tip fillets, 0.7 pounds), and (5) 201063 (beef cube steaks, 0.7 pounds). The top five nonlean line UPCs in terms of average purchases per 1,000 customers are (1) 202601 (ground beef chuck #079, 68.6 pounds), (2) 202600 (ground beef #078, 50.2 pounds), (3) 202602 (ground beef #080, 31.0 pounds), (4) 202450 (Choice boneless brisket #062, 17.6 pounds), and (5) 202012 (chuck boneless pot roast, 16.0 pounds). Similarly, the top five convenience UPCs in terms of average purchases per 1,000 customers are (1) 208989 (Armour Chicken Fry Beef Patties, 6.37 units), (2) 5015551 (Armour Salisbury Steak, 1.21 units), (3) 7337006 (Budget Sirloin Beef, 1.12 units), (4) 7337004 (Budget Gourmet Oriental Beef, 1.00 units), and (5) 7336006 (Budget Gourmet Pepper Steak with Rice, 0.92 units).

Graphs corresponding to movement (units) over time for each of the 147 beef items are available from the authors upon request. The graphs serve to summarize the variability in item movement on a week-to-week basis. With few exceptions, movement of beef items vary tremendously per week.

Additionally, descriptive statistics of budget shares for the 147 beef products are exhibited in Tables 4-6. Budget shares represent the proportion of beef sales attributable to individual products. The top 10 lean fresh beef products, on the basis of average budget shares are (1) 201047 (Lean Line Gourmet Ground, 27.5 percent), (2) 201023 (Lean Line Extra Lean Boneless Stew Meat, 9.1 percent), (3) 201029 (Lean Line Eye Round Roast, 8.1 percent), (4) 201031 (Lean Line Sirloin Tip Fillets, 5.9 percent), (5) 201059 (Lean Line Flank Steaks, 5.7 percent), (6) 201063 (Lean Line Beef Cube Steaks, 4.9 percent), (7) 201033 (Lean Line Sandwich Steaks, 4.5 percent), (8) 201045 (Lean Line Shish Kabob, 3.7 percent), (9) 201032 (Lean Line Ranch Broils, 3.7 percent), and (10) 201028 (Lean Line Eye Round Steaks, 3.5 percent). Collectively, these 10 products account for almost 77 percent of the sales of lean beef products.

On the basis of average budget shares, the top 10 fresh nonlean beef products are (1) 202601 (lean ground beef chuck #079, 16.1 percent), (2) 202600 (fresh ground beef #078, 8.9 percent), (3) 202602 (extra lean ground beef #080, 8.5 percent), (4) 202103 (beef rib eye steak #037, 7.13 percent), (5) 202213 (top sirloin steak boneless #032, 5.5 percent), (6) 202210 (beef loin T-bone steak #029, 4.7 percent), (7) 202209 (boneless strip steak #028, 4.6 percent), (8) 202012 (beef chuck boneless pot roast #054, 3.7 percent), (9) 202308 (beef round steak boneless #007, 3.0 percent), and (10) 202603 (ground beef gourmet #081, 2.6 percent). Collectively, these 10 products account for approximately 65 percent of the sales of fresh nonlean beef products.

Within the class of convenience beef products, on the basis of Table 6, roughly 58 percent of dollar sales is attributable to steak items; 19 percent is attributable to entree items; 16 percent, to ground beef items; 6 percent, to roast beef items; and less than 1 percent, to beef rib items.

Individually, the top 10 convenience items on the basis of average budget shares are (1) 208989 (Armour Chick Fry Beef Patties, 14.3 percent), (2) 5106322 (Le Menu Sirloin Tips, 6.7 percent), (3) 5106328 (Le Menu Yankee Potroast, 4.1 percent), (4) 5106324 (Le Menu Chop Sirloin, 4.0 percent), (5) 1386630 (Stouffer Oriental Beef Lean Cuisine, 3.7 percent), (6) 7337006 (Budget Sirloin Beef, 3.4 percent), (7) 5106327 (Le Menu Pepper Steak, 3.2 percent), (8) 7337004 (Budget Gourmet Oriental Beef, 3.1 percent), and (9) 5015916

(Classic Lite Steak Diane Mignonette, 3.0 percent), and (10) 5106313 (Le Menu Beef Stroganoff, 2.8 percent). Collectively, these items account for slightly more than 48 percent of the sales of convenience beef products.

Within the class of fresh beef products, by carcass section, on the basis of Tables 4 and 5, ground beef constitutes roughly 37 percent of dollar sales; loin products constitute 19 percent; rounds constitute almost 12 percent; ribs constitute nearly 10 percent; chuck products constitute 6 percent; and briskets constitute 4 percent. All other beef cuts constitute 11 percent of dollar sales. Importantly, in this retail firm, roughly 6 percent of fresh dollar sales is attributable to lean beef items, whereas 94 percent is attributable to nonlean beef items.

Average dollar sales per week for convenience and fresh beef products are exhibited in Table 7. Convenience beef products generated nearly $36,000 sales per week, whereas fresh beef products yielded almost $600,000 in sales per week. Within the class of convenience products, steak items, ground beef items, and beef entrees were most important in terms of dollar sales. Within the class of fresh beef products, by carcass section, ground beef and loin products were the top contributors to dollar sales. Finally, lean beef products constituted about $34,000 per week in sales, whereas nonlean beef products constituted almost $564,000 per week in sales.

Table 4. Budget shares for fresh lean beef products.

UPC	Mean	Std. Dev.	Median	Minimum	Maximum
201020	.0048	.0021	.0043	.0004	.0099
201023	.0909	.0365	.0800	.0458	.2649
201027	.0171	.0039	.0174	.0078	.0287
201031	.0589	.0115	.0607	.0272	.0799
201036	.0317	.0055	.0322	.0193	.0451
201043	.0031	.0018	.0028	0	.0081
201047	.2757	.0386	.2769	.1809	.3832
201061	.0068	.0026	.0064	.0010	.0136
201021	.0132	.0066	.0119	.0009	.0349
201022	.0199	.0032	.0194	.0142	.0307
201024	.0107	.0054	.0097	.0039	.0339
201025	.0082	.0030	.0074	.0045	.0198
201028	.0351	.0083	.0338	.0214	.0637
201029	.0808	.0238	.0767	.0519	.2159
201032	.0371	.0050	.0378	.0241	.0480
201033	.0448	.0053	.0446	.0325	.0776
201039	.0177	.0073	.0152	.0088	.0460
201040	.0211	.0135	.0169	.0065	.0803
201044	.0112	.0065	.0099	.0006	.0353
201045	.0373	.0072	.0373	.0194	.0578
201048	.0140	.0031	.0137	.0074	.0236
201059	.0573	.0144	.0557	.0383	.1769
201062	.0020	.0015	.0018	0	.0065
201063	.0491	.0145	.0530	.0071	.0713
201026	.0023	.0016	.0021	0	.0076
201030	.0129	.0081	.0112	.0042	.0630
201034	.0124	.0024	.0119	.0070	.0187
201042	.0024	.0016	.0022	.0002	.0119
201046	.0067	.0038	.0056	.0010	.0172
201060	.0148	.0062	.0138	.0030	.0373

Table 5. Budget shares for fresh nonlean beef products.

UPC	Mean	Std. Dev.	Median	Minimum	Maximum
202100	.0003	.0002	.0002	0	.0009
202101	.0018	.0064	.0006	0	.0526
202103	.0727	.0159	.0697	.0499	.1506
202105	.0006	.0012	.0003	.0000	.0107
202106	.0005	.0003	.0005	.0000	.0014
202107	.0019	.0033	.0011	.0000	.0252
202109	.0027	.0047	.0018	.0008	.0411
202016	.0060	.0019	.0056	.0029	.0127
202205	.0068	.0049	.0056	.0028	.0327
202017	.0020	.0005	.0019	.0011	.0032
202206	.0018	.0015	.0014	.0003	.0138
202019	.0262	.0158	.0217	.0079	.0855
202210	.0469	.0084	.0450	.0285	.0738
202213	.0547	.0301	.0465	.0282	.2447
202212	.0060	.0047	.0049	.0005	.0478
202211	.0097	.0020	.0095	.0043	.0150
202214	.0001	.0002	.0001	0	.0016
202215	.0061	.0013	.0061	.0032	.0119
202306	.0022	.0016	.0018	.0008	.0115
202308	.0298	.0259	.0232	.0120	.1475
202309	.0158	.0070	.0146	.0084	.0537
202311	.0013	.0016	.0009	.0001	.0131
202312	.0054	.0021	.0054	.0015	.0172
202313	.0105	.0038	.0094	.0059	.0363
202314	.0050	.0023	.0046	.0019	.0154
202315	.0005	.0002	.0005	.0001	.0010
202316	.0001	.0005	.0001	.0000	.0003
202317	.0006	.0002	.0005	.0002	.0014
202318	.0250	.0113	.0211	.0113	.0603
202319	.0139	.0096	.0099	.0036	.0447
202320	.0004	.0001	.0004	.0002	.0008
202321	.0033	.0038	.0022	.0008	.0238
202322	.0004	.0002	.0004	.0000	.0011
202323	.0005	.0003	.0005	.0000	.0013
202324	.0005	.0002	.0004	.0001	.0011
202209	.0463	.0243	.0380	.0226	.1416
202400	.0039	.0021	.0034	.0013	.0112
202450	.0221	.0344	.0092	.0042	.1834
202451	.0222	.0112	.0185	.0100	.0719
202500	.0203	.0066	.0193	.0098	.0588
202501	.0038	.0019	.0040	.0002	.0090
202503	.0216	.0031	.0216	.0149	.0333
202504	.0006	.0003	.0006	.0001	.0018
202505	.0122	.0175	.0066	.0030	.1130
202506	.0014	.0005	.0015	.0003	.0029
202507	.0097	.0014	.0097	.0064	.0137
202508	.0061	.0021	.0057	.0032	.0152
202550	.0037	.0008	.0036	.0023	.0070
202600	.0888	.0213	.0860	.0470	.1731
202601	.1609	.0165	.1611	.1228	.2136
202602	.0849	.0145	.0830	.0570	.1432
202603	.0264	.0032	.0259	.0201	.0343
202605	.0011	.0011	.0006	.0000	.0036
202607	.0124	.0013	.0125	.0091	.0154
8858531	.0003	.0006	.0000	0	.0027
202608	.0133	.0024	.0133	.0086	.0231
202609	.0032	.0030	.0013	.0007	.0115
202203	.0010	.0030	.0003	0	.0246

(continued)

Table 5 (continued).

UPC	Mean	Std. Dev.	Median	Minimum	Maximum
8858507	.0023	.0018	.0026	0	.0117
202325	.0000	.0000	.0000	0	.0002
8858508	.0043	.0028	.0046	0	.0207
201658	.0000	.0000	.0000	0	.0002
202006	.0050	.0010	.0050	.0027	.0076
202005	.0006	.0004	.0005	.0000	.0020
202009	.0088	.0037	.0078	.0038	.0196
202008	.0063	.0026	.0055	.0026	.0152
202014	.0009	.0007	.0007	0	.0035
202015	.0003	.0003	.0003	0	.0017
202007	.0053	.0017	.0053	.0019	.0088
202012	.0373	.0225	.0307	.0122	.1196

Table 6. Budget shares for convenience beef products.

UPC	Mean	Std. Dev.	Median	Minimum	Maximum
1380011	.0209	.0097	.0221	0	.0551
2581923	.0105	.0136	.0004	0	.0721
2581927	.0243	.0244	.0238	0	.1260
2581961	.0206	.0081	.0226	0	.0387
1380032	.0155	.0071	.0160	0	.0289
5015400	.0253	.0236	.0296	0	.1179
5015409	.0091	.0129	0	0	.0627
5015410	.0092	.0126	.0012	0	.0805
5015412	.0077	.0117	0	0	.0607
5015551	.0227	.0356	0	0	.1978
5015910	.0127	.0129	.0111	0	.0877
1380059	.0100	.0066	.0106	0	.0254
5015916	.0302	.0122	.0292	.0015	.0755
5106313	.0284	.0158	.0236	.0117	.0913
2582032	.0049	.0077	0	0	.0336
5015413	.0063	.0109	0	0	.0678
5106322	.0673	.0318	.0601	.0234	.1905
5106324	.0405	.0221	.0323	.0142	.1386
5106327	.0317	.0139	.0293	.0123	.1165
4482503	.0065	.0093	.0002	0	.0424
5015550	.0114	.0155	0	0	.0559
7336006	.0289	.0198	.0232	.0086	.1529
7337004	.0312	.0230	.0256	0	.1561
1380610	.0086	.0066	.0085	0	.0503
7338003	.0276	.0232	.0367	0	.0987
1382010	.0086	.0111	0	0	.0546
1382011	.0125	.0161	0	0	.0708
1386620	.0192	.0139	.0202	0	.1038
1386630	.0372	.0215	.0372	0	.1563
208989	.1438	.2079	.0492	.0102	.6735
1386631	.0108	.0198	0	0	.1307
1851470	.0031	.0049	0	0	.0263
2580049	.0235	.0084	.0250	.0023	.0518
3687184	.0036	.0043	0	0	.0164
4482511	.0068	.0103	.0002	0	.0461
5106328	.0413	.0188	.0375	.0149	.1373
7112088	.0065	.0086	0	0	.0267
7112187	.0108	.0147	0	0	.0556
7338009	.0135	.0154	0	0	.0722
759010	.0137	.0187	.0049	0	.1081

(continued)

Table 6 (continued).

UPC	Mean	Std. Dev.	Median	Minimum	Maximum
1380627	.0076	.0063	.0077	0	.0291
5015414	.0046	.0068	0	0	.0231
7336007	.0271	.0205	.0201	.0087	.1544
7338005	.0169	.0148	.0220	0	.0780
1382023	.0153	.0201	0	0	.0779
5015923	.0265	.0190	.0294	0	.0760
7337006	.0344	.0237	.0294	0	.1528

Table 7. Average dollar sales per week for convenience and fresh beef products.

Convenience Beef Products

Category	Average Dollar Sales Per Week
Convenience beef products	$35,729
Steak products	19,351
Beef entrees	6,226
Ground beef products	7,863
Beef ribs	260
Roast beef	2,027

Fresh Beef Products

Category	Average Dollar Sales Per Week
Fresh beef products	$597,897
By carcass section	
Brisket	26,638
Loin	113,531
Rib	59,946
Round	71,038
Ground	222,934
Chuck	39,920
AOB	66,887
Lean	34,206
Nonlean	563,691

Descriptive Statistics (Commodity Groups)

Descriptive statistics of prices and purchases per 1,000 customers for aggregate beef commodity groups are exhibited in Table 8. The average price of lean beef items in the aggregate is $3.47 per pound; in comparison, the price of nonlean beef, on the average, is $2.42 per pound, roughly 70 percent of the price of lean beef. Thus, the price premium for lean beef is on the order of 40 percent in this retail firm. Except for loin, the price of lean products exceeds the price of nonlean products. In particular, the price for lean brisket is about 1.4 times that of nonlean brisket; for rib the price premium is 80 percent; for round, 30 percent; for ground, 50 percent; and for chuck, 20 percent.

In the aggregate for this retail firm, the average purchase per 1,000 customers for lean products is almost 14 pounds per week. In comparison, the average purchase per 1,000 customers for nonlean products is about 336 pounds. The average purchase of convenience products, per 1,000 customers, is roughly 23 units. The principal beef product in terms of purchases per 1,000 customers is ground beef (nearly 170 pounds), and the least important product is rib (almost 20 pounds). Purchases per 1,000 customers for the remaining aggregate groups are on the order of 25 to 40 pounds. For convenience products, the key products in terms of product movement are steak, ground beef, and entrees. The least important convenience items in terms of product movement are roasts and ribs.

Finally, Figures 12-33 are graphs corresponding to purchases over time for each of the beef commodity groups. With few exceptions, purchases of the aggregate beef products vary tremendously on a weekly basis.

Table 8. Descriptive statistics of prices and purchases per 1,000 customers for aggregate beef commodity groups.

Variable	Mean	Median	Std. Dev.	Min	Max	N
			Prices			
LEAN						
PFLEAN	347.04	349.03	10.68	281.74	362.02	113
PFLBRISK	249.88	249.00	10.81	229.00	269.00	113
PFLRIB	772.09	759.00	57.27	659.00	889.00	113
PFLLOIN	429.52	432.20	20.80	380.68	474.40	113
PFLAOB	378.66	387.13	23.78	235.53	405.76	113
PFLROUND	296.38	399.74	18.16	310.27	421.81	113
PFLGRND	277.82	280.02	11.98	260.49	300.42	113
PFLCHUCK	312.83	312.29	15.13	279.73	340.80	113
NONLEAN						
PFNLEAN	242.25	249.86	26.13	189.49	295.41	113
PFNLBRSK	173.64	180.64	27.52	99.42	211.10	113
PFNLRIB	418.87	417.55	37.01	240.45	504.40	113
PFNLLOIN	441.20	432.98	68.27	279.12	570.02	113
PFNLAOB	268.26	278.08	36.78	164.90	315.50	113
PFNLRND	303.37	316.92	45.24	177.03	264.71	113
PRNLGRND	187.74	194.80	23.05	132.29	221.15	113
PFNLCHCK	262.99	277.60	47.59	125.48	325.58	113
CONVEN						
PCON	245.06	249.47	23.38	183.45	283.36	150
PCSTEAK	259.53	263.26	17.96	175.20	291.20	150
PCGBEEF	170.11	159.00	25.74	97.84	199.00	150
PCROAST	320.79	302.93	41.06	201.29	373.00	150
PCENTREE	258.55	251.41	35.61	145.51	379.00	150
PCRIB	378.19	389	16.02	299.00	389.00	62
			Purchases per 1,000 Customers			
LEAN						
FLEAN	13.96	13.94	1.74	7.14	18.84	113
FLBRISK	0.34	0.29	0.13	0.10	0.90	113
FLCHUCK	0.33	0.32	0.12	0.08	0.65	113
FLGRND	5.03	5.17	0.76	2.68	6.93	113
FLLOIN	1.64	1.63	0.32	0.92	2.50	113
FLRIB	.08	0.07	0.04	0.00	0.21	113
FLROUND	2.23	2.10	0.72	0.93	6.88	113
FLAOB	4.30	4.10	0.96	2.08	10.00	113
NONLEAN						
FNLEAN	336.34	318.07	72.29	182.61	526.48	113
FNLBRSK	25.50	12.15	37.52	4.60	213.92	113
FNLCHUCK	25.37	16.93	24.89	8.14	126.87	113
FNLGRND	163.96	152.37	38.13	87.21	319.76	113
FNLLOIN	36.93	32.87	13.82	15.06	90.01	113
FNLRIB	19.48	18.63	6.49	9.52	57.67	113
FNLROUND	33.78	24.59	25.45	12.41	130.85	113
FNLAOB	31.30	25.95	15.72	15.90	118.87	113
CONVEN						
CSTEAK	11.20	10.87	3.04	4.11	20.70	150
CENTREE	3.81	2.77	2.47	0.20	12.34	150
CGBEEF	6.93	1.94	11.06	0.46	46.07	150
CROAST	0.97	0.84	0.47	0.39	3.47	150
CRIB	0.25	0.24	0.19	0.00	1.25	62

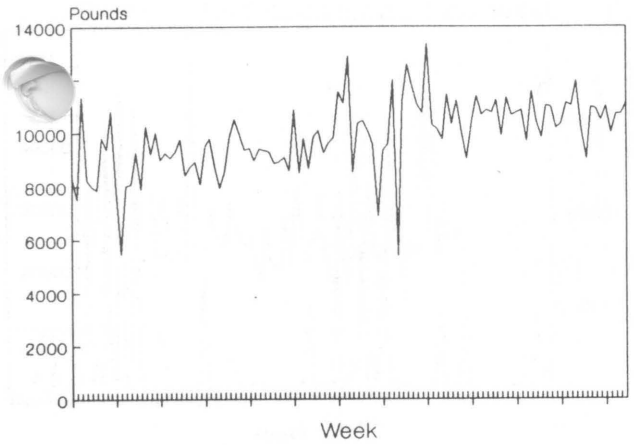

Figure 12. Purchases of fresh lean beef.

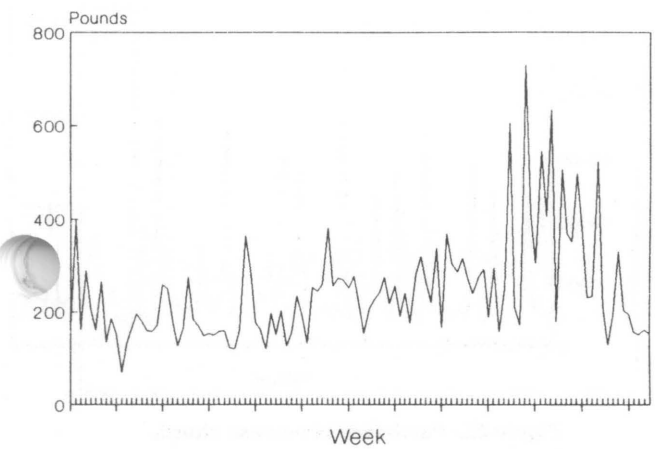

Figure 13. Purchases of lean brisket.

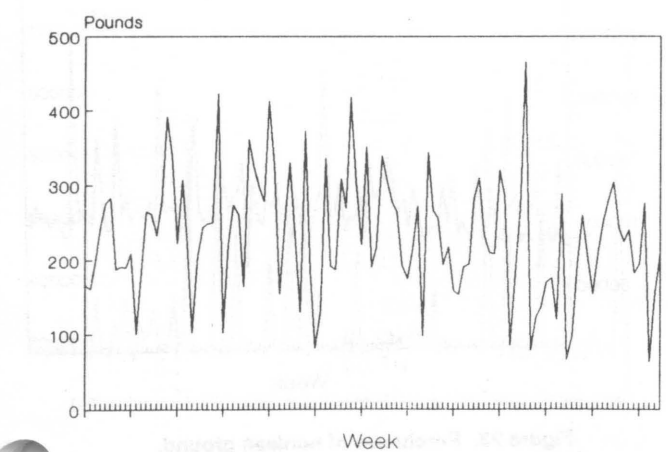

Figure 14. Purchases of lean chuck.

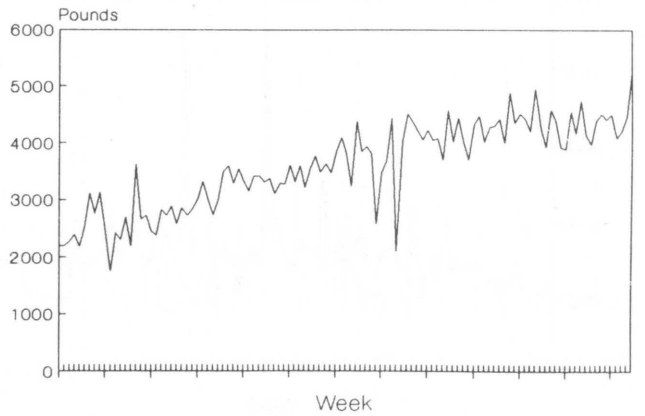

Figure 15. Purchases of lean ground beef.

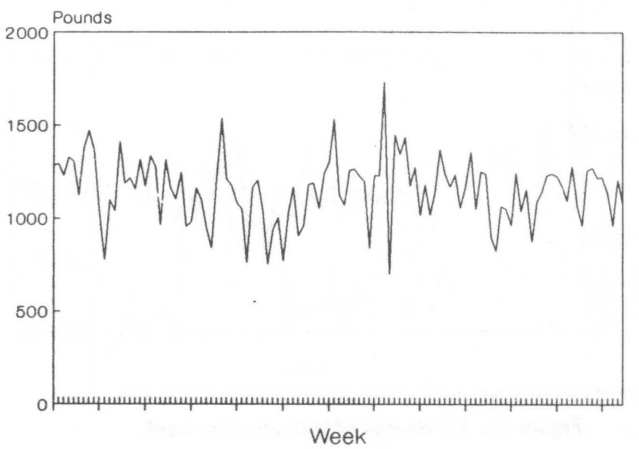

Figure 16. Purchases of lean loin.

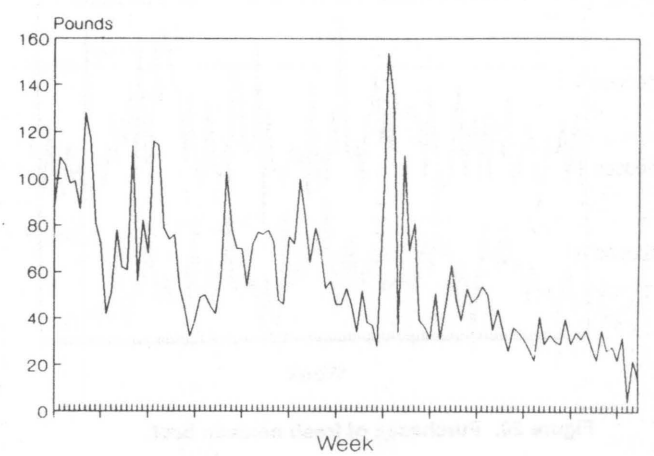

Figure 17. Purchases of lean rib.

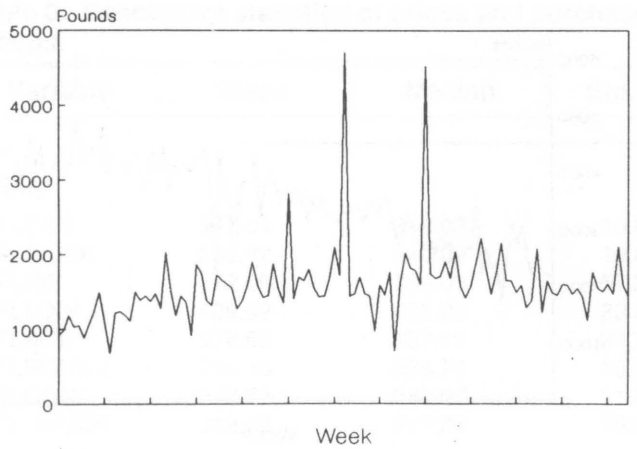

Figure 18. Purchases of lean round.

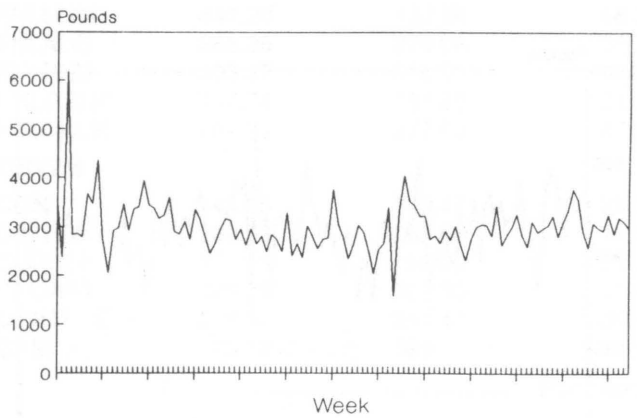

Figure 19. Purchases of lean all other beef.

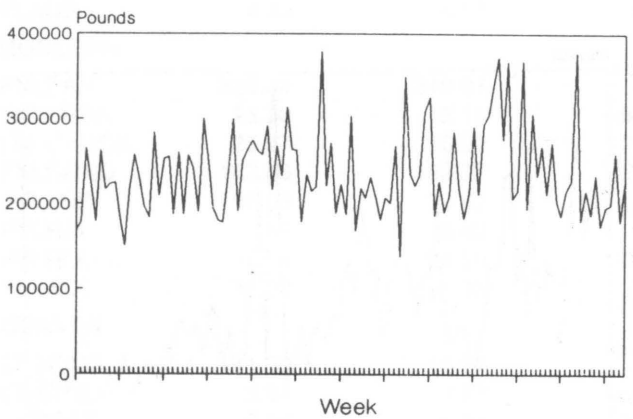

Figure 20. Purchases of fresh nonlean beef.

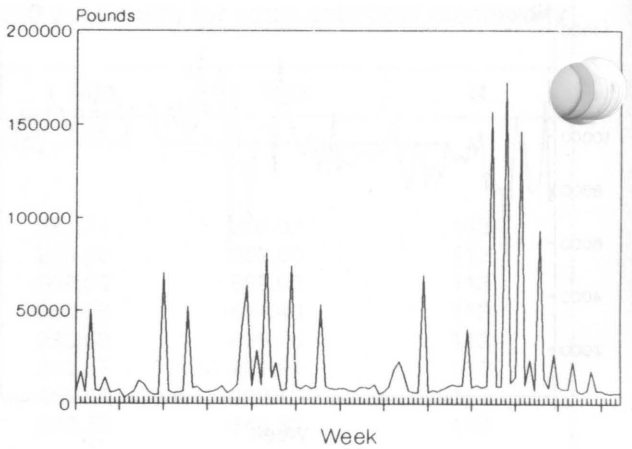

Figure 21. Purchases of nonlean brisket.

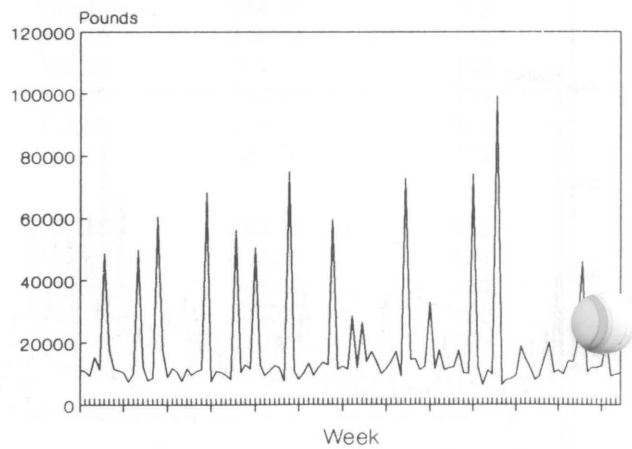

Figure 22. Purchases of nonlean chuck.

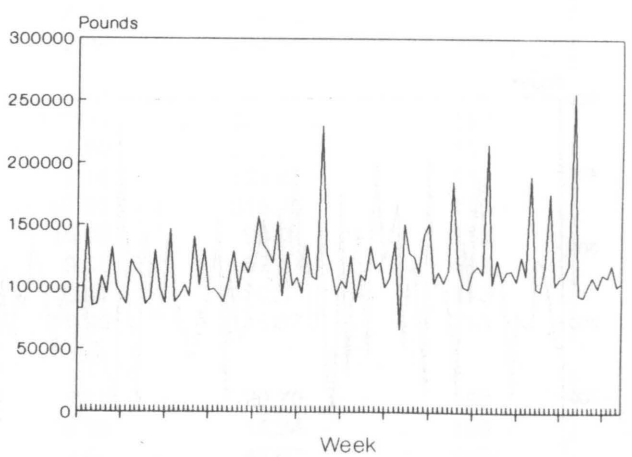

Figure 23. Purchases of nonlean ground.

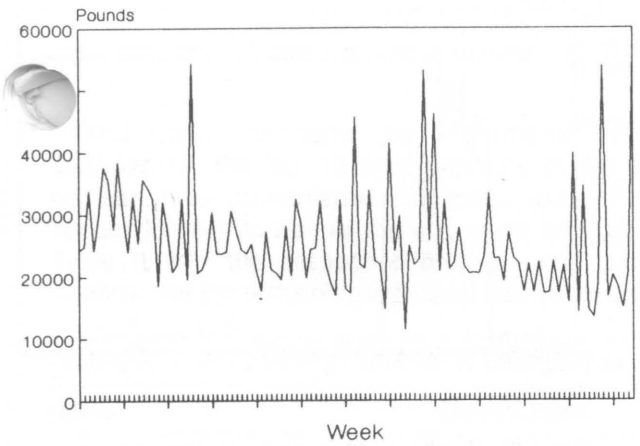

Figure 24. Purchases of nonlean loin.

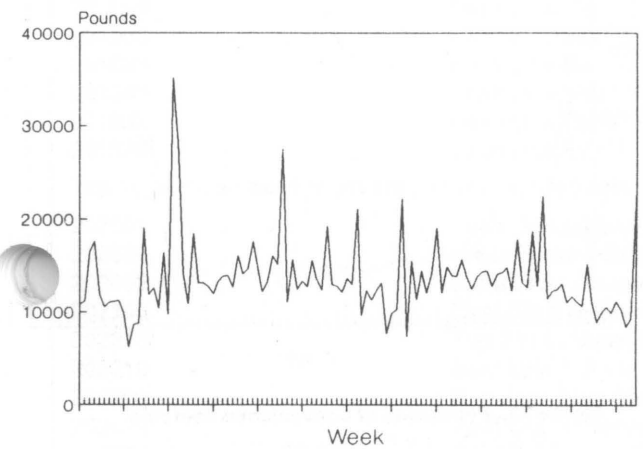

Figure 25. Purchases of nonlean rib.

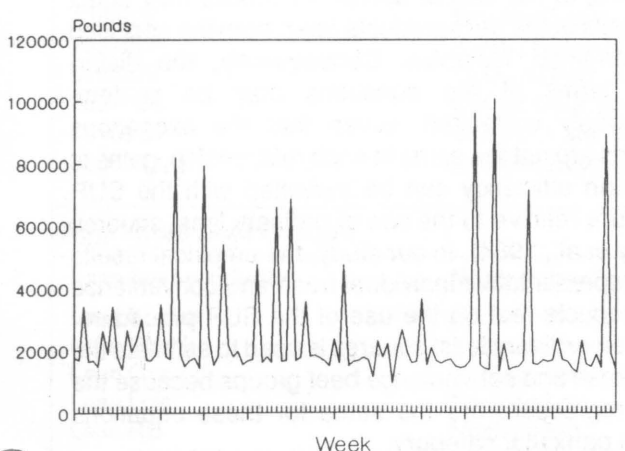

Figure 26. Purchases of nonlean round.

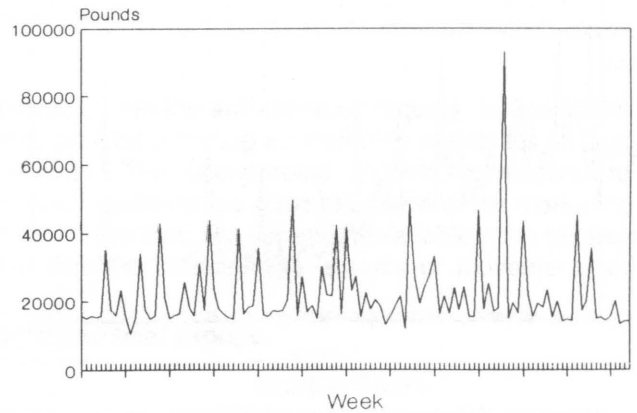

Figure 27. Purchases of nonlean all other beef.

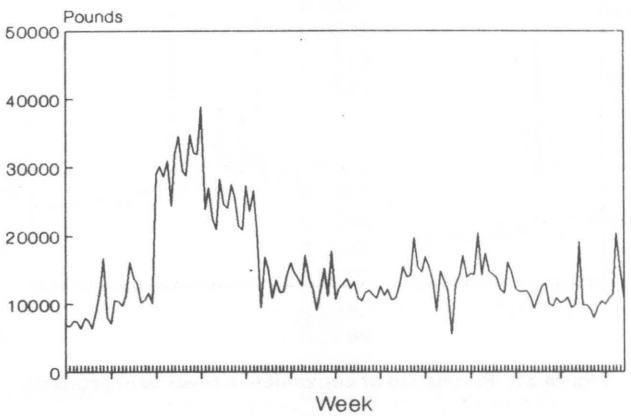

Figure 28. Purchases of convenience products.

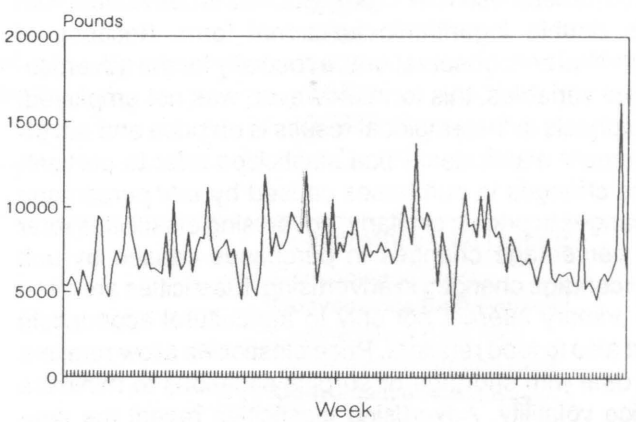

Figure 29. Purchases of convenience steak products.

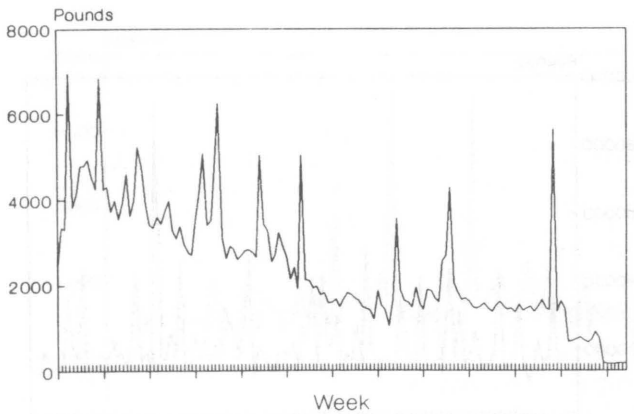

Figure 30. Purchases of convenience beef entrees.

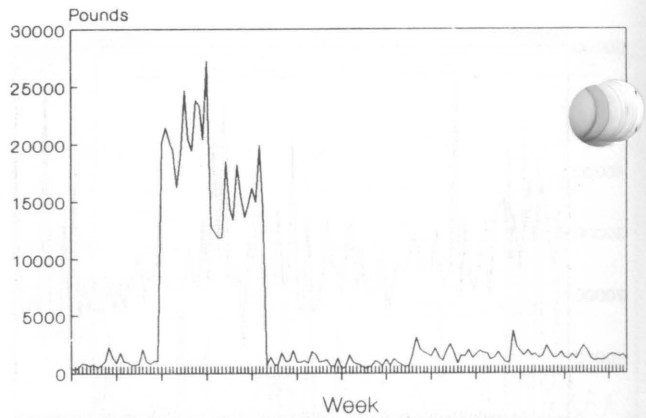

Figure 32. Purchases of convenience ground beef products.

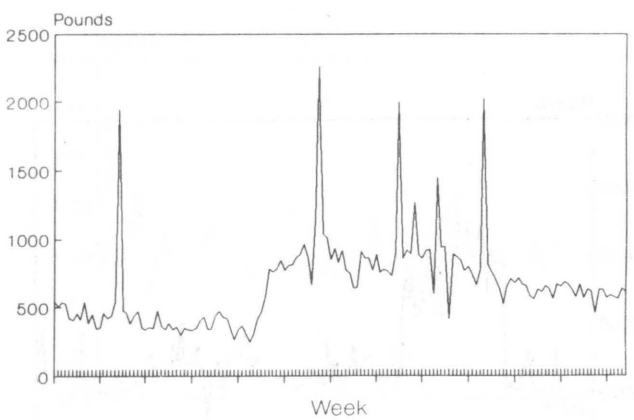

Figure 31. Purchases of convenience roast beef products.

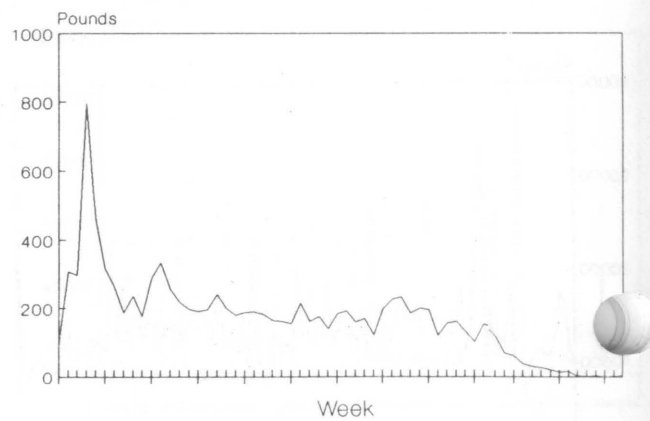

Figure 33. Purchases of convenience beef ribs.

Econometric Analysis

The purpose of econometric analysis in this study is to develop models to explain variation in product movement. The functional form chosen for the demand relationships is open to empiricism. The study rests on the use of the linear functional form. The interpretation of parameter estimates as elasticities is convenient with the double logarithmic functional form. Because of potential zero observations, especially for the advertisement variables, this form, however, was not employed. Emphasis in the empirical results is on price and advertisement elasticities. Price elasticities refer to percentage changes in purchases caused by *unit* percentage changes in prices; similarly, advertising elasticities refer to percentage changes in purchases caused by unit percentage changes in advertising. Elasticities are often of primary interest not only to agricultural economists but also to food retailers. Price elasticities allow retailers to deal with shortage or surplus situations to minimize price volatility. Advertising elasticities reveal the sensitivity of purchases to advertisement efforts.

Under the assumption that supply is perfectly elastic in this local market, a seemingly unrelated regression (SUR) procedure is workable. Random exogenous variates such as general level of economic activity, competitors' actions, prices of nonmeat items within the retail firm, or the lack of certain influences may affect purchases of the beef products apart from the specified predetermined variables. Consequently, the disturbance terms of the equations may be contemporaneously correlated. Given that the exogenous variables are not the same in each relationship, gains in estimation efficiency can be expected with the SUR procedure relative to the use of ordinary least squares (Fomby et al., 1984). In our study, the empirical results of the representative individual fresh and convenience beef products rest on the use of the SUR procedure. However, ordinary least squares is used to estimate the broad fresh and convenience beef groups because the set of regressors are the same for these equations within a particular category.

Empirical Results

This section concerns the econometric demand analyses for the top 10 beef products in the lean, nonlean, and convenience categories (according to budget shares) as well as the aggregate beef groups. Table 9 lists the respective products and groups. Analyses for the remaining individual beef products are available from the authors upon request. Space limitations prohibit reporting econometric results for all beef products. The econometric models correspond to demand relationships at the retail level of the marketing chain for this firm. The dependent variable in the respective demand relationships is units of movement per

Table 9. Top 10 beef products by category and list of aggregate beef groups.

UPC	Description	Budget Share
Top 10 lean beef products (according to budget share)		
201047	Lean Line Gourmet Round	0.2757
201023	Lean Line Extra Lean Boneless Stew Meat	0.0909
201029	Lean Line Eye Round Roast	0.0808
201031	Lean Line Sirloin Tip Fillets	0.0589
201059	Lean Line Flank Steaks	0.0573
201063	Lean Line Beef Cube Steaks	0.0491
201033	Lean Line Sandwich Steaks	0.0448
201045	Lean Line Shish Kabob	0.0373
201032	Lean Line Ranch Broils	0.0371
201028	Lean Line Eye Round Steaks	0.0351
Top 10 nonlean beef products (according to budget shares)		
202601	Lean Ground Beef Chuck #079	0.1609
202600	Fresh Ground Beef #078	0.0888
202602	Extra Lean Ground Beef #080	0.0849
202103	Beef Rib Eye Steak #037	0.0727
202213	Top Sirloin Steak Boneless #032	0.0547
202210	Beef Loin T-Bone Steak #029	0.0469
202209	Boneless Strip Steak #028	0.0463
202012	Beef Chuck Boneless Pot Roast #054	0.0373
202308	Beef Round Steak Boneless #007	0.0298
202603	Ground Beef Gourmet #081	0.0264
Top 10 convenience beef products (according to budget share)		
208989	Armour Chick Fry Beef Patties	0.1438
5106322	Le Menu Sirloin Tips	0.0673
5106328	Le Menu Yankee Potroast	0.0413
5106324	Le Menu Chop Sirloin	0.0405
1386630	Stouffer Oriental Beef Lean Cuisine	0.0372
7337006	Budget Sirloin Beef	0.0344
5106327	Le Menu Pepper Steak	0.0317
7337004	Budget Gourmet Oriental Beef	0.0312
5015916	Classic Lt Steak Diane Mignonette	0.0302
5106313	Le Menu Beef Stroganoff	0.0284

Aggregate Beef Groups

Lean beef products	Nonlean beef products	Convenience beef products
Lean Brisket	Nonlean Brisket	Convenience Steak
Lean Chuck	Nonlean Chuck	Convenience Beef Entrees
Lean Ground	Nonlean Ground	Convenience Beef Ribs
Lean Loin	Nonlean Loin	Convenience Ground Beef
Lean Rib	Nonlean Rib	Convenience Roast Beef
Lean Round	Nonlean Round	
Lean All Other Beef	Nonlean All Other Beef	

1,000 customers. The respective exogenous (independent) variables are (1) own-price, (2) prices of competing products, (3) advertisement variables, (4) seasonality (monthly dummy variables), and (5) a dummy variable for holidays. Simply put, the purpose of the econometric analysis is to identify and assess factors affecting purchases per 1,000 customers. Emphasis is on price elasticities and on advertisement elasticities.

For the respective econometric analyses, it is necessary to operationalize the generic specifications given by equation 2 (see section titled "Conceptual Framework for the Analysis"). For example, in the econometric model for lean beef products, individual UPC 201047 (Lean Line Gourmet Ground Round), cross-price variables correspond to competing lean cuts, namely, chuck, brisket, loin, rib, round, and all other beef. Prices of nonlean beef products, convenience beef products, and meat products other than beef (pork, poultry, and fish) are also incorporated in the model. Similarly, in the econometric model for nonlean beef products, for example individual UPC 202210 (beef loin T-bone steak #029), cross-price variables correspond to competing nonlean cuts, namely, brisket, chuck, ground, rib, round, and all other beef. As well, prices of lean beef products, convenience beef products, and meat products other than beef are regressors in the model. Advertising variables corresponding to carcass section cuts are also incorporated in the models for lean beef products and nonlean beef products. Finally, in the econometric model for convenience beef products, for example individual UPC 5106327 (Le Menu Pepper Steak), cross-price variables correspond to competing products, namely, convenience entrees, beef ribs, ground beef, and roast beef. Prices of lean and nonlean beef products as well as meat products other than beef are also included. However, no advertisement variables are included in the models for convenience beef products. Convenience beef products were not advertised over the period in question.

Fresh Beef and Convenience Beef Products (Individual UPCs)

Results of the econometric analyses for individual beef products are documented in Appendix C, and a summary of the econometric analyses is given in Tables 10-12. These tables correspond to analyses performed for lean beef products (Table 10), nonlean beef products (Table 11), and convenience beef products (Table 12).

Goodness-of-Fit and Serial Correlation

The models adequately capture significant amounts of variation in purchases per 1,000 customers. The system R^2 measure is the statistic used to represent the amount of variation explained by the model because a seemingly unrelated regression (SUR) procedure is used. The closer to 1, the better the fit of the model. For the representative lean beef products, the system R^2 is 0.8418; for nonlean beef products, the system R^2 is 0.8987; finally, for convenience products, the system R^2 is 0.8236. For the relatively large amount of variation to

Table 10. Summary of econometric analysis: individual lean beef products.

UPC	Own-Price[a] Elasticity	Own-Advert.[a] Elasticity	DW Test[b]	Seasonality[c]	Holiday[d]
201047	-1.067*	NS	2.449	4.945*	-3.850*
201023	-2.485*	NS	2.093	10.717*	-3.826*
201029	-10.531*	0.043*	2.126	2.297*	-3.094*
201031	NS	-0.034*	2.292	1.578	-1.713*
201059	-1.242*	-0.029*	2.288	1.620*	-3.429*
201063	-1.598*	NS	1.967	1.724*	-3.895*
201033	-4.746*	NS	2.044	4.543*	-4.996*
201045	-3.974*	-0.022*	2.268	3.350*	-0.207
201032	NS	-0.024*	2.193	1.620*	-2.728*
201028	NS	0.062*	2.278	1.825*	-2.671*

System R^2 = 0.8418

[a] At the sample means.
[b] Durbin-Watson test statistic for serial correlation.
[c] F-statistic.
[d] t-statistic.
* Statistically significant at the 0.05 level (for the elasticity measures, denotes regression coefficient statistically different from zero).

NS denotes regression coefficient not statistically different from zero.

Table 11. Summary of econometric analysis: individual nonlean beef products.

UPC	Own-Price[a] Elasticity	Own-Advert.[a] Elasticity	DW Test[b]	Seasonality[c]	Holiday[d]
202601	-1.589*	0.015*	2.452	0.975	-2.026*
202600	-1.599*	0.087*	2.084	1.138	1.658
202602	-1.963*	0.015*	1.995	1.641*	-2.005*
202103	-3.905*	0.033*	1.997	2.981*	2.128*
202213	-3.286*	0.152*	2.052	1.898*	-0.124
202210	-2*600	0.028*	1.973	2.084*	-0.113
202209	-7.511*	NS	1.984	4.218*	0.205
202012	-3.506*	0.016*	2.164	1.945*	-0.579
202308	-5.658*	0.244*	2.382	1.380	-0.030
202603	-1.681*	NS	2.570	1.659*	-3.928*

System $R^2 = 0.8987$

[a] At the sample means.
[b] Durbin-Watson test statistic for serial correlation.
[c] F-statistic.
[d] t-statistic.
* Statistically significant at the 0.05 level (for the elasticity measures, denotes regression coefficient statistically different from zero).

NS denotes regression coefficient not statistically different from zero.

Table 12. Summary of econometric analysis: individual convenience beef products.

UPC	Own-Price[a] Elasticity	DW Test[b]	Seasonality[c]	Holiday[d]
208989	-2.513*	1.713	0.850	-2.416*
5106322	-7.697*	2.567	2.993*	-4.540*
5106328	-8.227*	2.604	5.148*	-4.270*
5106324	-15.389*	2.287	1.842*	-1.535
1386630	-4.232*	1.786	4.193*	-3.634*
7337006	-11.312*	2.555	3.046*	1.490
5106327	-9.232*	2.585	3.504*	-3.702*
7337004	-11.767*	2.582	3.016*	-1.566
5015916	-2.612*	2.155	2.913*	-2.378*
5106313	-9.834*	2.125	5.219*	-3.625*

System $R^2 = 0.8236$

[a] At the sample means.
[b] Durbin-Watson test statistic for serial correlation.
[c] F-statistic.
[d] t-statistic.
* Statistically significant at the 0.05 level (for the elasticity measures, denotes regression coefficient statistically different from zero).

NS denotes regression coefficient not statistically different from zero.

be explained on a week-to-week basis, the goodness-of-fit is generally very satisfactory.

Additional evidence of reasonable results comes from the Durbin-Watson (DW) test statistic. This statistic provides evidence of the existence (or nonexistence) of serial correlation, a phenomenon often observed with time-series data in the evaluation of econometric models. All DW test statistics indicate the *absence* of serial correlation at the 0.05 level of significance.

Own-Price Elasticities

All own-price elasticities are negative, corresponding to an inverse relationship between purchases (movement) and price. Further, except for three lean beef products, all are statistically different from zero.

Moreover, the respective own-price elasticities are in the elastic range. For the lean beef items, the magnitudes range from -1.067 to -10.513; for nonlean beef products, -1.589 to -7.511; and for convenience beef items, -2.513 to -15.389. This finding agrees with previous studies (Funk et al., 1977, pp. 536-537; Marion and Walker, 1978, p. 672). In general, the own-price elasticities for convenience beef products are larger than the own-price elasticities for lean and nonlean beef products.

Cross-Price Elasticities

Statistically significant cross-price elasticities corresponding to individual UPCs are exhibited in Tables 13-15. Cross-price elasticities may be either positive, indicating gross substitutability, or negative, indicating gross complementarity. For lean beef products, 21 of the 60 cross-cut price elasticities are significantly different from zero; of these, 15 are positive and 6 are negative. Additionally, only 3 of the 50 cross-product price elasticities are significantly different from zero; of these, 1 is positive and 2 are negative. The signs of

Table 13. Statistically significant[a] cross-price elasticities[b] for individual lean beef products.

UPC	Cross-Cut Price Elasticity[c]							Cross-Product Price Elasticity[d]				
	Brisket	Chuck	Grnd	Loin	Rib	Round	AOB	NLean	Conv	Pork	Poult	Fish
201047	-1.594		NA	0.755	1.895							
201023	3.979	1.346		0.020			NA					
201029	-3.719	2.359	3.454	4.545	2.101	NA			-1.031			
201031				-2.131		NA					-0.288	
201059		-0.843	-2.858				NA					
201063		1.134				NA						
201033	-1.618	0.723		2.360			NA					
201045	1.705						NA					
201032							NA					
201028		1.203		2.612		NA		0.520				

[a] At the 0.05 level of significance.
[b] At the sample means.
[c] Cross-cut price elasticity indicates the cross-price elasticity of a particular UPC with respect to a particular lean beef cut (i.e., brisket, chuck, ground loin, rib, round, or all other beef).
[d] Cross-product price elasticity indicates the cross-price elasticity of a particular UPC with respect to nonlean beef, convenience beef, pork, poultry, or fish.
NA Not applicable.

Table 14. Statistically significant[a] cross-price elasticities[b] for individual nonlean beef products.

UPC	Cross-Cut Price Elasticity[c]							Cross-Product Price Elasticity[d]				
	Brisket	Chuck	Grnd	Loin	Rib	Round	AOB	Lean	Conv	Pork	Poult	Fish
202601			NA		-0.807							
202600			NA		-1.493		0.973					
202602			NA			0.328		1.881				-0.378
202103	0.364				NA						0.235	
202213				NA		1.235						
202210	0.576			NA								
202209				NA		1.168	1.463	5.761	-1.484		0.826	-0.996
202012	1.023	NA			-1.957	1.508	-2.101	7.268				
202308		1.762				NA		16.045	-2.262			
202603			NA		-0.668							

[a] At the 0.05 level of significance.
[b] At the sample means.
[c] Cross-cut price elasticity indicates the cross-price elasticity of a particular UPC with respect to a particular nonlean beef cut (i.e., brisket, chuck, ground, loin, rib, round, or all other beef).
[d] Cross-product price elasticity indicates the cross-price elasticity of a particular UPC with respect to lean beef, convenience beef, pork, poultry, or fish.
NA Not applicable.

Table 15. Statistically significant[a] cross-price elasticities[b] for individual convenience products.

UPC	Cross-Cut Price Elasticity[c]					Cross-Product Price Elasticity[d]				
	Steak	Ribs	Ground	Roast	Entree	NLean	Lean	Pork	Poult	Fish
208989		-7.212	NA							1.448
5106322	NA	-1.204					1.846			
5106328		-1.137		NA	0.386		2.091			
5106324	NA	-5.171								
1386630		-2.250			NA					0.918
7337006	NA									1.872
5106327	NA						1.908			
7337004					NA					
5015916	NA									
5106313		-1.498			NA					

[a] At the 0.05 level of significance.
[b] At the sample means.
[c] Cross-cut price elasticity indicates the cross-price elasticity of a particular UPC with respect to a particular convenience beef item (i.e., steak, ribs, ground, roast, or entree).
[d] Cross-product price elasticity indicates the cross-price elasticity of a particular UPC with respect to nonlean beef, lean beef, pork, poultry, or fish.
NA Not applicable.

statistically significant cross-cut elasticities are predominantly positive. The cross-cut price elasticities range from -3.719 to 4.545. Generally, cross-product prices exert no discernible influence on purchases of lean beef.

For individual nonlean beef products, only 15 of the 60 cross-cut price elasticities are significantly different from zero. Of the 10 nonlean beef items, all are sensitive to at least one cross-cut price. Typically, prices of brisket, rib, round, and all other beef affect purchases of the individual nonlean beef purchases. However, prices of chuck, ground, and loin generally do not affect purchases of the individual nonlean beef products. Further, 10 of the 50 cross-product price elasticities are significantly different from zero; of these, 6 are positive and 4 are negative. The price of lean beef positively influences purchases of UPCs 202602, 202209, 202012, and 202308. The price of convenience beef, on the other hand, negatively influences purchases of UPCs 202209 and 202308. The price of poultry positively affects purchases of UPCs 202103 and 202209. The price of fish, however, negatively affects purchases of UPCs 202602 and 202209.

For individual convenience beef products, only 7 of the 40 cross-cut price elasticities are significantly different from zero. The cross-cut price elasticities range from -7.212 to 0.386. Particularly, the price of beef ribs negatively influences 6 of the 10 individual products. Additionally, only 6 of the 50 cross-product price elasticities are significantly different from zero. Generally, fish and lean beef are gross substitutes for the convenience beef items. The prices of pork, poultry, and nonlean beef typically are not statistically significant influences on purchases of convenience beef.

Own-Advertisement Elasticities

In this study, 2 of the 10 lean products and 8 of the 10 nonlean products have positive and statistically significant own-advertisement elasticities (Tables 10, 11, and 16). Contrary to expectations, however, four lean products have negative and statistically significant own-advertisement elasticities. For individual lean products, the magnitudes of the own-advertisement elasticities range from -0.034 to 0.062, whereas for individual nonlean products, these elasticities range from 0.015 to 0.224. The magnitude of the own-advertisement elasticities is much smaller than the magnitude of the own-price or cross-price elasticities.

Cross-Advertisement Elasticities

Statistically significant cross-advertisement elasticities for lean and nonlean beef products are exhibited in Table 16. Cross-advertisement effects for most of the individual fresh beef products are marginal. Only 14 cross-cut advertisement elasticities are significantly different from zero for lean beef, whereas only 5 are significantly different from zero for nonlean beef. Cross-cut advertisements are a statistically significant influence primarily in the purchases of UPC 201031 and UPC 201059. The magnitude of the cross-cut advertisement elasticities are smaller than the magnitude of the own-advertisement elasticities. Additionally, cross-product advertisement elasticities are negative and statistically significant for only two products, UPCs

Table 16. Statistically significant[a] advertisement elasticities[b] for individual fresh beef products.

UPC	Cross-Cut Advertisement Elasticity[e]							Cross-Product Advertisement Elasticity[f]
	Brisket	Chuck	Ground	Lion	Rib	Round	AOB	Other Meat Products[c]
Lean Beef								
201047				0.013	-0.010			
201023								
201029						0.043[d]		
201031	0.016	0.018	0.016			-0.034	-0.029	
201059			0.013		-0.009	-0.014	-0.029[d]	
201063	-0.020							
201033				0.015				
201045								
201032	0.018	0.017						
201028						0.062[d]		
Nonlean Beef								
202601		0.021	0.015[d]		-0.010			
202600			0.087[d]					
202602			0.15[d]					
202103					0.033[d]			-0.139
202213				0.152[d]	0.036			-0.341
202210	0.032			0.028[d]				
202209				-0.041				
202012		0.106[d]						
202308						0.224[d]		
202603								

[a] At the 0.05 level of significance.
[b] At sample means.
[c] Fish, lamb, pork, poultry, and veal.
[d] Denotes own-advertisement elasticities.
[e] Cross-cut advertisement elasticity indicates the cross-advertisement elasticity of a particular UPC with respect to a particular beef cut.
[f] Cross-product advertisement elasticity indicates the cross-advertisement elasticity of a particular UPC with respect to other meat products (nonbeef).

202103 and 202213. Where statistical significances occur, the magnitude of the cross-product advertisement elasticities generally exceeds the magnitude of the own-advertisement or cross-cut advertisement elasticities.

Holidays and Seasonality

Influences of the holiday variable and seasonality are shown in Tables 10-12. For individual lean and convenience beef products, the holiday variable is negative. Typically, the holiday variable is also statistically different from zero. Thus, fewer purchases of lean beef and convenience beef products occur during holidays relative to nonholidays. For nonlean beef products, the holiday variable is not statistically different from zero for 6 of the 10 individual products. Except for UPCs 202601, 202602, 202103, and 202603, purchases of nonlean beef during holidays are not statistically different from those purchases during nonholidays.

Seasonality, on the other hand, generally significantly influences purchases of beef products. Except for UPCs 201031, 202600, 202601, 202308, and 208989, all the individual lean, nonlean, and convenience beef products are subject to seasonal influences.

Fresh Beef and Convenience Beef Products (Aggregate Groups)

Appendix C documents the results of the econometric analyses for broad groups of beef products. A summary of the econometric analyses is given in Table 17. The focus in this section is *not* on *individual* UPCs but on *groups* of UPCs. The groups are (1) convenience rib, (2) convenience steak, (3) convenience entrees, (4)

Table 17. Summary of econometric analysis: aggregate beef groups.

	Own-Price[a] Elasticity	Own-Advert.[a] Elasticity	ADJRSO[b]	DW Text[c]	Seasonality[d]	Holiday[e]
Lean						
Brisket	NS	0.073*	0.501*	2.150	2.242*	2.053*
Chuck	NS	NS	0.571*	2.295	0.838	-1.633
Ground	-1.185*	NS	0.551*	2.423	4.713*	-3.795*
Lion	-1.300*	NS	0.486*	2.381	1.551	-3.216*
Rib	NS	0.049*	0.425*	1.833	2.411*	-1.246
Round	-5.694*	0.040*	0.697*	2.349	2.190*	-2.882*
AOB	-2.666*	NS	0.644*	2.164	4.037*	-4.454*
Nonlean						
Brisket	-5.732*	0.172*	0.776*	2.117	1.240	1.033
Chuck	-2.902*	0.097*	0.904*	2.143	1.828*	-0.287
Ground	-1.209*	0.040*	0.753*	2.338	0.827	-0.036
Lion	-1.897*	0.060*	0.820*	2.372	1.400	-1.507
Rib	-2.146*	0.059*	0.609*	2.473	0.314	0.337
Round	-3.756*	0.109*	0.876*	2.513	0.972	-0.189
AOB	-2.895*	0.053*	0.814*	2.102	2.138*	-0.958
Convenience						
Steak	-2.088*	NA	0.763*	2.257	2.604*	-4.956*
Entree	-3.127*	NA	0.600*	2.075	1.514	-1.696*
Ground	-3.022*	NA	0.746*	2.539	2.595*	-4.613*
Roast	-4.692*	NA	0.780*	1.730	3.593*	-1.754*
Rib	-19.925*	NA	0.828*	2.039	5.758*	-1.250

[a] At the sample means.
[b] Adjusted R^2
[c] Durbin-Watson test for serial correlation.
[d] F-statistic.
[e] t-statistic.
* Statistically significant at the 0.05 level.
NS denotes regression coefficient not statistically different from zero.
NA Not applicable.

convenience ground beef, (5) convenience roast beef, (6) brisket (lean, nonlean), (7) chuck (lean, nonlean), (8) ground (lean, nonlean), (9) loin (lean, nonlean), (10) rib (lean, nonlean), (11) round (lean, nonlean), and (12) all other beef (lean, nonlean). Ordinary least squares is used in the estimation process for the aggregate groups because the set of exogenous variables, or regressors, are the same for all the equations in each of the three categories (lean, nonlean, convenience). Thus, no gains in efficiency of the parameter estimates are realized from using the seemingly unrelated regression (SUR) procedure.

Goodness-of-Fit and Serial Correlation

In all instances, the models for the respective aggregate groups capture significant amounts of variation in purchases per 1,000 customers. The adjusted R^2 ($\overline{R}^2$) measure is the statistic used to represent the amount of variation explained by the model. The closer to 1, the better the fit of the model. The $\overline{R}^2$ statistic for lean beef products ranges from 0.425 (rib) to 0.697 (round); for nonlean beef, the range is from 0.609 (rib) to 0.904 (chuck); finally, the $\overline{R}^2$ statistic for convenience beef products ranges from 0.600 (entrees) to 0.828 (rib). Consequently, the econometric analyses are highly satisfactory on the basis of goodness-of-fit. Additional evidence of reasonable results comes from the DW test statistic. All DW test statistics indicate the absence of serial correlation at the 0.05 level of significance.

Own-Price Elasticities

Except for lean brisket, lean chuck, and lean rib, the own-price elasticities for the broad groups are negative and statistically different from zero. For lean beef, the own-price elasticities range from -1.185 (ground) to -5.694 (round); for nonlean beef, from -1.209 (ground) to -5.732 (brisket); and for convenience products, from -2.088 (steak) to -19.925 (rib).

Similar to the findings for individual products, the response to price changes is elastic. Lean round and lean all other beef are particularly sensitive to changes in own-price. Nonlean brisket, nonlean chuck, nonlean rib, nonlean round, and nonlean all other beef are sensitive to changes in own-price as well. Finally, con-

venience rib, roast, ground beef, entree, and steak products are also highly sensitive to changes in own-price, all other things held constant.

Cross-Price Elasticities

Tables 18-20 show statistically significant cross-price elasticities corresponding to aggregate beef groups. In general, purchases of lean beef products do not respond to changes in the price of nonlean beef products (Table 18). However, except for brisket, ground, loin, and rib cuts, purchases of nonlean beef are sensitive to changes in the price of lean beef. Consequently, the price of nonlean beef is generally not a key determinant of purchases of lean beef, but the price of lean beef is a prime determinant of nonlean chuck, round, and all other beef. With a single exception, the price of convenience products has no statistically significant influence on purchases of lean and nonlean beef products. Likewise, except for convenience roast products, the prices of lean and nonlean beef do not significantly affect purchases of convenience beef products.

On the whole, only 6 of the 57 cross-product price elasticities relevant to pork, poultry, and fish are statistically different from zero. Pork is a gross complement to lean brisket. Poultry is a gross complement to both lean loin and convenience ground beef. Fish is also a gross complement to both lean and nonlean brisket, but fish is a gross substitute for convenience entree.

For fresh beef, cross-cut prices have a relatively minor influence on purchase patterns. Of the 42 cross-cut price elasticities for lean (nonlean) beef, 11 (6) are significantly different from zero (Tables 18 and 19). The price of lean chuck positively influences purchases of lean brisket, but the price of lean loin negatively influences purchases of this product. For lean products, chuck and brisket are substitutes; loin is a complement to (substitute for) brisket and chuck (round); ground beef is a complement to loin, rib, and all other beef; rib is a substitute for ground beef and all other beef; chuck and round are substitutes; and brisket is a complement to ground beef. For nonlean beef products, rib and all other beef (round) are complements (substitute) to chuck; rib is a complement to both ground beef and all other beef; and round is a substitute for loin.

For convenience products, cross-cut prices also play a relatively minor role. Of the 20 cross-cut elasticities for convenience beef products, 4 are statistically different from zero (Table 20). The price of rib exerts a negative influence on purchases of entrees and ground beef. Likewise, the price of steak negatively affects purchases of both entrees and ground.

Own-Advertisement Elasticities

Own-advertisement elasticities for fresh beef groups are exhibited in Tables 17 and 21. In this study, for the broad groups in question, the own-advertisement elasticities are without exception positive and mostly statistically significant. The own-advertisement elasticities have more influence on purchases of nonlean beef products, for which all estimates are statistically significant, than on purchases of lean beef products. For lean beef, the only significant elasticities correspond to brisket, rib, and round. The elasticities for lean beef range from 0.040 to 0.073. For nonlean beef, the range is from 0.040 to 0.172. The magnitude of the own-advertisement elasticities is much smaller than the magnitude of the own-price elasticities.

Cross-Advertisement Elasticities

Statistically significant cross-advertisement elasticities corresponding to aggregate beef groups are exhibited in Table 21. The cross-cut advertisement elasticities are marginal. For lean (nonlean) beef products,

Table 18. Statistically significant[a] price elasticities[b] for aggregate lean beef products.

Commodity	Cross-Cut Price Elasticity[c]							Cross-Product Price Elasticity[d]				
	Brisket	Chuck	Grnd	Loin	Rib	Round	AOB	Pork	Poult	Fish	Conv	NLean
Brisket		3.369		-2.397				-1.180		-0.872		
Chuck				-2.514								
Ground	-1.185		-1.205		1.799							
Loin			-1.629	-1.300					-0.187			
Rib			-4.828									
Round		2.513		2.725		-5.694					-0.857	
AOB			-1.548		1.026		-2.666					

[a] At the 0.05 level of significance.
[b] At the sample means.
[c] Cross-cut price elasticity indicates the cross-price elasticity of a particular beef cut with respect to another lean beef cut.
[d] Cross-product price elasticity indicates the cross-price elasticity of a particular beef cut with respect to pork, poultry, fish, convenience beef, or nonlean beef.

Table 19. Statistically significant[a] price elasticities[b] for aggregate nonlean beef products.

Commodity	Cross-Cut Price Elasticity[c]							Cross-Product Price Elasticity[d]				
	Brisket	Chuck	Grnd	Loin	Rib	Round	AOB	Pork	Poult	Fish	Conv	Lean
Brisket	-5.732									-2.672		
Chuck		-2.902			-1.614	0.970	-2.005					5.878
Ground			-1.209		-0.602							
Loin				-1.897		0.398						
Rib					-2.146							
Round						-3.756						6.992
AOB					-2.164		-2.895					3.467

[a] At the 0.05 level of significance.
[b] At the sample means.
[c] Cross-cut price elasticity indicates the cross-price elasticity of a particular beef cut with respect to another nonlean beef cut.
[d] Cross-product price elasticity indicates the cross-price elasticity of a particular beef cut with respect to pork, poultry, fish, convenience beef, or lean beef.

Table 20. Statistically significant[a] price elasticities[b] for aggregate convenience beef products.

Commodity	Cross-Cut Price Elasticity[c]					Cross-Product Price Elasticity[d]				
	Rib	Steak	Entree	Ground	Roast	Pork	Poultry	Fish	Lean	NLean
Rib	-19.925									
Steak		-2.088								
Entree	-3.728	-1.789	-3.127					1.475		
Ground	-3.844	-1.144		-3.022			-0.741			
Roast					-4.692					-1.136

[a] At the 0.05 level of significance.
[b] At the sample means.
[c] Cross-cut price elasticity indicates the cross-price elasticity of a particular beef cut with respect to another convenience beef item.
[d] Cross-product price elasticity indicates the cross-price elasticity of a particular beef cut with respect to pork, poultry, fish, lean beef, or nonlean beef.

only 9 (2) of 42 cross-cut elasticities are significantly different from zero. Advertisement elasticities for fish, pork, poultry, lamb, and veal on purchases of fresh beef products are, however, not statistically significant.

Holidays and Seasonality

As exhibited in Table 17, purchases of nonlean beef during holidays are not significantly different from nonholiday purchases. This result, however, is not evident for either lean beef or convenience beef products. In particular, purchases of lean ground, loin, round, and all other beef (brisket) are significantly lower (higher) during holidays than during nonholidays. As well, purchases of convenience steak, ground, roast, and entree products are significantly lower during holidays relative to nonholidays, all other things held constant.

Seasonal purchase patterns are evident for all broad convenience beef groups except entrees. Similarly, purchase patterns are evident for all broad lean beef groups except lean chuck and lean loin. However, only nonlean chuck and nonlean all other beef among the broad nonlean beef groups are subject to seasonality in purchases.

Table 21. Statistically significant[a] advertisement elasticities[b] for fresh beef products by carcass section.

Commodity	Cross-Cut Advertisement Elasticity[e]							Cross-Product Advertisement Elasticity[f]
	Brisket	Chuck	Ground	Lion	Rib	Round	AOB	Other Meat Products[c]
Lean Beef								
Brisket	0.073[d]							
Chuck			0.064			-0.059		
Ground				0.013	-0.010			
Loin	0.014		0.014			-0.019	-0.025	
Rib					0.049[d]			
Round						0.040[d]		
AOB				0.015				
Nonlean Beef								
Brisket	0.172[d]						-0.163	
Chuck		0.097[d]						
Ground			0.040[d]		-0.009			
Loin				0.060[d]				
Rib					0.059[d]			
Round						0.109[d]		
AOB							0.053[d]	

[a] At the 0.05 level of significance.
[b] At sample means.
[c] Fish, lamb, pork, poultry, and veal.
[d] Denotes own-advertisement elasticities.
[e] Cross-cut advertisement elasticity indicates the cross-advertisement elasticity of a particular beef cut (lean and nonlean) with respect to another beef cut.
[f] Cross-product advertisement elasticity indicates the cross-advertisement elasticity of a particular beef cut (lean and nonlean) with respect to other meat products (nonbeef).

Conclusions and Implications for Further Research

The cornerstone of this analysis is the specification and estimation of econometric models to analyze purchases of beef products on a per 1,000 customer basis. The purpose is to identify and assess key factors that allow producers, processors, and distributors to analyze trends in retail markets, improve planning, and provide better service to consumers.

The models adequately capture significant variation in purchase patterns and importantly are not subject to serial correlation problems. Key variables include own-price, prices of competing products, and own-advertisement effects. Retailers may utilize the models to assess promotional activity, to forecast purchases, and to determine optimal space allocation. Because development of effective marketing programs is a primary concern of retail food chain executives, the analyses can be used to make pricing and advertising decisions. In particular, purchase patterns of the individual beef products in question are highly sensitive to own-price changes and moderately sensitive to the effects of advertising. All other things held constant, given elastic demands for individual beef products, incentive exists for this firm to lower average prices for selected cuts to maximize total revenue. A strategy to increase advertisement exposure to boost demand for beef cuts may also be worthwhile. However, it is not possible to discern whether a strategy to reduce prices is preferable to a strategy to increase advertising exposure or vice versa. Such a determination depends upon the costs of the respective strategies.

Despite the apparent success in analyzing retail demand relationships with scanner data, concern lies with generalizing the results to regional or national levels. Scanner data from supermarkets in a particular location represent a "controlled" experimental situation. The community-specific results may not allow defensible, broad regional or nationwide influences. Because

of this potential limitation, the results of local analyses (such as this study) should not be used on a stand-alone basis but as supporting evidence in conjunction with a research approach designed to conduct analyses with scanner data on a regional or national basis.

Given that scanner data either on a local, regional, or national basis are available only from the private sector, given the potentially enormous cost considerations of either money or physical resources, and given the volume and integrity of scanner data, perhaps the single most important recommendation is for analysts and marketers to lobby heavily for the effective acquisition and organization of scanner data. Although analysts typically do not have the comparative advantage in data collection, they do have the comparative advantage in analysis.

At least two ways exist to present arguments for acquiring and organizing scanner data. First, given the budget cutbacks of the federal government, which definitely influence data collection, it may be appropriate for public agencies (presumably either the Bureau of Labor Statistics or the United States Department of Agriculture) to negotiate with private firms (e.g., Information Resources, Inc.) to acquire scanner data. Costs for scanner data are not trivial, but neither are costs for various consumer surveys or panels. Furthermore, neither could an individual researcher efficiently collect or organize the volume of information nor could an individual researcher afford the information. Of course, the costs and benefits of this type of data collection require consideration. Second, if individual researchers banded together and combined efforts in collaboration with national retail food chains and/or commodity groups (e.g., the Beef Industry Council [BIC]), research with scanner data on a national or at least regional level would be cost effective.

If neither of these two proposals for data acquisition is feasible, the individual researcher must focus on the local retail firm, which presumably has multiple stores. In this instance, at least in the short-run, analysts can conduct research across the country, interacting with each firm at each location. Such a process, however, will require a unified effort for the acquisition, organization, and analysis of the data, so that, in some fashion, the results can be generalized over several regions. There must also be agreement on which commodities to analyze. Furthermore, agreement on which variables to incorporate in econometric models and which time frame to choose for analysis is essential. Obviously, these questions are not necessarily trivial.

Though much recent empirical and theoretical work exists on demand and market analyses, reliable estimates of demand parameters for individual beef commodities are few. Much data are now available to food retailers because of scanning technology. These scanner data have tremendous potential for use in the analysis of consumer demand for specific products. Translating these data into information for management, advertising, and pricing decisions, however, remains a major concern. Scanner data indeed may result in the most detailed and definitive source of retail food industry statistics available to researchers and marketing executives.

Use of scanner data can expand demand analyses. Scanner data promise fresh insights in market research. Although the realization of benefits from the use of scanner data is in the embryonic stage of development, in the next decade, analysts will concentrate on scanner data assembly, management, and analysis. Conceivably, with proper management, scanner data may well be the ultimate data source of demand and market analyses at the retail level. This particular pilot study reveals the potential utility of scanner data in market research on beef products.

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Appendix A –
List of Individual UPCs

Brisket

OBS	UPC	Description
1	2010390000	Lean Line Trimmed Briskets
2	2024500000	Choice Boneless Brisket #062
3	2024510000	Choice Trimmed Brisket #067

Chuck

OBS	UPC	Description
1	2010600000	Lean Line Chuck Tenders
2	2010610000	Lean Line Chuck Tender Steaks
3	2020050000	Choice Chuck Tender #047
4	2020060000	Choice Chuck Tender Steak #048
5	2020070000	Gravy Steak (Cut From Chuck) #049
6	2020080000	Beef Chuck Shoulder Swiss Steak #050
7	2020090000	Beef Chuck Steak Center Boneless #051
8	2020120000	Beef Chuck Boneless Pot Roast #054
9	2020160000	Beef Chuck Eye Steak #060

Ground Beef

OBS	UPC	Description
1	2010470000	Lean Line Gourmet Ground Round
2	2010480000	Lean Line Gourmet Beef Patties
3	2026000000	Fresh Ground Beef #078
4	2026010000	Lean Ground Beef Chuck #079
5	2026020000	Extra Lean Ground Beef #080
6	2026030000	Ground Round Gourmet #081
7	2026050000	Ground Beef Patties #083
8	2026080000	Extra Lean Beef Patties #086
9	2026090000	Family Pak Ground Beef

Loin

OBS	UPC	Description
1	2010200000	Lean Line Sirloin Strips
2	2010220000	Lean Line Fondue
3	2010240000	Lean Line Tailless T-bone Steaks
4	2010250000	Lean Line Top Sirloin Steaks
5	2010260000	Lean Line Tenderloin Roast
6	2010270000	Lean Line Tenderloin Steak
7	2010310000	Lean Line Sirloin Tip Fillets
8	2010340000	Lean Line Beef Stroganoff
9	2010440000	Lean Line Sirloin Tip Roast
10	2022030000	Choice Boneless Strip 12/14 #023

11	2022050000	Choice Tenderloin 7 Down #025
12	2022060000	Choice Butt Tenderloin #026
13	2022090000	Boneless Strip Steak #028
14	2022100000	Beef Loin T-bone Steak #029
15	2022110000	Beef Loin Porterhouse Steak #030
16	2022120000	Beef Loin Sirloin Steak #031
17	2022130000	Top Sirloin Steak Boneless #032
18	2022140000	Tenderloin Roast #033
19	2022150000	Tenderloin Steak
20	2023160000	Beef Fondue #015
21	2023170000	Sirloin Tip Fillets #016
22	2023190000	Beef Sirloin Tip Roast #018
23	2023250000	Beef Stroganoff #076

Rib

OBS	UPC	Description
1	2010210000	Lean Line Rib Eye Steaks
2	2021000000	Choice Box Rib
3	2021010000	Boneless Whole Rib Eye Lip-On #035
4	2021030000	Beef Rib Eye Steak #037
5	2021050000	Beef Rib Roast Large End #039
6	2021060000	Beef Rib Steak #040
7	2021070000	Beef Rib Eye Roast #041
8	2021090000	Stdg Rib Roast 1st 3rd ribs #043
9	2025010000	Choice Rib Cap-Meat #064
10	2025070000	Extra Lean Beef Short Rib #073
11	2025080000	Beef Ribs for Bar-B-Q #074

Round

OBS	UPC	Description
1	2010280000	Lean Line Eye Round Steaks
2	2010290000	Lean Line Eye Round Roast
3	2010300000	Lean Line Top Round Steak Boneless
4	2010620000	Lean Line Top Round Roast
5	2010630000	Lean Line Beef Cube Steaks
6	2023060000	Beef Eye Round Steak #00
7	2023080000	Beef Round Steak Boneles #007
8	2023090000	Beef Round Steak Tenderized #008
9	2023110000	Beef Round Bottom #010
10	2023120000	Beef Top Round Steak Boneless #011
11	2023130000	Beef Eye of Round Roast #012
12	2023180000	Round Boneless Rump Roast #017
13	2023210000	Beef Round Top Roast #020
14	2025030000	Beef Cubed Steak #069

All Other Beef

OBS	UPC	Description
1	2010230000	Lean Line Extra Lean Boneless Stew Meat
2	2010320000	Lean Line Ranch Broils
3	2010330000	Lean Line Sandwich Steaks
4	2010360000	Lean Line Stir Fry (Beef)
5	2010400000	Lean Line London Broil
6	2010420000	Lean Line Boneless Shoulder Roast
7	2010430000	Lean Line Tip Steak Boneless
8	2010450000	Lean Line Shish Kabob
9	2010460000	Lean Line Beef Tips for Braising
10	2010590000	Lean Line Flank Steaks
11	2016580000	Beef Kidney
12	2020140000	Beef Boneless Clod Roast #058
13	2020150000	Rolled Clod Roast #059
14	2020170000	Beef Min Steak (Chick/Fry) #061
15	2020190000	Beef Boneless Shoulder Roast #056
16	2023140000	Beef Tip Steak Boneless #013
17	2023150000	Breakfast Steak #014
18	2023200000	Sandwich Steak #019
19	2023220000	Ranch Broil #021
20	2023230000	Rotisserie Roast #022
21	2023240000	Shish Kabob #075
22	2024000000	Center Cut Beef Shank #068
23	2025000000	Inside Skirts (Fajitas) #063
24	2025040000	Skirt Steak #070
25	2025050000	London Broil #071
26	2025060000	Beef Tip for Braising #072
27	2025500000	Choice Flank Steaks #066
28	2026070000	Beef Chopped Steak #085
29	8850988507	Marinated Pre-Sliced Beef 12oz
30	8850988508	Marinated Beef Fajitas 12oz
31	8850988531	Seasoned Beef for Stir Fry

Convenience Steak Products

OBS	UPC	Description
1	1380010032	Stouffers Green Pepper Steak
2	1380010059	Stouffers Salisbury Steak
3	1380010627	Stouffers Steak Mushroom
4	1380012023	Stouffers Sup Salisbury Steak w/Gravy and mushrooms
5	1380016620	Stouffers Salisbury Steak Lean Cuisine
6	1800051470	Pills M-W Classic Sirloin Beef Cass
7	2580000049	Weight Watcher Beef Steak
8	2580001927	Weight Watcher Candle Lite Sirloin Tips
9	2580001961	Weight Watcher Salisbury Steak Romano
10	2580002032	Candle Light Dinner Sirloin Beef-Mushroom
11	4482506003	Benihana Oriental Pepper Steak
12	5010045400	Armour Dinner Classic Salisbury Steak
13	5010045409	Armour Dinner Classic-Sirloin Tip

14	5010045410	Armour Dinner Classic-Sirloin Roast
15	5010045550	Armour Sirloin Tips
16	5010045551	Armour Salisbury Steak
17	5010045910	Armour Beef Pepper Steak Lite
18	5010045916	Classic Lite Steak Diane Mignonnett
19	5010045923	Classic Lite Salisbury Steak
20	5100006322	Le Menu Sirloin Tips
21	5100006324	Le Menu Chop Sirloin
22	5100006327	Le Menu Pepper Steak
23	7336906006	Budget Gourmet Pepper Steak/Rice
24	7336906007	Budget Gourmet Sirloin Country/Vegetables
25	7336907006	Budget S-L Sirloin-BF Herb Sauce
26	7336908003	Budget Gourmet Dinner Sirloin Salisbury Steak
27	7336908009	Budget Gourmet Sirloin Tips
28	7590100203	Advance Steak Fingers

Convenience Beef Entrees

OBS	UPC	Description
1	1380010011	Stouffers Beef Stroganoff
2	1380010610	1119 Stouffers Beef Pie
3	1380012010	Stouffers Supreme Beef Teriyaki
4	1380012011	Stouffers Supreme Beef Tips Bourguignone
5	1380016630	Stouffers Oriental Beef Lean Cuisine
6	1380016631	Stouffers S/C Szechwan Beef Noodles
7	2580001923	Candle Lite Beef Stroganoff
8	3680077184	Topfrost Oriental Beef w/Vegetables
9	4482506011	Benihana Beef Szechuan
10	5010045413	Armour Dinner Classic-Beef Stroganoff
11	5100006313	Le Menu Beef Stroganoff
12	7336907004	Budget Gourmet S-L Oriental Beef

Convenience Ground Beef Products

OBS	UPC	Description
1	2089890000	Armour Chick Fry Beef Patties
2	7117952088	Micromagic Hamburgers
3	7117952187	Micromagic Cheeseburgers

Convenience Beef Ribs

OBS	UPC	Description
1	5010045412	Armour Dinner Classics-BBQ Beef Ribs

Convenience Roast Beef Products

OBS	UPC	Description
1	5010045414	Armour Dinner Classic-Yankee Pot Roast
2	5100006328	Le Menu Yankee Pot Roast
3	7336908005	Budget Gourmet Yankee Pot Roast

Appendix B –
Descriptive Statistics of Prices and Purchases per 1,000 Customers for the 147 Beef Products (Nonlean, Lean, and Convenience Products)

Nonlean Line Beef

OBS	UPC	Description
1	2016580000	Beef Kidney
2	2020050000	Choice Chuck Tender #047
3	2020060000	Choice Chuck Tender Steak #048
4	2020070000	Gravy Steak (Cut from Chuck) #049
5	2020080000	Beef Chuck Shouldr Swiss Steak #050
6	2020090000	Beef Chuck Steak Center Boneless #051
7	2020120000	Beef Chuck Boneless Pot Roast #054
8	2020140000	Beef Boneless Clod Roast #058
9	2020150000	Rolled Clod Roast #059
10	2020160000	Beef Chuck Eye Steak #060
11	2020170000	Beef Min Steak (Chick/Fry) #061
12	2020190000	Beef Boneless Shoulder Roast #056
13	2021000000	Choice Box Rib
14	2021010000	Boneless Whole Rib Eye Lip-On #035
15	2021030000	Beef Rib Eye Steak
16	2021050000	Beef Rib Roast Large End #039
17	2021060000	Beef Rib Steak #040
18	2021070000	Beef Rib Eye Roast #041
19	2021090000	Stdg Rib Roast 1st 3rd Ribs #043
20	2022030000	Choice Boneless Strip 12/14 #023
21	2022050000	Choice Tenderloin 7 Down #025
22	2022060000	Choice Butt Tenderloin #026
23	2022090000	Boneless Strip Steak #028
24	2022100000	Beef Loin T-Bone Steak #029
25	2022110000	Beef Loin Porterhouse Steak #030
26	2022120000	Beef Loin Sirloin Steak #031
27	2022130000	Top Sirloin Steak Boneless #032
28	2022140000	Tenderloin Roast #033
29	2022150000	Tenderloin Steak
30	2023060000	Beef Eye Round Steak #005
31	2023080000	Beef Round Steak Boneless #007
32	2023090000	Beef Round Steak Tenderized #008
33	2023110000	Beef Round Bottom #010
34	2023120000	Beef Top Round Steak Boneless #011
35	2023130000	Beef Eye of Round Roast #012
36	2023140000	Beef Tip Steak Boneless #013
37	2023150000	Breakfast Steak #014
38	2023160000	Beef Fondue #015
39	2023170000	Sirloin Tip Fillets #016
40	2023180000	Rnd Bonless Rump Roast #017
41	2023190000	Beef Sirloin Tip Roast #018

Nonlean Line Beef (Continued)

OBS	UPC	Description
42	2023200000	Sandwich Steak #019
43	2023210000	Beef Round Top Roast #020
44	2023220000	Ranch Broil #021
45	2023230000	Rotisserie Roast #022
46	2023240000	Shish Kabob #075
47	2023250000	Beef Stroganoff #076
48	2024000000	Center Cut Beef Shank #068
49	2024500000	Choice Boneless Brisket #062
50	2024510000	Choice Trimmed Brisket #067
51	2025000000	Inside Skirts (Fajitas) #063
52	2025010000	Choice Rib Cap-Meat #064
53	2025030000	Beef Cubed Steak #069
54	2025040000	Skirt Steak #070
55	2025050000	London Broil #071
56	2025060000	Beef Tip for Braising #072
57	2025070000	Extra Lean Beef Short Rib #073
58	2025080000	Beef Ribs for Bar B Q #074
59	2025500000	Choice Flank Steaks #066
60	2026000000	Fresh Ground Beef #078
61	2026010000	Lean Ground Beef Chuck #079
62	2026020000	Extra Lean Ground Beef #080
63	2026030000	Ground Round Gourmet #081
64	2026050000	Ground Beef Patties #083
65	2026070000	Beef Chopped Steak #085
66	2026080000	Extra Lean Beef Patties #086
67	2026090000	Family Pak Ground Beef
68	8850988507	Marinated Pre-Sliced Beef 12 oz.
69	8850988508	Marinated Beef Fajitas 12 oz.
70	8850988531	Seasoned Beef for Stir Fry

Descriptive Statistics of Nonlean Line Beef Products

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P202600	148.98	159	24.90	89	199	113
P202601	192.16	199	23.79	139	229	113
P202602	219.61	229	20.75	169	249	113
P202603	265.90	269	8.97	249	289	113
P202605	198.73	199	10.56	189	219	113
P202608	254.31	249	9.45	199	279	113
P202609	148/02	149	9.33	129	169	113
P202005	278.08	279	18.44	229	319	113
P202006	315.99	329	28.02	259	369	113
P202007	309.70	309	22.82	199	339	113
P202008	268.71	289	45.58	139	339	113
P202009	257.92	279	46.83	129	329	113

Descriptive Statistics of Nonlean Line Beef Products (Continued)

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P202016	443.95	459	24.75	399	469	113
P202203	421.45	389	59.51	299	529	110
P202205	455.99	459	37.34	379	529	113
P202206	407.14	399	63.45	279	529	113
P202209	617.48	629	81.17	398	759	113
P202210	519.53	519	87.43	359	689	113
P202211	531.12	539	87.78	389	709	113
P202212	375.90	389	42.99	259	429	113
P202213	373.95	369	65.48	199	469	113
P202215	768.87	739	57.00	698	869	113
P202316	385.72	389	10.81	369	399	113
P202317	382.89	389	24.87	189	399	113
P202325	421.12	389	54.09	369	499	113
P202100	326.12	319	37.10	239	389	110
P202101	509.71	499	66.62	299	659	112
P202103	629.25	629	74.09	398	759	113
P202106	532.17	539	46.20	389	579	113
P202306	383.69	389	16.03	259	399	113
P202308	289.11	299	53.84	137	359	113
P202309	312.15	309	35.73	147	369	113
P202311	268.64	249	31.53	189	319	113
P202312	337.76	349	34.28	189	389	113
P202503	329.61	339	33.84	228	359	113
P202017	327.14	339	17.03	299	349	113
P202314	352.62	349	15.75	329	389	113
P202315	351.74	349	14.15	329	369	113
P202320	351.74	349	14.15	329	369	113
P202322	385.72	389	10.81	369	399	113
P202324	385.72	389	10.81	369	399	113
P202504	322.54	319	12.95	299	349	113
P202505	322.24	349	58.13	168	369	113
P202506	297.76	299	3.30	289	299	113
P202550	451.30	439	46.08	389	559	113
P202607	271.47	269	9.21	259	289	113
P202012	241.54	259	47.53	108	299	113
P202214	241.54	259	47.53	108	299	113
P202319	291.89	309	48.60	159	349	113
P202105	351.74	359	19.83	319	389	113
P202107	620.94	699	63.30	429	749	113
P202109	425.46	429	22.87	379	479	113
P202313	369.35	369	14.75	319	389	113
P202318	289.94	309	49.89	159	349	113
P202321	302.00	309	31.92	189	349	113
P202014	270.35	269	19.83	239	309	111
P202015	272.07	269	14.95	249	299	91
P202019	252.77	269	47.81	118	329	113
P202323	302.00	299	19.31	249	329	113
P202450	127.34	129	18.52	87	159	113

Descriptive Statistics of Nonlean Line Beef Products (Continued)

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P202451	230.06	229	15.08	139	249	113
P202501	316.39	319	6.94	298	319	113
P202507	231.40	229	19.19	189	279	113
P202508	121.72	119	14.08	79	149	113
P201658	102.94	99	4.19	99	109	109
P202400	180.97	179	19.25	149	229	113
P202500	274.13	269	28.38	169	339	113
P8858507	368.90	379	28.79	279	459	101
P8858508	370.58	379	29.22	279	449	103
P8858531	305.05	299	17.11	239	329	71
Purchases per 1,000 Customers						
UC202600	50.2785	43.9711	23.2868	25.2408	172.355	113
UC202601	68.6	65.3877	17.16	35.7006	113.619	113
UC202602	31.0005	29.2469	6.9622	17.2484	58.7212	113
UC202603	7.8800	7.9166	0.9144	4.4340	10.5198	113
UC202605	0.4127	0.2674	0.3800	0.0092	1.2306	113
UC202608	4.1443	4.1120	0.7524	1.8122	7.3296	113
UC202609	1.6490	0.7434	1.4678	0.2889	5.9508	113
UC202005	0.1699	0.1465	0.1204	0.0143	0.6188	113
UC202006	1.2748	1.2038	0.3309	0.5637	2.3076	113
UC202007	1.4186	1.4420	0.5936	0.5497	4.1614	113
UC202008	2.1531	1.4883	1.7901	0.7847	10.9402	113
UC202009	3.1975	2.1308	2.7130	1.1624	14.8019	113
UC202016	1.0941	0.9823	0.4309	0.5516	2.7196	113
UC202203	0.2353	0.0611	0.8075	0.0000	6.6267	113
UC202205	1.2177	0.9415	0.9704	0.4220	7.3228	113
UC202206	0.3668	0.2894	0.3036	0.0502	2.0651	113
UC202209	6.4696	4.7615	4.7999	2.1270	27.0925	113
UC202210	7.6047	7.0580	2.7308	3.1596	16.9633	113
UC202211	1.5406	1.4295	0.5842	0.5360	3.0998	113
UC202212	1.3896	1.0192	1.6441	0.0808	17.0031	113
UC202213	12.7897	9.4296	10.4308	5.7386	63.5774	113
UC202214	0.6266	0.6251	0.1389	0.3042	1.4966	113
UC202316	0.0289	0.0277	0.0190	0.0071	0.0693	113
UC202317	0.1155	0.1089	0.0521	0.0365	0.3807	113
UC202325	0.0079	0.0054	0.0071	0.0000	0.0418	113
UC202100	0.0780	0.0615	0.0576	0.0026	0.2379	110
UC202101	0.4061	0.0910	1.9027	0.0162	16.4782	112
UC202103	9.6196	8.7677	4.1417	4.2725	31.0045	113
UC202106	0.0795	0.0759	0.0468	0.0040	0.2723	113
UC202306	0.4650	0.3768	0.3343	0.1040	2.2507	113
UC202308	10.7065	6.0486	15.828	3.0977	78.6186	113
UC202309	4.2911	3.5858	3.2161	1.9334	27.8009	113
UC202311	0.4319	0.2497	0.6905	0.0424	5.2828	113
UC202312	1.3256	1.2623	0.7331	0.4396	5.3402	113
UC202503	5.3455	5.0135	1.4907	2.0862	11.4398	113
UC202017	0.4971	0.4873	0.1280	0.2186	0.8913	113

Descriptive Statistics of Nonlean Line Beef Products (Continued)

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
UC202314	1.1277	1.0306	0.5048	0.3850	3.1284	113
UC202315	0.1028	0.0960	0.0372	0.0274	0.2332	113
UC202320	0.0894	0.0844	0.0329	0.0299	0.1978	113
UC202322	0.0847	0.0822	0.0429	0.0128	0.2199	113
UC202324	0.0931	0.0805	0.0408	0.0294	0.2111	113
UC202504	0.1589	0.1443	0.0792	0.0144	0.4310	113
UC202505	3.9903	1.4445	7.3328	0.6229	41.2632	113
UC202506	0.3776	0.3719	0.1179	0.0883	0.6776	113
UC202550	0.6593	0.6063	0.1919	0.3226	1.2849	113
UC202607	3.6403	3.6481	0.4271	1.6134	4.6306	113
UC202012	16.0667	9.4165	20.045	3.6120	104.479	113
UC202214	0.0178	0.0130	0.0234	0.0024	0.2150	101
UC202319	4.5321	2.5870	4.7464	1.0378	19.1814	113
UC202105	0.1265	0.0812	0.2881	0.0102	2.5991	113
UC202107	0.2670	0.1394	0.5131	0.0072	3.7201	113
UC202109	0.5065	0.3399	0.9786	0.1616	8.6469	113
UC202313	2.2991	2.0076	0.9724	1.1452	8.8839	113
UC202318	7.9167	5.3318	6.5183	2.9120	31.1119	113
UC202321	1.0002	0.5804	1.5585	0.2090	10.0998	113
UC202014	0.2838	0.2141	0.2353	0.0026	1.3002	111
UC202015	0.1312	0.0946	0.1120	0.0026	0.6046	91
UC202019	10.5827	6.3352	12.8178	2.2633	68.349	113
UC202323	0.1469	0.1427	0.0772	0.0145	0.3885	113
UC202450	17.6178	5.6775	33.9585	2.3389	184.459	113
UC202451	7.8844	6.0428	4.7741	2.2673	29.468	113
UC202501	0.9427	0.9752	0.4566	0.0720	2.3423	113
UC202507	3.3767	3.3543	0.7527	1.8604	6.2158	113
UC202508	4.0836	3.8655	1.7277	1.5473	15.6210	113
UC201658	0.0285	0.0224	0.0232	0.0025	0.1129	109
UC202400	1.6701	1.4082	0.8364	0.6134	4.5510	113
UC202500	6.1087	5.5635	3.1222	2.7474	29.1666	113
C8858507	0.5743	0.5804	0.4055	0.0000	2.6442	101
C8858508	1.0559	1.0049	0.6208	0.0012	4.6819	103
C8858531	0.1334	0.0682	0.1839	0.0035	0.7516	71

Lean Line Beef

OBS	UPC	Description
1	2010200000	Lean Line Sirloin Strips
2	2010210000	Lean Line Rib Eye Steaks
3	2010220000	Lean Line Fondue
4	2010230000	Lean Line Extra Lean Boneless Stew Meat
5	2010240000	Lean Line Tailless T-Bone Steaks
6	2010250000	Lean Line Top Sirloin Steaks
7	2010260000	Lean Line Tenderloin Roast
8	2010270000	Lean Line Tenderloin Steak
9	2010280000	Lean Line Eye Round Steaks

10	2010290000	Lean Line Eye Round Roast
11	2010300000	Lean Line Top Round Steak Boneless
12	2010310000	Lean Line Sirloin Tip Fillets
13	2010320000	Lean Line Ranch Broils
14	2010330000	Lean Line Sandwich Steaks
15	2010340000	Lean Line Beef Stroganoff
16	2010360000	Lean Line Stir Fry (Beef)
17	2010390000	Lean Line Trimmed Briskets
18	2010400000	Lean Line London Broil
19	2010420000	Lean Line Boneless Shoulder Roast
20	2010430000	Lean Line Tip Steak Boneless
21	2010440000	Lean Line Sirloin Tip Roast
22	2010450000	Lean Line Shish Kabob
23	*2010460000*	*Lean Line Beef Tips for Braising*
24	2010470000	Lean Line Gourmet Ground Round
25	2010480000	Lean Line Gourmet Beef Patties
26	2010590000	Lean Line Flank Steaks
27	2010600000	Lean Line Chuck Tenders
28	2010610000	Lean Line Chuck Tender Steaks
29	2010620000	Lean Line Top Round Roast
30	2010630000	Lean Line Beef Cube Steaks

Descriptive Statistics of Lean Line Beef Products

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P201047	276.52	279	12.21	259	299	113
P201048	306.43	309	14.44	279	329	113
P201060	306.96	309	14.02	289	329	113
P201061	325.46	329	27.67	269	379	113
P201020	737.58	739	68.99	639	869	113
P201022	383.95	389	11.73	369	399	113
P201024	558.29	559	87.55	419	719	113
P201025	431.47	409	51.55	339	509	113
P201027	770.64	759	56.35	698	869	113
P201031	385.72	389	10.81	369	399	113
P201034	421.30	389	53.95	369	499	113
P201021	722.09	759	57.27	659	889	113
P201028	433.33	439	14.07	399	449	113
P201030	370.77	379	30.06	229	419	113
P201063	340.15	339	18.11	299	359	113
P201032	385.72	389	10.81	369	399	113
P201033	353.07	359	17.35	249	369	113
P201040	349.00	369	30.26	269	369	113
P201043	352.83	349	15.66	329	389	112
P201045	385.72	389	10.81	369	399	113
P201046	315.28	319	9.92	289	319	113
P201059	490.94	509	54.77	399	559	113
P201026	768.25	759	52.39	698	859	113
P201042	326.16	329	18.24	299	369	113

Descriptive Statistics of Lean Line Beef Products (Continued)

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P201044	325.81	329	18.28	259	359	113
P201029	435.81	439	22.76	299	459	113
P201062	314.31	319	18.08	249	349	113
P201039	249.88	249	10.81	229	269	113
P201023	359.00	369	38.77	189	419	113
P201036	385.99	389	7.18	369	389	113
Purchases per 1,000 Customers						
UC201047	4.8098	4.9344	0.7584	2.5735	6.7781	113
UC201048	0.2221	.2264	0.0564	0.0658	0.3935	113
UC201060	0.2316	0.2231	0.0964	0.0435	0.4846	113
UC201061	0.1010	0.0969	0.0389	0.0179	0.2086	113
UC201020	0.0324	0.0286	0.0162	0.0026	0.0693	113
UC201022	0.2519	0.2476	0.0520	0.1514	0.4118	113
UC201024	0.0995	0.0830	0.0609	0.0263	0.3292	113
UC201025	0.0933	0.0845	0.0406	0.0374	0.2543	113
UC201027	0.1071	0.1069	0.0247	0.3548	1.1673	113
UC201031	0.7372	0.7476	0.1615	0.3548	1.1673	113
UC201034	0.1429	0.1436	0.0325	0.0684	0.2411	113
UC201021	0.0846	0.727	0.0469	0.0051	0.2140	113
UC201028	0.3947	0.3794	0.1104	0.1317	0.7390	113
UC201030	0.1800	0.1464	0.1840	0.0553	1.3935	113
UC201063	0.6984	0.7395	0.2215	0.1151	1.1486	113
UC201032	0.4652	0.4615	0.0787	0.2199	0.6664	113
UC201033	0.6170	0.6149	0.1270	0.2910	1.5781	113
UC201040	0.2987	0.2432	0.1969	0.0526	1.0953	113
UC201043	0.0424	0.0398	0.0247	0.0032	0.1069	112
UC201045	0.4663	0.4659	0.0954	0.1764	0.6896	113
UC201046	0.1013	0.0855	0.0560	0.0150	0.2658	113
UC201026	0.0141	0.0135	0.0098	0.0000	0.0467	113
UC201042	0.0364	0.0320	0.0239	0.0024	0.1478	113
UC201044	0.1676	0.1459	0.1012	0.0086	0.5269	113
UC201029	0.9258	0.8560	0.4746	0.4254	4.4290	113
UC201062	0.0317	0.0260	0.0239	0.0000	0.1073	113
UC201039	0.3401	0.2970	0.1363	0.1066	0.9046	113
UC201036	0.3978	0.3980	0.0846	0.1712	0.6105	113
UC201023	1.3028	1.1038	0.8331	0.5047	7.2483	113
UC201059	0.5721	0.5613	0.1856	0.2199	2.1253	113

Convenience Beef Products

OBS	UPC	Description
1	1380010011	Stouffers Beef Stroganoff
2	1380010032	Stouffers Green Pepper Steak
3	1380010059	Stouffers Salisbury Steak
4	1380010610	1119 Stouffers Beef Pie
5	1380010627	Stouffers Steak Mushroom

6	1380012010	Stouffers Supreme Beef Teriyaki
7	1380012011	Stouffers Sup Bf Tips Bourguignone
8	1380012023	Stouffers Supper Salisby Stk W/Grv/Msh
9	1380016620	Stouffers Salisby Stk Ln Cuisine
10	1380016630	Stouffers Orient Beef Lean Cuisine
11	1380016631	Stouffers S/C Szechwan Bf Noodles
12	1800051470	Pills M-W Clssc Sirl Beef Cass
13	2089890000	Armour Chick Fry Beef Patties
14	2580000049	Weight Watchers Beef Steak
15	2580001923	Candle Lite Beef Stroganoff
16	2580001927	Weight Watchers Candle Lite Sirloin Tips
17	2580001961	Weight Watchers Salisbury Steak Romano
18	2580002032	Candel Lite Dinner Sirloin Beef-Msh
19	3680077184	Topfrost Oriental Beef w/Veg
20	4482506003	Benihana Oriental Pepper Steak
21	4482506011	Benihana Beef Szechuan
22	5010045400	Armour Dinner Classics-Salisbury Stk
23	5010045409	Armour Dinner Classics-Sirloin Tips
24	5010045410	Armour Dinner Classics-Sirloin Roast
25	5010045412	Armour Dinner Classics-BBQ Bf Ribs
26	5010045413	Armour Dinner Classics-Bf Stroganoff
27	5010045414	Armour Dinner Classics-Yankee Pot Roast
28	5010045550	Armour Sirloin Tips
29	5010045551	Armour Salisbury Steak
30	5010045910	Armour Beef Pepper Steak Lite
31	5010045916	Classic Lite Steak Diane Mignonnett
32	5010045923	Classic Lite Salisbury Steak
33	5100006313	Le Menu Beef Stroganoff
34	5100006322	Le Menu Sirloin Tips
35	5100006324	Le Menu Chop Sirloin
36	5100006327	Le Menu Pepper Steak
37	5100006328	Le Menu Yankee Pot Roast
38	7117952088	Micromagic Hamburgers
39	7117952187	Micromagic Cheeseburgers
40	7336906006	Budget Gourmet Pepper Steak/Rice
41	7336906007	Budget Gourmet Sirloin Cntry/Veg
42	7336907004	Budget Gourmet S-L Oriental Beef
43	7336907006	Budget S-L Sirloin-Bf Herb Sce
44	7336908003	Budget Gourmet Din Srln Salsby Stk
45	7336908005	Budget Gourmet Yankee Pot Roast
46	7336908009	Budget Gourmet Sirloin Tips
47	7590100203	Advance Steak Fingers

Descriptive Statistics of Convenience Beef Products

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P1380032	254.44	254	6.87	239	269	134
P1380059	273.78	269	8.33	259	287	127

Descriptive Statistics of Convenience Beef Products (Continued)

Variable	Mean	Med	St Dv	Min	Max	N
Prices						
P1380627	286.54	287	7.74	229	297	114
P1382023	311.42	317	7.84	288	317	61
P1386620	231.75	239	10.78	177	239	134
P1851470	196.00	199	5.83	169	199	51
P2580049	209.85	209	2.57	199	215	150
P2581927	379.59	389	19.88	268	389	112
P2581961	223.38	225	5.83	199	237	143
P2582032	325.04	327	5.46	310	327	61
P4482503	253.32	253	11.12	197	273	75
P5015400	297.87	299	17.94	237	319	92
P5015409	377.67	389	15.77	299	389	68
P5015410	379.40	389	14.23	299	389	85
P5015550	337.84	339	6.02	323	343	69
P5015551	260.18	267	15.66	197	269	64
P5015910	350.14	339	27.97	268	389	121
P5015916	372.02	369	13.03	329	389	150
P5015923	299.87	299	12.83	258	319	122
P5106322	371.61	373	10.39	288	379	150
P5106324	315.00	319	16.10	257	333	150
P5106327	369.39	373	12.89	288	379	150
P7336006	160.02	159	11.08	117	169	150
P7336007	160.02	159	11.08	117	169	150
P7337006	175.44	179	12.73	117	187	143
P7338003	212.99	219	11.34	157	219	96
P7338009	215.27	219	12.59	157	230	74
P759010	394.68	405	55.81	269	449	77
P1380011	287.69	287	9.57	228	297	134
P1380610	185.15	188	13.87	119	199	133
P1382010	371.08	377	13.37	288	377	61
P1382011	371.08	377	13.37	288	377	61
P1386630	250.65	254	11.24	188	268	134
P1386631	271.95	277	15.01	198	277	44
P2581923	365.83	369	12.47	268	369	80
P3687184	215.62	219	8.65	177	187	143
P4482511	254.06	259	11.00	197	273	75
P7338005	213.09	219	11.35	157	219	96
P5015413	379.48	389	15.19	299	389	62
P5106313	373.87	379	10.95	299	379	150
P7337004	175.44	179	12.73	117	187	143
P208989	182.54	189	24.12	129	229	150
P7712088	125.64	129	7.21	88	129	62
P7112187	135.40	139	8.07	88	139	62
P5015412	378.19	389	16.02	99	389	62
P5015414	380.00	389	10.44	36	389	60
P5106328	372.29	373	10.65	88	379	150

Descriptive Statistics of Convenience Beef Products (Continued)

Variable	Mean	Med	St Dv	Min	Max	N
Purchases per 1,000 Customers						
C1380032	.3485	.3453	.0834	.1119	.6138	134
C1380059	.2444	.2555	.1211	.0023	.4631	127
C1380627	.2133	.1754	.1436	.0059	.8072	114
C1382023	.5076	.4425	.2188	.2411	1.6121	61
C1386620	.4862	.4224	.3886	.1422	3.6790	134
C1851470	.3423	.3488	.1563	.0651	.8471	51
C2580049	.5343	.5249	.1501	.0761	.9593	150
C2581927	.4850	.4093	.3900	.0	1.9650	112
C2581961	.4914	.4665	.1753	.0156	1.2711	143
C2582032	.1720	.1743	.1246	.0012	.4827	61
C4482503	.2861	.2742	.1533	.0057	.8871	75
C5015400	.6436	.5899	.3716	.2133	2.4411	92
C5015409	.2721	.2729	.2044	.0049	1.2995	68
C5015410	.2155	.1918	.2304	.0012	1.6678	85
C5015550	.4335	.4715	.2015	.0	.7435	69
C5015551	1.2105	1.1834	.7527	.0015	4.2555	64
C5015910	.2354	.2227	.1591	.0011	1.2397	121
C5015916	.3882	.3899	.1121	.0507	.7351	150
C5015923	.5166	.4860	.2237	.0164	1.2678	122
C5106322	.8821	.7792	.4066	.3529	4.4677	150
C5106324	.6366	.5448	.3350	.2502	2.5384	150
C5106327	.4217	.3823	.2259	.1778	2.7320	150
C7336006	.9284	.7219	.8487	.2146	6.4488	150
C7336007	.8687	.6273	.8539	.2291	6.5130	150
C7337006	1.1232	.8310	.9835	.0835	6.5508	143
C7338003	.9266	.8456	.5064	.0597	3.5280	96
C7338009	.5620	.4642	.3869	.0869	2.6832	74
UC759010	.2983	.2721	.2166	.0353	1.1615	77
C1380011	.4154	.3968	.1206	.1870	1.3280	134
C1380610	.2799	.2263	.2624	.0842	2.0633	133
C1382010	.2470	.2159	.1370	.1132	1.1295	61
C1382011	.3571	.3048	.1845	.1751	1.4657	61
C1386630	.8789	.7972	.4857	.2739	4.3018	134
C1386631	.5677	.4202	.4671	.1128	3.0204	44
C2581923	.2603	.2751	.2170	.0	1.4309	80
C3687184	.1514	.1351	.0782	.0039	.4551	72
C4482511	.2991	.2820	.1728	.0086	.8197	75
C5015413	.2115	.1810	.2198	.0013	1.4054	62
C5106313	.3743	.3197	.1689	.1356	.9199	150
C7337004	1.0064	.7342	.9475	.0817	7.0484	143
UC208989	6.3747	1.2322	1.3139	.2266	46.071	150
C7112088	.5339	.5001	.2747	.0014	1.7533	62
C7112187	.8105	.7393	.4597	.0058	3.4349	62
C5015412	.2520	.2457	.1961	.0013	1.2584	62
C5015414	.1506	.1642	.0835	.0053	.3446	60
C5106328	.5430	.4856	.2719	.2199	3.2194	150
C7338005	.5787	.4843	.3792	.0481	2.6215	96

Appendix C –
Estimation of Econometric Models

Fresh Lean Beef Products Individual UPCs Parameter Estimates (t-Values)

Variable	UC201023	UC201028	UC201029	UC201063	UC201059
INTERCEPT	-3.2634	.5615	3.0666	.8330	2.4559*
	(-1.602)	(.430)	(1.255)	(.609)	(3.028)
OWN-PRICE	-.0076*	-.0028	-.0222*	-.0036*	-.0014*
	(-4.319)	(-1.352)	(-22.998)	(-2.848)	(-6.412)
PFNLEAN	.0001	.0008*	.0003	-.0003	-.0001
	(.097)	(1.706)	(.256)	(-4.88)	(-.303)
PCON	-.0022	-.0005	-.0038*	.0003	.0005
	(-1.516)	(-.984)	(-2.615)	(.399)	(.981)
PFLBRISK	.0177*	-.0006	-.0136*	.0001	.0016
	(3.093)	(-.240)	(-2.251)	(.045)	(.803)
PFLLOIN	.0011	.0023*	.0096*	-A	-.0002
	(.552)	(3.166)	(4.895)	(-.034)	(-.238)
PFLRIB	.0026	-A	.0025*	.0008	.0007
	(1.666)	(-.109)	(1.930)	(1.142)	(1.440)
PFLAOB	-	-.0006	-.0006	.0009	-
	-	(-.670)	(-.227)	(.662)	-
PFLROUND	-.0012	-	-	-	.0003
	(-.807)	-	-	-	(-.640)
PFLGRND	-.0015	-.0012	.0114*	-.0021	-.0059*
	(-.328)	(-.748)	(2.609)	(-.746)	(-3.631)
PFLCHUCK	.0048*	.0015*	.0069*	.0028*	-.0015*
	(1.986)	(1.702)	(2.920)	(1.732)	(-1.815)
ADVAOM	A	-A	A	-A	A
	(1.033)	(-1.148)	(.805)	(-.774)	(.561)
ADBRISK	.0002	A	A	-.0003*	A
	(.859)	(.293)	(.214)	(-2.484)	(.725)
ADRIB	-.0006	-.0003	-.0002	-.0001	-.0004*
	(-.851)	(-1.354)	(-.285)	(-.263)	(-1.675)
ADAOB	A	-.0001	-A	-A	-.0003*
	(.213)	(-1.235)	(-.004)	(-.391)	(-2.845)
ADROUND	-A	.0004*	.0007*	-A	-.0001*
	(-.312)	(6.126)	(3.738)	(-.264)	(-2.229)
ADGBEEF	.0001	-A	A	.0001	.0001*
	(.965)	(-.405)	(.310)	(1.128)	(1.917)
ADCHUCK	-A	-A	-.0001	-A	.0001
	(-.066)	(-1.261)	(-.619)	(-.717)	(1.409)
ADLOIN	.0004*	-A	-A	.0002	A
	(1.899)	(-.642)	(-.155)	(1.653)	(1.232)
M1	.5755*	.1723*	.3705*	.1012	.1034*
	(4.673)	(3.765)	(3.031)	(1.461)	(2.380)
M2	-.0115	.1067*	.4013	.0502	.1353*
	(-.085)	(2.103)	(2.958)	(.655)	(2.848)
M3	-.4023*	.1088*	.3519*	.0419	.0936*
	(-3.203)	(2.422)	(2.904)	(.614)	(2.059)

Variable	UC201023	UC201028	UC201029	UC201063	UC201059
M4	-.4676*	.0845	.1712	.1824*	.1409*
	(-3.291)	(1.662)	(1.263)	(2.339)	(2.838)
M5	-.4044*	.1182*	.1312	.1572*	.0371
	(-2.763)	(2.246)	(.932)	(1.959)	(.734)
M6	-.6119*	.0041	-.1925	-.0099	-.0396
	(-3.531)	(.062)	(-1.119)	(-.102)	(-.640)
M7	-.5962*	.0543	-.1052	.0607	-.0724
	(-3.488)	(.832)	(-.614)	(.628)	(-1.209)
M8	-.6484*	.0545	-.0490	.0648	-.0306
	(-3.658)	(.823)	(-.278)	(.649)	(-.488)
M9	-.4442*	.0641	-.0072	.1324	-.0388
	(-2.394)	(.935)	(-.040)	(1.279)	(-.593)
M10	-.1840	.0627	.1911	.1653*	.0045
	(-1.226)	(1.121)	(1.278)	(1.909)	(.087)
M11	.0255	.0495	.1029	.0917	.0361
	(.201)	(1.047)	(.813)	(1.279)	(.811)
H	-.3137*	-.0825*	-.2524*	-.1811*	-.0988*
	(-3.826)	(-2.671)	(-3.094)	(-3.895)	(-3.429)
PORK	.0002	.0001	.0007	-.0007	-.0001
	(.201)	(.360)	(.709)	(-1.321)	(-.400)
POULTRY	-.0003	.0003	-A	-.0008	-.0002
	(-3.49)	(.992)	(-.068)	(-1.605)	(-.569)
FISH	.0007	.0002	.0005	.0003	.0003
	(1.053)	(.767)	(.798)	(.959)	(1.216)
DW	2.093	2.278	2.126	1.967	2.288

Note: System R^2 = 0.8418.
"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

Variable	UC201045	UC201033	UC201032	UC201031	UC201047
INTERCEPT	.9048	2.378*	1.3279	2.1379	7.2690
	(1.208)	(3.207)	(1.618)	(1.581)	(1.372)
OWN-PRICE	-.0047*	-.0081*	-.0022	-.0020	-.0191*
	(-3.626)	(-15.064)	(-1.524)	(-.852)	(-1.894)
PFNLEAN	.0002	.0007	.0005	.0001	.0031
	(.572)	(1.518)	(.958)	(.203)	(1.030)
PCON	-.0003	-.0002	-.0002	-.0002	.0037
	(-.619)	(-.447)	(-.350)	(-.246)	(1.141)
PFLBRISK	.0031*	-.0039*	-.0013	.0042	-.0313*
	(1.787)	(-2.210)	(-.723)	(1.284)	(-2.451)
PFLOIN	.0008	.0033*	.0002	-.0035*	.0086*
	(1.003)	(4.900)	(.179)	(-2.447)	(1.940)
PFLRIB	A	-.0004	A	.0005	.0120*
	(.111)	(-.797)	(.199)	(.635)	(4.148)
PFLAOB	-	-	-	.0011	-.0033
	-	-	-	(.675)	(-.675)
PFLROUND	.0001	-.0002	.0003	-	-.0049
	(.276)	(-.316)	(.545)	-	(-1.384)

Variable	UC201045	UC201033	UC201032	UC201031	UC201047
PFLGRND	-.0010	.0014	-.0003	-.0025	-
	(-.663)	(.881)	(-.187)	(-1.028)	-
PFLCHUCK	.0012	.0014*	.0005	-.0004	.0013
	(1.485)	(1.759)	(.526)	(-.300)	(.244)
ADVAOM	-A	-A	A	A	-.0002
	(-1.147)	(-.586)	(.986)	(1.298)	(-1.608)
ADBRISK	A	.0001	.0002*	.0003*	-.0006
	(.778)	(1.155)	(2.254)	(1.873)	(-1.035)
ADRIB	-.0002	-.0001	-.0002	.0004	-.0041*
	(-.998)	(-.414)	(-.579)	(.767)	(-2.577)
ADAOB	-.0002*	-A	-.0002*	-.0004*	-.0009
	(-1.736)	(-.452)	(-1.840)	(-2.240)	(-1.195)
ADROUND	A	-A	-A	-.0004*	-.0006
	(.934)	(-.643)	(-.198)	(-4.234)	(-1.569)
ADGBEEF	A	A	A	.0002*	.0003
	(1.122)	(1.572)	(1.442)	(1.946)	(.935)
ADCHUCK	A	A	.0001*	.0002*	.0003
	(.086)	(1.182)	(2.158)	(2.292)	(.669)
ADLOIN	-A	.0002*	-A	-A	.0013*
	(-.330)	(2.288)	(-.005)	(-.221)	(2.486)
M1	.1604*	.1847*	.1043*	.1707*	1.1797*
	(3.931)	(4.338)	(2.337)	(2.502)	(4.285)
M2	.1713*	.1399*	.1487*	.2120*	1.1122*
	(3.805)	(3.004)	(3.016)	(2.793)	(3.672)
M3	.1728*	.1065*	.1346*	.1995*	.8511*
	(4.296)	(2.548)	(3.058)	(2.970)	(3.136)
M4	.1711*	.1481*	.0950*	.1368*	1.2900*
	(3.872)	(3.205)	(1.964)	(1.816)	(4.263)
M5	.2333*	.0966*	.0964*	.1710*	.7689*
	(4.975)	(1.973)	(1.879)	(2.179)	(2.415)
M6	.2348*	.1048*	.0812	.1783*	-.6669*
	(4.040)	(1.752)	(1.277)	(1.828)	(-1.707)
M7	.1790*	.0287	.0721	.1368	-.5354
	(3.182)	(.486)	(1.171)	(1.439)	(-1.385)
M8	.2036*	.1013	.0869	.1695*	-.6214
	(3.468)	(1.642)	(1.353)	(1.725)	(-1.560)
M9	.1876*	.2001*	.1445*	.2214*	-.5034
	(3.037)	(3.147)	(2.137)	(2.137)	(-1.216)
M10	.1772*	.1553*	.1177*	.2507*	.2110
	(3.478)	(2.988)	(2.112)	(2.957)	(.337)
M11	.1285*	.1535*	.0778*	.1295*	.9563*
	(3.042)	(3.517)	(1.684)	(1.825)	(3.365)
H	-.0057	-.1422*	-.0819*	-.0784*	-.7083*
	(-.207)	(-4.996)	(-2.728)	(-1.713)	(-3.850)
PORK	-.0001	-.0002	-.0004	-.0004	-.0008
	(-.330)	(-.506)	(-1.132)	(-.796)	(-.330)
POULTRY	-.0003	-A	-.0003	-.0012*	-.0025
	(-1.115)	(-.265)	(-1.080)	(-2.473)	(-1.225)
FISH	-A	.0001	A	A	-.0008
	(.089)	(.522)	(.055)	(.124)	(-.597)
DW	2.268	2.044	2.193	2.292	2.449

"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

Fresh Nonlean Beef Products Individual UPCs Parameter Estimates (t-Values)

Variable	UC202103	UC202210	UC202213	UC202209	UC202308
INTERCEPT	24.7744*	17.1651	41.0212	4.9277	-82.0807
	(1.875)	(1.589)	(.799)	(.382)	(-1.596)
OWN-PRICE	-.0593*	-.0348*	-.1124*	-.0576*	-.2157*
	(-17.628)	(-9.793)	(-5.683)	(-12.094)	(-10.166)
PFLEAN	.0465	.0346	-.0779	.0805*	.5127*
	(1.318)	(1.171)	(-.561)	(2.300)	(3.613)
PCON	-.0181	-.0148	.0316	-.0287*	0.0999*
	(-1.483)	(-1.497)	(.679)	(-2.387)	(-1.968)
PFNLBRISK	.0201*	.0164*	.0037	-.0005	.0114
	(1.806)	(1.833)	(.087)	(-.043)	(-.253)
PFNLGRND	.0019	.0046	.0416	-.0032	.0255
	(.173)	(.457)	(.815)	(-.253)	(.458)
PFNLOIN	.0008	-	-	-	.0250
	(.214)	-	-	-	(1.314)
PFNLAOB	-.0043	.0082	-.0372	.0266*	-.0373
	(-.320)	(.758)	(-.720)	(1.988)	(-.663)
PFNLRND	.0097	.0027	.0526*	.0187*	-
	(1.451)	(.506)	(2.257)	(3.023)	-
PFNLCHCK	.0030	-.0046	.0450	-.0069	.0747*
	(.320)	(-.622)	(1.281)	(-.774)	(1.874)
PFNLRIB	-	-.0075	.0088	.0101	-.0455
	-	(-1.165)	(.264)	(1.207)	(-1.248)
ADVAOM	-.0016*	-.0003	-.0053*	-.0010	-.0026
	(-2.435)	(-.558)	(-2.105)	(-1.608)	(-.986)
ADBRISK	.0023	.0055*	.0009	-.0038	-.0123
	(.730)	(2.157)	(.083)	(-1.256)	(-.965)
ADRIB	.0264*	-.0023	.0384*	-.0094	-.0096
	(4.032)	(-.479)	(1.684)	(-1.608)	(-.395)
ADAOB	-.0022	.0021	-.0099	.0058	-.0035
	(-.514)	(.605)	(-.607)	(1.398)	(-.200)
ADROUND	-.0001	.0019	-.0044	.0020	.0435*
	(-.059)	(1.129)	(-.536)	(.976)	(5.357)
ADGBEEF	-.0009	-.0006	-.0018	-.0011	-.0089
	(-.561)	(-.426)	(-.258)	(-.651)	(-1.185)
ADCHUCK	-.0031	.0025	-.0044	-.0004	.0068
	(-1.327)	(1.309)	(-.489)	(-.201)	(.688)
ADLOIN	-.0037	.0039*	.0386*	-.0039*	-.0128
	(-1.616)	(2.476)	(4.143)	(-1.882)	(-1.282)
M1	-.2554	-.6764	1.2287	.6200	-4.7416
	(-.255)	(-.787)	(2.96)	(.588)	(-1.225)
M2	-.5499	.5154	-7.0778	-1.0069	-8.8870*
	(-.505)	(.564)	(-1.548)	(-.873)	(-2.220)
M3	.3344	.3220	2.4995	-.1173	-2.9073
	(.333)	(.377)	(.573)	(-.111)	(-.805)
M4	.7678	.7781	5.6945	2.4338*	-11.2313*
	(.756)	(.913)	(1.347)	(2.337)	(-3.136)
M5	2.8048*	2.2231*	6.3893	3.3958*	A
	(2.680)	(2.665)	(1.458)	(3.327)	-
M6	4.5042*	2.6103*	8.9321*	3.4653*	-4.5757
	(3.946)	(2.882)	(1.808)	(3.151)	(-1.245)

Variable	UC202103	UC202210	UC202213	UC202209	UC202308
M7	4.3325*	2.7984*	8.0186	5.1522*	-4.8942
	(3.582)	(2.846)	(1.499)	(4.781)	(-1.332)
M8	4.1713*	3.0099*	10.1886*	3.7590*	-3.9988
	(3.469)	(2.945)	(1.977)	(3.349)	(-1.029)
M9	3.1788*	2.9183*	7.5666	4.6104*	-.8011
	(3.064)	(3.283)	(1.662)	(4.374)	(-.235)
M10	2.4641*	2.2038*	5.8043	3.1569*	-3.9207
	(2.286)	(2.538)	(1.315)	(2.972)	(-1.121)
M11	2.0998*	1.3269	3.8521	2.1856*	-.2855
	(2.044)	(1.584)	(.970)	(2.135)	(-.083)
H	1.4857*	-.0645	-.3276	.1479	-.0864
	(2.128)	(-.113)	(-.124)	(.205)	(-.030)
PORK	.0013	-.0088	-.0091	.0020	.0285
	(.145)	(-1.204)	(-.261)	(.231)	(.758)
POULTRY	.0134	-.0055	.0399	.0239*	.0119
	*(1.795)	(-.899)	(1.359)	(3.164)	(.384)
FISH	.0012	-.0009	-.0035	-.0097*	-.0136
	(.259)	(-.223)	(-.199)	(-2.074)	(-.697)
DW	1.997	1.9731	2.052	1.984	2.382

Note: System R^2 = 0.8987.
"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

Variable	UC202012	UC202603	UC202602	UC202601	UC202600
INTERCEPT	-15.8146	24.4183*	52.5746	313.0037*	90.7104
	(-.297)	(3.732)	(1.402)	(4.348)	(.981)
OWN-PRICE	-.2333*	-.0505*	-.2827*	-.5557*	-.5269*
	(-6.654)	(-5.827)	(-9.177)	(-11.756)	(-7.955)
PFLEAN	.3336*	.0108	.1708*	-.2055	.3238
	(2.341)	(.615)	(1.726)	(-1.048)	(1.340)
PCON	-.0441	-.0021	-.0388	.0321	-.1444
	(-.891)	(-.363)	(-1.101)	(.489)	(-1.627)
PFNLBRSK	.0937*	.0005	.0393	.0130	.1178
	(2.077)	(.096)	(1.258)	(.214)	(1.440)
PFNLGRND	-.0582	-	-	-	-
	(-1.104)	-	-	-	-
PFNLLOIN	.0051	.0003	.0102	.0053	-.0231
	(.255)	(.121)	(.739)	(.187)	(-.692)
PFNLAOB	-.1253*	-.0066	.0048	-.0634	.1797*
	(-2.251)	(-.993)	(.129)	(-.859)	(1.824)
PFNLRND	.0788*	.0008	.0039*	-.0029	.0631
	(2.809)	(.247)	(1.761)	(-.076)	(1.255)
PFNLCHCK	-	.0074	.0219	.0454	-.0581
	-	(1.615)	(.833)	(.866)	(-8.53)
PFNLRIB	-.0743*	-.0126*	-.0378	-.1297*	-.1756*
	(-2.126)	(-3.263	(-1.634)	(-2.864)	(-2.925)
ADVAOM	.0004	.0002	-.0026	-.0003	-.0029
	(.174)	(.825)	(-1.439)	(-.081)	(-.617)

Variable	UC202012	UC202603	UC202602	UC202601	UC202600
ADBRISK	.0145	.0007	.0050	.0121	.0105
	(1.150)	(.465)	(.573)	(.710)	(.459)
ADRIB	-.0248	-.0033	-.0216	-.0558*	-.0482
	(-1.023)	(-1.150)	(-1.267)	(-1.708)	(-1.112)
ADAOB	.0104	-.0015	.0143	-.0101	.0247
	(.582)	(-.746)	(1.245)	(-.446)	(.814)
ADROUND	.0071	A	.0092	A	.0127
	(.826)	(.011)	(1.556)	(.007)	(.830)
ADGBEEF	-.0121	.0005	.0078*	.0166*	.0707*
	(-1.669)	(.675)	(1.790)	(1.960)	(5.951)
ADCHUCK	.0341*	.0015	.0020	.0280*	-.0135
	(3.785)	(1.289)	(.307)	(2.192)	(-.795)
ADLOIN	-.0035	.0008	.0089	.0107	-.0195
	(-.358)	(.721)	(1.309)	(.788)	(-1.092)
M1	-1.5210	.6012	3.2901	5.4089	-7.2033
	(-.348)	(1.171)	(1.102)	(.923)	-1.001)
M2	-.5429	-.3513	-2.2238	5.5553	-13.1302*
	(-.114)	(-.633)	(-.685)	(.861)	(-1.792)
M3	-1.0923	-.7887	-2.3758	-3.2319	-9.1042
	(-.247)	(-1.547)	(-.797)	(-.545)	(-1.364)
M4	4.2848	-.3932	2.7223	.1317	-8.7039
	(.977)	(-.770)	(.916)	(.022)	(-1.280)
M5	11.5388*	-.4537	.3012	-2.5553	-13.8214*
	(2.604)	(-.884)	(.100)	(-.428)	(-2.349)
M6	.5005	-1.0359*	-4.0864	-2.9311	-10.4325
	(.102)	(-1.847)	(-1.249)	(-.447)	(-1.630)
M7	8.7975*	-.7419	-.8270	-.1201	-.0934
	(1.705)	(-1.262)	(-.240)	(-.017)	(-.144)
M8	4.5067	-.6696	1.449	1.8386	-9.1894
	(.892)	(-1.147)	(.427)	(.270)	(-1.462)
M9	1.8128	-.5405	.5612	-4.3451	A
	(.404)	(-1.115)	(.191)	(-.727)	-
M10	1.5712	.0804	3.6211	2.2382	-3.5684
	(.348)	(.156)	(1.194)	(.369)	(-.623)
M11	5.1916	.2267	2.0733	4.8032	1.5043
	(1.233)	(.459)	(.724)	(.849)	(.244)
H	-1.6405	-1.3208*	-3.8539*	-7.5130*	8.2046
	(-.579)	(-3.928)	(-2.005)	(-2.026)	(1.658)
PORK	-.0147	-.0022	-.0422	-.0241	.0196
	(-.408)	(-.513)	(-1.658)	(-.498)	(.299)
POULTRY	.0401	-.0024	.0177	-.0222	-.0099
	(1.316)	(-.669)	(.836)	(-.543)	(-.181)
FISH	.0163	-.0006	-.0239*	-.0168	-.0538
	(.863)	(-.292)	(-1.823)	(-.659)	(-1.568)
DW	2.164	2.570	1.995	2.452	2.084

"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

Convenience Beef Products Individual UPCs Parameter Estimates (t-Values)

Variable	C5106313	C7337004	C1386630	C5015916	C55106322
INTERCEPT	3.6566*	7.2894	5.8582*	1.5492*	6.0479*
	(7.397)	(1.529)	(4.857)	(2.200)	(6.013)
OWN-PRICE	-.0079*	-.0604*	-.0139*	-.0027*	-.0157*
	(-14.162)	(-10.769)	(-9.159)	(-3.117)	(-11.562)
PCSTEAK	.0001	-.0006	-.0009	-	-
	(.348)	(-.412)	(-.941)	-	-
PCGBEEF	.0005	-.0042	-.0009	.0003	-.0005
	(1.345)	(-.950)	(-.918)	(.593)	(-.627)
PCROAST	-.0003	.0040	-.0001	-.0004	-.0003
	(-1.107)	(1.155)	(-.150)	(-.924)	(-.621)
PCRIB	-.0012*	.0059	-.0049*	-A	-.0024*
	(-2.137)	(.944)	(-3.311)	(-.075)	(-2.179)
PCENTREE	-	-	-	.0001	.0006
	-	-	-	(-.254)	(1.190)
PORK	.0002	.0025	-A	.0005	.0004
	(.611)	(.665)	(-.080)	(1.103)	(.646)
POULTRY	-.0002	.0010	A	.0003	-.0005
	(-.645)	(.338)	(.115)	(.795)	(-1.009)
FISH	A	.0027	.0014*	-.0003	.0004
	(.321)	(1.563)	(3.411)	(-1.247)	(1.333)
M1	.0219	.4666	.2627*	.1299*	.0534
	(.745)	(1.470)	(3.382)	(2.790)	(.907)
M2	-.0222	.1740	.2017*	.1133*	-.0335
	(-.795)	(.577)	(2.723)	(2.520)	(-.590)
M3	-.0707*	.7193*	.1697*	.0687*	-.0304
	(-2.630)	(2.519)	(2.322)	(1.702)	(-.583)
M4	-.0692*	.3422	.2588*	.0902*	.0373
	(-2.730)	(1.257)	(3.702)	(2.264)	(.743)
M5	-.0639	1.1860*	.2879*	.1575*	.0768
	(-1.663)	(2.852)	(2.800)	(2.606)	(1.002)
M6	-.0834*	-.0538	.4225*	.0851	-.0253
	(-2.588)	(-.155)	(4.614)	(1.590)	(-.396)
M7	-.0848*	.1431	.1754*	-.0197	-.0566
	(-2.415)	(.379)	(1.859)	(-.365)	(-.819)
M8	-.0801*	-.1544	.1437	.0588	-.0519
	(-2.164)	(-.388)	(1.432)	(.991)	(-.711)
M9	-.0628*	-.0716	.2315*	.0623	-.0531
	(-1.856)	(-.194)	(2.541)	(1.173)	(-.805)
M10	-.1172*	-.2638	.0754	.1737*	-.1796*
	(-2.998)	(-.727)	(.829)	(3.188)	(-2.211)
M11	.0732*	-.4288	.0551	.1433*	.1394*
	(2.312)	(-1.210)	(.653)	(2.713)	(2.124)
H	-.0751*	-.3521	-.2006*	-.0739*	-.1789*
	(-3.625)	(-1.566)	(-3.634)	(-2.378)	(-4.540)
PFLEAN	.0004	-.0045	-A	-A	.0040*
	(.394)	(-.417)	(-.011)	(-.064)	(2.008)
PFNLEAN	-.0003	.0034	-.0006	-.0004	-.0005
	(-.841)	*(.930)*	*(-.686)*	*(-.773)*	*(-.818)*
DW	2.125	2.582	1.786	2.155	2.567

Note: System R^2 = 0.8236.
"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

Variable	C5106324	C5106328	UC208989	C5106327	C7337006
INTERCEPT	11.9671*	3.8411*	14.5104*	3.2230*	7.9986
	(4.676)	(6.569)	(3.312)	(5.508)	(1.502)
OWN-PRICE	-.0279*	-.0103*	-.0162*	-.0096*	-.0673*
	(-10.952)	(-13.769)	(-4.903)	(-11.607)	(-11.364)
PCSTEAK	-	-.0003	-.0062	-	-
	-	(-.886)	(-1.591)	-	-
PCGBEEF	-.0003	-.0006	-	-.0003	-.0041
	(-.130)	(-1.288)	-	(-.678)	(-.848)
PCROAST	.0023	-	.0037	-.0001	.0050
	(1.364)	-	(1.068)	(-.463)	(1.314)
PCRIB	-.0079*	-.0014*	-.0219*	-.0001	.0047
	(-2.385)	(-2.134)	(-4.115)	(-.201)	(.681)
PCENTREE	-.0006	.0007*	-.0037	.0004	.0017
	(-.344)	(2.291)	(-1.228)	(1.256)	(1.311)
PORK	-.0003	.0001	-.0029	.0004	.0035
	(-.148)	(.293)	(-.833)	(1.210)	(.846)
POULTRY	.0022	A	-.0028	-.0001	.0015
	(1.431)	(.019)	(-.919)	(-.417)	(.452)
FISH	.0013	.0002	.0033*	.0001	.0037*
	(1.341)	(.814)	(1.906)	(.542)	(1.862)
M1	-.0758	.0423	.3343	.0398	.4549
	(-.443)	(1.212)	(1.019)	(1.158)	(1.279)
M2	-.1032	-.0529	.4600	-.0581*	.0845
	(-.627)	(-1.550)	(1.469)	(-1.743)	(.250)
M3	-.0732	-.0715*	.0252	-.0456	.7236*
	(-.4951)	(-2.271)	(.088)	(1.502)	(2.278)
M4	.2203	-.0520*	.0653	-.0391	.2987
	(1.532)	(-1.722)	(.240)	(-1.334)	(.981)
M5	.3187	.0161	.1397	-.0117	1.2544*
	(1.391)	(.351)	(.349)	(-.261)	(2.697)
M6	.2462	-.0811*	.1003	-.0540	-.1214
	(1.292)	(-2.117)	(.295)	(-1.453)	(-.314)
M7	.2080	-.0662	-.0715	-.0267	.0528
	(1.011)	(-1.592)	(-.197)	(-.666)	(.125)
M8	.1483	-0677	-.0294	-.0465	-.2794
	(.684)	(-1.543)	(-.075)	(-1.094)	(-.629)
M9	.2939	-.0391	.3399	-.0258	-.1902
	(1.475)	(-.990)	(.982)	(-.673)	(-.464)
M10	-.2818	-.1336*	.4404	-.1108*	-.3309
	(-1.400)	(-2.829)	(1.173)	(-2.314)	(-.814)
M11	-.0877	.0773*	.0378	.0744*	-.5813
	(-.453)	(2.044)	(.101)	(1.921)	(-1.463)
H	-.1745	0.0982*	-.5405*	-.0849*	-.3726
	(-1.535)	(-4.270)	(-2.416)	(-3.702)	(-1.490)
PFLEAN	-.0039	.0028*	-.0021	.0021*	-.0062
	(-.702)	(2.370)	(-.190)	(1.780)	(-.512)
PFNLEAN	.0018	-.0002	-.0016	-.0003	.0035
	(.976)	(-.493)	(-.454)	(-.866)	(.850)
DW	2.287	2.604	1.713	2.585	2.555

"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

Fresh Lean Beef Products: Aggregate Commodities Parameter Estimates (t-Values)

Variable	FLBRISK	FLCHUCK	FLGRND	FLLOIN
INTERCEPT	0.6785	1.8656	6.1918	4.4678
	(0.513)	(1.596)	(1.019)	(1.569)
PFLBRISK	-0.0049	-0.00004	-0.0243*	0.0059
	(-1.559)	(-0.015)	(-1.688)	(0.880)
PFNLEAN	-0.0003	-0.0009	0.0034	0.0007
	(-0.367)	(-1.456)	(1.063)	(0.509)
PCON	-0.0007	0.0005	0.0032	-0.0009
	(-0.930)	(0.822)	(0.973)	(-0.572)
PFLRIB	0.0009	-0.0003	0.0119*	0.0017
	(1.380)	(-0.484)	(3.994)	(1.228)
PFLLOIN	-0.0019*	-0.0020*	0.0073	-0.0048*
	(-1.847)	(-2.199)	(1.576)	(-2.193)
PFLAOB	0.00006	-0.0004	-0.0011	-0.0017
	(0.042)	(-0.307)	(-0.154)	(-0.517)
PFLROUND	0.0007	0.00008	-0.0040	0.0003
	(0.710)	(0.102)	(-0.924)	(0.145)
PFLGRND	0.0013	-0.0014	-0.0224*	-0.0093*
	(0.539)	(-0.685)	(-2.052)	(-1.819)
PFLCHUCK	0.0037*	-0.0007	0.0008	-0.0006
	(3.041)	(-0.665)	(0.141)	(-0.226)
ADVAOM	-0.00002	0.00003	-0.0003	0.00007
	(-0.420)	(0.950)	(-1.607)	(-0.226)
ADBRISK	0.0006*	-0.00003	-0.0005	0.0006*
	(4.571)	(-0.292)	(-0.905)	(1.951)
ADRIB	-0.00006	0.0001	-0.0042*	0.0003
	(-0.174)	(0.312)	(-2.524)	(0.387)
ADAOB	0.00002	-0.0002	-0.0010	-0.0008*
	(0.104)	(-1.054)	(-1.292)	(-2.219)
ADROUND	-0.0002*	-0.0003*	-0.0007	-0.0005*
	(-1.666)	(-4.173)	(-1.538)	(-2.648)
ADGBEEF	0.00007	0.0001	0.0004	0.0004*
	(0.773)	(1.189)	(1.079)	(1.953)
ADCHUCK	-0.00002	0.0004*	0.0004	0.0003
	(-0.175)	(4.580)	(0.752)	(1.188)
ADLOIN	0.0002	0.00007	0.0013*	0.0001
	(1.284)	(0.666)	(2.426)	(0.394)
PORK	-0.0014*	0.0005	-0.0006	-0.0005
	(-2.619)	(0.981)	(-0.250)	(-0.424)
POULTRY	-0.0005	-0.0003	-0.0028	-0.0018*
	(-1.002)	(-0.718)	(-1.342)	(-1.775)
FISH	-0.006*	0.0004	-0.0008	0.0003
	(-1.854)	(1.320)	(-0.530)	(0.455)
M1	0.1484*	0.0785	1.2099*	0.2900*
	(2.406)	(1.441)	(4.271)	(2.185)
M2	0.1681*	0.0457	1.1406*	0.1645
	(2.458)	(0.756)	(3.630)	(1.117)
M3	0.1489*	0.0934*	0.8720*	0.0464
	(2.435)	(1.729)	(3.104)	(0.352)
M4	0.1939*	0.1074*	1.3381*	0.0527
	(2.831)	(1.773)	(4.251)	(0.358)

Variable	FLBRISK	FLCHUCK	FLGRND	FLLOIN
M5	0.2732*	0.0739	0.8922*	-0.0407
	(3.859)	(1.182)	(2.743)	(-0.267)
M6	0.1980*	0.1070	-0.5783	-0.2695
	(2.287)	(1.399)	(-1.454)	(-1.446)
M7	0.2083*	0.0471	-0.4321	-0.3381*
	(2.407)	(0.616)	(-1.087)	(-1.815)
M8	0.2691*	0.0373	-0.5407	-0.2345
	(3.028)	(0.475)	(-1.324)	(-1.226)
M9	0.2528*	0.1175	-0.4085	-0.1227
	(2.752)	(1.447)	(-0.968)	(-0.620)
M10	0.2076*	0.0856	0.2897	0.0378
	(2.749)	(1.283)	(0.835)	(0.233)
M11	0.0772	0.0818	1.0243*	-0.0497
	(1.211)	(1.452)	(2.498)	(-0.362)
H	0.0850*	-0.0597	-0.7215*	-0.2863*
	(2.053)	(-1.633)	(-3.795)	(-3.216)
DW	2.150	2.295	2.423	2.381
ADJ R^2	0.5016	0.5712	0.5508	0.4857

* Statistically significant at the 0.05 level.

Variable	FLRIB	FLROUND	FLAOB
INTERCEPT	0.6189	2.5329	9.8775*
	(1.477)	(0.451)	(1.705)
PFLBRISK	0.0006	-0.0136	0.0106
	(0.595)	(-1.021)	(0.772)
PFNLEAN	0.00001	0.0016	0.00005
	(0.063)	(0.542)	(0.015)
PCON	0.00009	-0.0078*	-0.0013
	(0.379)	(-2.547)	(-0.421)
PFLRIB	-0.0002	0.0016	0.0054*
	(-0.786)	(0.567)	(1.915)
PFLLOIN	0.0002	0.0144*	0.0030
	(0.637)	(3.375)	(0.687)
PFLAOB	-0.0007	0.0048	-0.0285*
	(-1.406)	(0.760)	(-4.362)
PFLROUND	0.00007	-0.0331*	0.0052
	(0.228)	(-8.254)	(1.249)
PFLGRND	-0.0013*	0.0079	-0.0229*
	(-1.696)	(0.787)	(-2.202)
PFLCHUCK	-0.0002	0.0184*	0.0036
	(-0.454)	(3.566)	(0.683)
ADVAOM	0.000003	0.00003	-0.00002
	(0.267)	(0.179)	(-0.109)
ADBRISK	0.00001	-0.000004	0.0002
	(0.331)	(-0.008)	(0.411)
ADRIB	0.0003*	-0.0004	-0.0017
	(2.657)	(-0.239)	(-1.113)
ADAOB	-0.00009	0.0004	3.1692
	(-1.569)	(0.552)	(0.000)

Variable	FLRIB	FLROUND	FLAOB
ADROUND	-0.00003	0.0016*	-0.0001
	(-0.944)	(4.138)	(-0.259)
ADGBEEF	0.00001	0.0001	0.0006
	(0.451)	(0.316)	(1.592)
ADCHUCK	-1.2143	-0.0004	0.0002
	(-0.004)	(-0.859)	(0.525)
ADLOIN	-0.000009	0.0003	0.0012*
	(-0.231)	(0.641)	(2.290)
PORK	-0.000002	-0.0002	-0.0011
	(-0.011)	(-0.070)	(-0.479)
POULTRY	-0.0002	0.0001	-0.0026
	(-1.595)	(0.071)	(-1.273)
FISH	0.0001	0.0005	0.0021
	(1.079)	(0.345)	(-1.273)
M1	-0.0191	0.8564*	1.3992*
	(-0.978)	(3.272)	(5.182)
M2	-0.0344	0.6776*	0.8837*
	(-1.588)	(2.334)	(2.951)
M3	-0.0609*	0.5015*	0.3096
	(-3.143)	(1.932)	(1.156)
M4	-0.0691*	0.4746	0.4699
	(-3.187)	(1.632)	(1.566)
M5	-0.0668*	0.3520	0.3444
	(-2.979)	(1.171)	(1.111)
M6	-0.0584*	-0.3318	-0.2647
	(-2.129)	(-0.903)	(-0.698)
M7	-0.0712*	-0.2177	-0.4904
	(-2.600)	(-0.593)	(-1.294)
M8	-0.0445	-0.1288	-0.2613
	(-1.582)	(-0.341)	(-0.671)
M9	-0.0495*	0.0070	-0.0254
	(-1.700)	(0.018)	(-0.063)
M10	-0.0711*	0.5495*	0.3462
	(-2.973)	(1.714)	(1.047)
M11	-0.0755*	0.1961	0.4715*
	(-3.740)	(0.725)	(1.689)
H	-0.0163	-0.5062*	-0.8072*
	(-1.246)	(-2.882)	(-4.454)
DW	1.833	2.349	2.164
ADJ R^2	0.4248	0.6969	0.6436

* Statistically significant at the 0.05 level.

Fresh Non-Lean Beef Products: Aggregate Commodities Parameter Estimates (t-Values)

Variable	FNLBRSK	FNLCHUCK	FNLGRND	FNLLOIN
INTERCEPT	284.0119	4.5626	356.8517*	134.1748*
	(1.853)	(0.071)	(2.260)	(2.895)
PFNLBRSK	-0.8783*	0.0817	0.1216	-0.0218
	(-6.803)	(1.512)	(0.912)	(-0.558)
PFLEAN	-0.0181	0.4248*	0.3210	-0.1179
	(-0.043)	(2.149)	(0.743)	(-0.930)

Variable	FNLBRSK	FNLCHUCK	FNLGRND	FNLLOIN
PCON	-0.0955	-0.0339	-0.0281	0.0054
	(-0.671)	(-0.568)	(-0.191)	(0.126)
PFNLRIB	-0.0087	-0.0965*	-0.2332*	-0.0202
	(-0.085)	(-2.235)	(-2.197)	(-0.648)
PFNLLOIN	0.0707	-0.0233	-0.0226	-0.1471*
	(1.126)	(-0.887)	(-0.349)	(-7.752)
PFNLAOB	-0.1907	-0.1883*	0.0526	0.0122
	(-1.219)	(-2.873)	(0.326)	(0.258)
PFNLRND	-0.0067	0.0799*	0.0597	0.0451*
	(-0.083)	(2.344)	(0.713)	(1.832)
PFNLGRND	0.0895	-0.0334	-1.0438*	0.0273
	(0.579)	(-0.517)	(-6.556)	(0.583)
PFNLCHCK	0.1108	-0.2783*	0.0147	-0.0065
	(0.993)	(-5.958)	(0.128)	(-0.192)
ADVAOM	-0.0104	0.0021	-0.0043	-0.0037
	(-1.368)	(0.675)	(-0.554)	(-1.600)
ADBRISK	0.1106*	0.0179	0.0188	0.0044
	(3.050)	(1.178)	(0.503)	(0.402)
ADRIB	0.0137	-0.0350	-0.1204*	0.0067
	(0.196)	(-1.198)	(-1.675)	(0.318)
ADAOB	-0.0884*	-0.0151	-0.0041	-0.0020
	(-1.791)	(-0.733)	(-0.081)	(-0.135)
ADROUND	-0.0173	0.0052	0.0167	0.0025
	(-0.697)	(0.505)	(0.654)	(0.335)
ADGBEEF	-0.0092	-0.0059	0.1066*	0.0013
	(-0.439)	(-0.671)	(4.908)	(0.198)
ADCHUCK	-0.0060	0.0491*	0.0230	-0.0032
	(-0.217)	(4.258)	(0.811)	(-0.385)
ADLOIN	0.0167	-0.0127	0.0141	0.0406*
	(0.569)	(-1.035)	(0.467)	(4.585)
PORK	-0.1101	0.0084	-0.0566	-0.0257
	(-1.055)	(0.193)	(-0.526)	(-0.815)
POULTRY	0.0181	0.0351	-0.0486	0.0145
	(0.207)	(0.955)	(-0.538)	(0.549)
FISH	-0.1428*	0.0086	-0.915	-0.0023
	(-2.639)	(0.381)	(-1.641)	(-0.143)
M1	20.5826	-0.2703	21.3494	3.8816
	(1.633)	(-0.051)	(1.643)	(1.018)
M2	15.5493	4.3942	12.6515	-2.1205
	(1.116)	(0.753)	(0.882)	(-0.504)
M3	17.2479	2.8869	9.8649	4.3703
	(1.334)	(0.533)	(0.741)	(1.118)
M4	20.9544	8.0750	14.7782	7.6887*
	(1.652)	(1.520)	(1.130)	(2.004)
M5	33.9634*	17.4808*	9.6654	6.9331*
	(2.615)	(3.214)	(0.722)	(1.766)
M6	17.3093	6.8214	11.1068	8.0033*
	(1.205)	(1.134)	(0.750)	(1.842)
M7	12.3942	15.5377*	20.0322	8.6615*
	(0.815)	(2.440)	(1.279)	(1.884)
M8	14.5279	11.0582*	18.4700	8.3778*
	(0.979)	(1.780)	(1.208)	(1.868)

Variable	FNLBRSK	FNLCHUCK	FNLGRND	FNLLOIN
M9	6.9035	7.6210	24.3997*	6.5206
	(0.517)	(1.364)	(1.774)	(1.616)
M10	4.8402	6.2878	22.8354*	6.6284
	(0.365)	(1.134)	(1.673)	(1.655)
M11	5.2407	8.5965*	26.0449*	3.1938
	(0.431)	(1.687)	(2.078)	(0.868)
H	8.4762	-0.9860	-0.3044	-3.7391
	(1.022)	(-0.287)	(-0.036)	(-1.507)
DW	2.117	2.143	2.338	2.372
ADJ R^2	0.7764	0.9041	0.7531	0.8202

* Statistically significant at the 0.05 level.

Variable	FNLRIB	FNLROUND	FNLAOB
INTERCEPT	50.9343	-66.4358	29.8572
	(1.491)	(-0.851)	(0.519)
PFNLBRSK	-0.0058	-0.0207	0.0387
	(-0.200)	(-0.315)	(0.799)
PFLEAN	-0.0036	0.6717*	0.3127*
	(-0.039)	(3.144)	(1.987)
PCON	0.0026	-0.0855	-0.0041
	(0.081)	(-1.179)	(-0.076)
PFNLRIB	-0.0992*	-0.0462	-0.1615*
	(-4.320)	(-0.880)	-4.177)
PFNLLOIN	0.0097	0.0093	0.0196
	(0.690)	(0.292)	(0.833)
PFNLAOB	0.0114	-0.0528	-0.3393*
	(0.327)	(-0.663)	(-5.778)
PFNLRND	-0.0084	-0.4107*	0.0424
	(-0.464)	(-9.911)	(1.391)
PFNLGRND	0.0020	0.0498	0.0104
	(0.057)	(0.633)	(0.179)
PFNLCHCK	-0.0142	0.0853	0.0068
	(-0.571)	(1.501)	(0.162)
ADVAOM	-0.0005	-0.0024	-0.0011
	(-0.266)	(-0.608)	(-0.372)
ADBRISK	-0.0022	-0.0141	-0.0043
	(-0.270)	(-0.765)	(-0.317)
ADRIB	0.0941*	-0.0094	-0.0262
	(6.052)	(-0.264)	(-0.999)
ADAOB	-0.0064	-0.0059	0.0340*
	(-0.586)	(-0.235)	(1.839)
ADROUND	-0.0035	0.0639*	0.0091
	(-0.640)	(5.072)	(0.984)
ADGBEEF	0.0020	-0.0071	-0.0053
	(0.435)	(-0.659)	(-0.675)
ADCHUCK	-0.0033	0.0117	-0.0006
	(-0.532)	(0.835)	(-0.053)
ADLOIN	-0.0006	-0.0160	0.0011
	(-0.096)	(-1.072)	(0.103)

Variable	FNLRIB	FNLROUND	FNLAOB
PORK	0.0079	0.0557	0.0001
	(0.341)	(1.047)	(0.003)
POULTRY	-0.0064	-0.0138	0.0224
	(-0.328)	(-0.308)	(0.683)
FISH	0.0153	-0.0048	0.0275
	(1.272)	(-0.174)	(1.353)
M1	-0.1235	2.6300	0.8271
	(-0.044)	(0.409)	(0.175)
M2	3.1071	-0.9978	-2.9429
	(1.001)	(-0.141)	(-0.563)
M3	2.0323	6.2096	-2.6687
	(0.705)	(0.943)	(-0.550)
M4	1.4489	-5.9377	1.7624
	(0.512)	(-0.919)	(0.370)
M5	2.7644	8.6872	14.4116*
	(0.955)	(1.313)	(2.957)
M6	1.7832	1.9475	2.1584
	(0.557)	(0.266)	(0.400)
M7	0.5729	2.4546	4.9314
	(0.169)	(0.317)	(0.864)
M8	1.6007	1.8791	5.0679
	(0.484)	(0.249)	(0.910)
M9	1.0372	4.7228	1.0208
	(0.349)	(0.695)	(0.204)
M10	1.7371	5.2216	3.2561
	(0.589)	(0.774)	(0.655)
M11	1.9803	4.8620	2.9076
	(0.730)	(0.784)	(0.637)
H	0.6167	-0.7888	-2.9501
	(0.337)	(-0.189)	(-0.958)
DW	2.473	2.513	2.102
ADJ R^2	0.6096	0.8759	0.8141

* Statistically significant at the 0.05 level.

Convenience Beef Products: Aggregate Commodities Parameter Estimates (t-Values)

Variable	CSTEAK	CENTREE	CGBEEF	CROAST	CRIB
INTERCEPT	52.6643*	13.5603*	13.3974*	8.9140*	6.0745*
	(3.843)	(1.837)	(2.630)	(3.570)	(6.915)
PCSTEAK	-0.932*	-0.0181*	-0.0081*	-0.0014	0.0011
	(-7.606)	(-2.742)	(-1.783)	(-0.637)	(1.398)
PCGBEEF	0.0040	0.0027	-0.0350*	0.0023	-0.0002
	(0.320)	(0.401)	(-7.557)	(1.001)	(-0.272)
PCROAST	-0.0105	0.0006	0.0039	-0.0207*	-0.0006
	(-1.025)	(0.114)	(1.304)	(-11.090)	(-0.969)
PCENTREE	-0.0041	-0.0347*	0.0004	-0.0003	-0.0010
	(-0.388)	(-6.111)	(0.096)	(-0.187)	(-1.543)
PCRIB	-0.0196	-0.0266*	-0.0191*	-0.0018	-0.0131*
	(-1.083)	(-2.730)	(-2.851)	(-0.557)	(-11.272)

Variable	CSTEAK	CENTREE	CGBEEF	CROAST	CRIB
PORK	0.0131	0.0028	-0.0003	0.0016	0.0003
	(1.261)	(0.512)	(-0.091)	(0.864)	(0.492)
POULTRY	-0.0106	-0.0029	-0.0086*	-0.0004	-A
	(-1.235)	(-0.623)	(-2.688)	(-0.230)	(-0.097)
FISH	-0.0017	0.0079*	0.0011	-0.0008	-A
	(0.327)	(2.865)	(0.554)	(-0.914)	(-0.048)
M1	3.1093*	-0.3172	-0.1125	0.2340	0.0141
	(3.248)	(-0.615)	(-0.316)	(1.342)	(0.230)
M2	1.4337	0.1616	-0.0191	-0.2227	-0.1411*
	(1.526)	(0.319)	(-0.055)	(-1.302)	(-2.345)
M3	1.3437	-0.5092	-0.5842*	-0.5047*	-0.1231*
	(1.590)	(-1.119)	(-1.859)	(-3.277)	(-2.272)
M4	1.2269	-0.5769	0.0056	-0.1267	-0.1210*
	(1.520)	(-1.327)	(0.019)	(-0.862)	(-2.339)
M5	1.0473	-0.7735	0.2014	-0.0089	-0.0709
	(0.848)	(-1.163)	(0.439)	(-0.040)	(-0.897)
M6	0.7652	-1.2536*	-0.6583*	-0.1915	-0.0647
	(0.749)	(-2.278)	(-1.733)	(-1.029)	(-0.988)
M7	-0.5058	-1.2906*	-0.4663	-0.3426*	-0.1932*
	(-0.459)	(-2.176)	(-1.139)	(-1.707)	(-2.738)
M8	-0.1276	-1.1557*	-0.5773	-0.2145	-0.2186*
	(-0.109)	(-1.839)	(-1.331)	(-1.009)	(-2.922)
M9	1.2280	-0.5762	-0.3486	-0.0978	-0.0314
	(1.169)	(-1.018)	(-0.893)	(-0.511)	(0.467)
M10	3.3234*	-0.4027	0.7755*	0.1390	0.0802
	(2.982)	(-0.671)	(1.872)	(0.684)	(1.123)
M11	2.2782*	0.1524	-0.1763	0.4559*	0.1366*
	(2.059)	(0.256)	(-0.429)	(2.262)	(1.926)
H	-3.1416*	-0.5792*	-1.0872*	-0.2026*	-0.0508
	(-4.956)	(-1.696)	(-4.613)	(-1.754)	(-1.250)
PFLEAN	-0.0105	0.0268	0.0168	-0.0008	-0.0019
	(-0.332)	(1.567)	(1.426)	(-0.135)	(-0.939)
PFNLEAN	-0.0144	-0.0051	-0.0089*	-0.0021	-0.0002
	(-1.377)	(-0.921)	(-2.306)	(-1.104)	(-0.245)
DW	2.257	2.075	2.539	1.730	2.039
ADJ R^2	0.7627	0.6006	0.7466	0.7804	0.8285

"A" denotes less than 0.0001.
* Statistically significant at the 0.05 level.

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