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Brand Premiums in the U.S. Beef Industry

Steve Martinez

The U.S. beef industry has experienced considerable reductions in beef demand over the past 30 years. One possible factor in declining beef demand is lack of progress in the development of consistent, high-quality branded beef products. This article uses Nielsen Homescan data and hedonic models to estimate the value that U.S. consumers place on various beef attributes, including brand.

Beef demand indexes suggest a greater long-term decline in beef demand compared to other meat products. The beef demand index involves calculating the real beef price that we would expect to observe if beef demand was consistent with demand in the base year. This is compared to the real beef price actually observed to indicate changes in underlying beef demand. A beef demand index value of 55 in 2006 (1980=100) suggests beef retail prices were 45 percent lower in 2006 than they would have been if beef demand was at its 1980 level (Tonsor, 2010). That is, beef demand fell by 45 percent since 1980. This compares to a pork demand index of 65, which suggests that pork demand fell by 35 percent over the same period. Along with changing consumer preferences and heightened health consciousness, poor quality assurance has been offered as one reason for the decline in beef demand (Brester, Schroeder, and Mintert, 1997; Ferrior and Lamb, 2007; Purcell, 2002; Purcell and Hudson, 2003). Marketing of differentiated beef products may be hampered by the fact that beef quality is unknown when cattle are sold, and quality variation related to genetics makes it difficult to establish branded products (Bailey, 2007; Ward, 1997; Ward, undated).

According to Ward (1997), one of the biggest obstacles to greater vertical coordination in the beef sector is difficulty in controlling quantity, quality, and consistency. Large capital requirements are involved in controlling a large number of small and geographically dispersed cow-calf producers. Measuring and controlling quality and end-product consistency also is a problem because of several factors, including the wide genetic base, longer production cycle required to quickly change the genetic base, greater number of production stages, and lack of economical measuring technology.[1]

Brand premiums can provide the necessary incentives for sourcing cattle of higher quality and consistency, and they can provide opportunities for increasing revenues to be allocated across the supply chain (i.e., producers, processors, distributors). Yet, limited research exists on how consumers value branded beef products. Parcell and Schroeder (2007), using a national survey of about 2,000 households from 1992 to 2000, found price premiums for branded roasts and steaks (mostly Certified Angus Beef®) compared to store brands, but not for branded ground beef. Based on data collected from grocery stores in three metropolitan areas from July-August 2006, Ward et al. (2008b) found price premiums for branded roast/steak and ground beef compared to unbranded/generic beef. In this study, we conduct a hedonic analysis to estimate implicit prices of branded beef using more recent data than Parcell and Schroeder (2007) and, unlike Ward et al. (2008b), uses scanner panel data that is national in scope from a panel of representative U.S. households.

Role of Brands

Consumers may be willing to pay a premium for branded products because branding can help to overcome problems that have limited beef sales. Branding provides a means for signaling quality. Brands can help consumers process, interpret, and store large quantities of information about products. As a source of information, brands

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[1]Other factors noted by Ward include capital requirements, and management skills required to manage many, small, and geographically dispersed cattle operations through several production stages.

serve as substitutes for the time and skills required for evaluating product quality (Jin, Zilberman, and Heiman, 2008).

Brands are particularly important in cases where information necessary for obtaining an objective determination of quality is limited at the time of purchase, as with experience and credence attributes (Jin, Zilberman, and Heiman, 2008).[2] For unprocessed beef, there may be only minor detectable quality differences at the store for products within the same category. Yet, considerable biological variation may exist, which results in different quality experiences. This situation compels consumers to search for other informational cues in the evaluation of unprocessed beef at the store. Branded beef has been shown to serve as the predominant cue for expected eating and health quality (Bredahl, 2003).

When companies develop products with unique quality attributes, these products are generally sold as branded products. Producers of branded products must support their brands by investing in quality control because perceived average quality levels and quality variation can affect premiums paid for branded products. Perceived quality is based on consistency of product characteristics, such as eating satisfaction and safety, from one purchase to the next. Brands can increase consumers' confidence regarding the purchase decision because of past experience with the product or familiarity with the brand and its characteristics.

Consumers may be willing to pay a higher price for branded products because of reduced search costs, and companies' commitment to quality to prevent losses in brand name investments and reputation (Fernandez-Barcala and Gonzalez-Diaz, 2006). In addition, if a brand is well positioned with respect to a key attribute, such as tenderness, competitors will find it difficult to differentiate their products based on the same attribute.

Nielsen Homescan Data

This research uses Nielsen Homescan data for household purchases in calendar years 2004 and 2005. Consumer panel participants were selected based on demographic and geographic targets to match the U.S. population as closely as possible. The nationally representative panel contains about 8,000 households per year who participated for at least ten months. These households recorded both their non-UPC-coded random-weight and UPC-coded purchases after each shopping trip using an electronic scanner located at their home.[3] For non-UPC-coded random-weight products, information is manually recorded using Nielsen's "Category Code Book For Non-UPC Barcoded Items."[4] The individual household food purchase data contains information on expenditures, quantities and date purchased, package size, number of units, price promotions (coupons, store features, and other deals), and brand. The data also contain demographic information for each household, such as geographic location, income, race, household size, education, and age.

Nielsen Homescan data include brand information for fresh, frozen, and precooked ground beef, steak, roast, and other beef cuts (e.g., beef for stew, ribs, liver, brisket).[5] Table 1 summarizes Nielsen's brand classifications for non-UPC random-weight and UPC-coded beef. Non-UPC coded random-weight beef has three broad brand descriptors: an actual brand name (e.g., Coleman Natural Beef, Swift); an "all other brands category;" and "no brand." UPC-coded beef cuts have four basic brand descriptors. These include

[2]Experience attributes are those that are costly to measure by the consumer prior to purchase, but are easily measured as the product is consumed (e.g., tenderness, taste). Credence attributes are those that are difficult to measure before and after purchasing (organic, natural). On the other hand, search attributes have a low cost of measuring at the time the purchase (e.g., color, visible fat). For search attributes, additional information provided by the brand is less likely to have significant value to the buyer (Pearson, 2003).

[3]Random-weight items are products that do not have a standard weight.

[4]The category code book is used for products with non-UPC barcodes and those without any barcodes. Panelists are instructed to first scan non-UPC barcoded items before using the code book.

[5]Our analysis excludes further processed products, including sausages and hotdogs, canned meat, jerky, meat snacks, frozen entrees, lunch meat, refrigerated and frozen ready-made sandwiches, sandwich spreads, and soups.

Table 1. Classification of Branded Beef in the Nielsen Homescan Data, Calendar Years 2004 - 2005

Product modules	Brand descriptors	Branded?
Non-UPC coded random-weight beef	No brand (includes those cuts branded with the store name)[1]	No
	Brand name (e.g., Sterling Silver, Swift, Store-specific brands that are not the store name)	Yes
	All other brands	Yes
UPC-coded beef	Brand name	Yes
	CTL BR (all private label/store brands)[2]	Yes
	NBL-no company listed	No
	Supplier name-NBL (e.g., Tyson Fresh Meats-NBL)[3]	No

[1]According to the Nielsen code book for non-UPC barcoded items, panelists are instructed to type the brand name into the scanner as it appears on the package label. If there is no brand name on the package, or if the store's name is the brand name, they are asked to press the "no" key on their scanner. Hence, private label products where the brand name is the store name (e.g., Kroger or Giant) are included in the "no brand" category, there is no way to segregate these brands from the category.
[2]Includes all private label products, including those brands where the brand is the name of the store.
[3]These products identify the supplier, but the company name is not the brand name.

the actual brand name; "CTL BR," which are private label (i.e., store brand) products (e.g., Giant or Safeway's Rancher's Reserve brand);[6] a company name followed by "NBL" (no brand label) (e.g., Tyson Fresh Meats---NBL); and "NBL---no company listed." The "NBL- no company listed" identifier means that the item did not have a label identifying the supplier. For random-weight beef, Nielsen considers private label products to be unbranded if the store name is the brand.[7]

Extent of Beef Branding

In this section, we use household projection factors (weights) contained in the Homescan data to aggregate household purchase data, which we then use to describe branded beef purchases in the United States. Each household is assigned a projection factor based on its demographics to make aggregate statistics representative at the national level. Each household is weighted by its projection factor according to its representation in the U.S. population based on U.S. Census data. A weighted quantity and expenditure is calculated for each recorded transaction, which can then be aggregated over all household transactions to obtain totals that are representative of national purchases. Nielsen recalculates the weights each year to maintain consistency with Census updates.[8]

Due to differences in brand classifications, as discussed earlier, we used Nielsen Homescan data to conduct separate analyses of non-UPC-coded random-weight beef, which accounted for 87 percent of beef poundage purchased in 2005, and UPC-coded beef. Consumers spent $3.1 billion on 1 billion pounds of random-weight branded beef cuts in 2005, or 25 percent of random-weight beef pounds purchased. In comparison, branded products accounted for 63 percent of random-weight chicken pounds purchased and 46 percent of random-weight pork pounds purchased in 2005 (Nielsen Homescan data).

For random-weight beef, we focus on ground beef, steaks, and roasts, which accounted for 85

[6]Private label or store-branded beef is exclusively developed, manufactured, and produced for a retailer. According to the Private Label Manufacturers Association, the brand can be the store's own name or a name created exclusively by that store.
[7]Information on the frequency distribution of purchases by type of brand, including those that have no brand present, are included table 3 for non-UPC random weight beef and table 5 for UPC-coded beef.
[8]More details on the projection factors can be found in Harris (2005).

percent of random-weight beef pounds purchased in 2005, the latest year in our sample (Nielsen Homescan data). Twenty-two percent of random weight ground beef carried a brand, compared to 25 percent of steaks and roasts. A smaller percentage of branded ground beef may be due to the fact that the degree of leanness is the primary factor that distinguishes ground beef (Parcell and Schroeder, 2007). In 2005, 87 percent of ground beef purchased carried a leanness specification, and accounted for 95 percent of all beef with information on leanness (Nielsen Homescan data).

In 2005, the percentage of beef purchased through some type of price promotion, including store and manufacturer coupons, store features, and other deals, was slightly higher for branded versus unbranded beef; 43 percent compared to 41 percent (Nielsen Homescan data). Price promotions and competition between store types can create incentives to improve product quality and consistency of branded products. Price promotions provide a quick and measureable means of increasing sales. However, promotions that simply offer a price discount may also cheapen the value of a brand, harm the brand image, and reduce the likelihood of future brand purchases (Aaker, 1991; Gedenk and Neslin, 1999). In the long term, price promotions can increase sales, but should be used in conjunction with advertisements and product improvements to increase the likelihood of future brand purchases (Gedenk and Neslin, 1999).

One of the most important developments in the food retail sector has been the growth in food sales by stores that did not traditionally sell many food items, especially wholesale clubs and supercenters. Homescan Panel data distinguishes stores by store type. The share of branded random-weight beef purchased at wholesale clubs was highest compared to grocery stores and supercenters. In 2005, 34 percent of random weight beef purchased at wholesale clubs carried a brand label, compared to 23 percent at grocery stores and 12 percent at supercenters.

Beef that is UPC-coded allows consumers to select beef cuts quicker because they don't have to search through packages to find the preferred weight or price. UPC-coded items also facilitate tracking of product movement by the supplier, and tracing of product by the buyer back to the supplier. In this study, we focused on UPC-coded ground beef, which accounted for 96 percent of UPC-coded purchases in 2005.[9] Branded UPC-coded ground beef purchased as a share of total UPC-coded ground beef was 69 percent in 2005. Grocery stores and supercenters accounted for 82 percent of UPC-coded ground beef purchases, and 86 percent of this beef was branded at grocery stores compared to 31 percent at supercenters.

Hedonic Regression Model Results

To examine price premiums associated with specific beef brands, we estimated a hedonic regression model using sample data on household purchases contained in the Nielsen Homescan data for 2004 and 2005. The hedonic price model assumes that consumers derive utility from the characteristics of goods rather than the goods themselves (Ladd and Suvannunt, 1976; Unnevehr and Bard, 1993). Price differences are assumed to be due to differences in product attributes which include *intrinsic* and *extrinsic* quality attributes (Parcell and Schroeder, 2007; Pearson, 2003). Intrinsic attributes are those associated with the actual characteristics of the product, such as fat content, taste, smell, and color. Extrinsic attributes relate to promotional or informational characteristics that can also affect consumer choice, including brand. We also assume that prices may vary by location of the household, as well as month and year of purchase.

To estimate price differences between branded and unbranded beef, we first classified brands into specific categories. There is no consensus in the literature on how to categorize brands. Ward et al. (2008b) identified four specific types of brands including special, program, store, and all other brands, along with an "unbranded" category. Special brands were those that carried a label identifying production practices, such as "all natural." Program brands were breed specific, such as Certified Angus Beef. In addition to store brands and unbranded beef, Schulz et al. (2010) classified beef into three brand categories

[9]Steak accounted for most of the remainder, and nearly all of it was branded.

based on the range of distribution. A national brand is distributed nation-wide and is controlled by the company that owns the brand. A local private brand is distributed locally and is privately owned and controlled by a small company. A regional private brand is distributed regionally and is owned and controlled by a private company. In addition to store brands, the National Cattlemen's Beef Association (NCBA) (undated) identified two other types of branding programs, similar to those defined by Ward et al. (2008). A breed-specific branded beef program selects beef from a specific breed. Company-specific branded beef is not breed specific, but includes other criteria, such as premium grade, no antibiotics or hormones, source verified, or grass-fed. Examples include Sterling Silver™ Beef or Maverick Ranch.

In this study, we combine the brand nomenclature described above to classify beef into six categories: 1) breed-specific/program brands, 2) company-specific/special brands, 3) private label/store brands, 4) national brands, 5) all other brands, 6) unbranded beef. Private label brands can be further classified into three general types: generic, no frills, low-priced products; national-brand equivalents (i.e., copies the national brands, but sold at lower price); and premium, value-added private label that is priced near or above the brand leader (Rivkin, 2006; Forgrieve, 2007). National brands are established brands that do not fall into any of the other brand categories, such as Hormel and Tyson.

Random-Weight Beef

Table 2 contains summary statistics for the continuous variables and table 3 contains the frequency distribution for all discrete variables used to estimate the random-weight hedonic models in this study. For random-weight beef, Nielsen data contain 12 brand names of substance (i.e., those with at least 15 observations per year, and 250,000 pounds purchased annually based on weighted and aggregated quantities across households to obtain a nationally representative total), including six national brands, four private label brands, a company-specific brand, and a breed-specific brand. National brands were less prevalent for ground beef and roast, while the other types of brands were well represented across each cut. To protect proprietary information, we do not divulge the names of specific brands.

The following equation was estimated for each of the three leading cuts of beef:

$$
\begin{aligned}
(1)\quad P = {} & \alpha + \beta_1 YEAR + \beta_2 SIZE + \beta_3 SIZESQ \\
& + \beta_4 ProductForm + \sum_{i=1}^{4} d_i Promotion_i \\
& + \sum_{i=1}^{3} f_i StoreTypes_i + \sum_{i=1}^{3} r_i Region_i \\
& + \sum_{i=1}^{3} l_i PercentLean_i + \sum_{i=1}^{2} q_i SteakCut_i \\
& + \sum_{i=1}^{13} b_i Brand_i + \sum_{i=1}^{11} m_i Month_i + \mu
\end{aligned}
$$

where P is price per pound,[10] the $Brand_i$'s are dummies for the 12 brand names of substance and an "all other brands" category (base=no brand), SIZE is the unit weight of the package purchased by the household, SIZESQ is unit weight squared, the $Promotion_i$'s are dummy variables that account for the four promotion categories (store feature, store coupon, manufacturer coupon, other deal, base=no deal), the $StoreTypes_i$'s are dummies for three store types (supercenter, warehouse club, other, base= grocery stores), the $Region_i$'s are dummies for three of the four regions (South, West, Central, base=East), the $PercentLean_i$'s are dummies for percent lean classifications of ground beef (less than 80%, 80% to 89%, 90% or greater, base=lean not specified), ProductForm is equal to 1 if ground beef is purchased as preformed patties and is equal to 0 if it is purchased in bulk form, the $Month_i$'s are monthly dummy variables (base=December), and μ is a random error term. A dummy variable, YEAR, takes the value 1 for purchases in 2005, and 0 for those in 2004. The $SteakCut_i$'s are dummies for quality of steak cut (Medium, High, base=Low) among fifteen cuts of steak identified in the data.

[10]Beef prices were imputed by dividing expenditures (incorporating any price promotions that may have accompanied the purchase, such as store coupons) by the amount purchased.

Table 2. Description of variables and summary statistics for non-UPC-coded random-weight beef continuous variables

Variables	Description	Ground Beef		Steaks		Roasts	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
		Dependent variable					
P	Price ($/lb)	2.57	0.89	5.23	2.90	2.99	1.40
		Independent variables					
SIZE	Unit weight of the meat (pounds)	2.19	1.70	1.66	1.35	2.87	1.57
SIZESQ	SIZE squared	7.66	15.28	4.59	12.15	10.69	16.37
Number of observations		115,287		87,717		37,851	

Following Parcell and Schroeder (2007), the steak cuts were identified as high, medium, or low quality. High quality steaks included rib, ribeye, tenderloin, and filet mignon. For medium quality steaks, T-bone, sirloin, NY strip, porterhouse, and round were aggregated. Low quality steaks included chuck, flank, blade, London broil, and cube. Although quality grade is an important determinant of prices, this attribute was excluded from this study because it is not included in the Nielsen Homescan data.[11]

Table 2 contains summary statistics for the continuous variables, and Table 3 (see Appendix) presents the frequency distribution for each discrete variable. Ordinary least squares regression models were applied to the data to determine the contribution of each of the variables to retail purchase prices.

Complete regression results for random-weight beef are presented in Table 4 (see Appendix). The goodness-of-measure, as indicated by the adjusted R^2's, ranged from 0.13 for roasts to 0.40 for ground beef. The overall low R^2's reported do not indicate poor model fit, and are to be expected given that panel data are used. In general, the regression results appear reasonable because most of the regression coefficients are statistically significant with expected signs. As noted by Parcell and Schroeder (2007), the low R^2 for roasts is not surprising given the variety of types for which we lack information, while leanness is an important price determinant for ground beef.

For promotions across all cuts, the largest price reductions were associated with manufacturer coupons, followed by store coupons. Price differences across grocery stores, supercenters, and wholesale clubs varied by beef cut. Warehouse clubs had the highest prices for steak and roast, while ground beef was priced the highest at grocery stores. Supercenters had the lowest prices for ground beef and steak. Results also show that as package size increases, price falls at a decreasing rate for each of the cuts, which suggests a volume discount.

Most brands were priced higher compared to unbranded beef. All but one of the ground beef brands were purchased at a premium price. Premiums ranged from $0.12/lb for the "all other brands" category to $1.41 for the company-specific brand. Similarly, all but one of the roast brands were priced at a statistically significant premium. Premiums ranged from $.19/lb for the "all other brand" category to $1.13/lb for "grocery store 2." For steak, all but 3 brands were priced at a premium, with the "grocery store 3" brand priced at a statistically significant discount. Premiums ranged from $.22/lb for "grocery store 1" to $4.08/lb for the company specific brand. Except for "grocery store 3" steak, all other store brands were purchased at a premium price compared to unbranded beef.[12]

[11]According to an analysis of three metropolitan areas of the United States, a considerable percentage of branded beef carried no designation of quality, which suggests that the brand may substitute for the USDA quality grade (Ward, Lusk, and Dutton, 2008a).

[12]Using more recent (2004 through March 2009) retail scanner data from stores across the nation, Schulz, L.L., T.C. Schroeder, and K. White (2010) found that all steak brands analyzed received premiums in excess of $2.00/lb, ranging from $2.05/lb for store brands to $2.95/lb for local private brands.

The highest premiums were found for brands produced through alternative pricing and marketing arrangements. For the company-specific branded ground beef and steak, a family-owned beef company produces the source-verified lines of natural, organic, and grass-fed beef, using enhanced food safety practices. It was one of the first branded beef systems to pay producers according to the true value of each animal, rather than paying an average price for the entire pen of cattle.[13] The company uses contracts with feedlots and ranches where the cattle are born.[14]

Among the five national steak brands, three were purchased at a statistically significant premium compared to unbranded steak, with sizeable differences across brands. National brands 3 and 6 had relatively high premiums. To qualify for national brand 3's program, producers must choose genetics that provide non-black hided cattle with specific quality and yield grade requirements.[15] Cattle supplies are obtained from an alliance between the company, a breed association, and a marketing services provider. Strategic alliances enable firms to share risks and benefits from mutually identified objectives, while allowing partners to maintain their independence (Brocklebank and Hobbs, 2004).

The company that produces national brand 6 was purchased prior to 2004 by a producer-owned "new generation" cooperative. New generation cooperatives are distinguished from traditional cooperatives because they add value to a raw agricultural product through further processing, thereby allowing producers to capture a larger portion of downstream value. Members of the branded beef company purchase or lease shares that entitle them to deliver one head of cattle for each share. Producers are rewarded for delivering high quality cattle based on a grid pricing system that prices individual cattle based on quality and yield grade.[16]

The breed-specific brand premium also ranked among the highest for ground beef, steaks, and roasts. Breed-specific brands are often organized as a brand licensing program (licensed by the breed organization) that typically requires that cattle meet certain genetic requirements (often breed-based), and uses the breed as a proxy for quality (Brocklebank and Hobbs, 2004). They tend to involve loose contract arrangements with the only requirements being that participants are certified to sell beef under the program name and that the breed of cattle can be verified. Producers may choose to sell all or no cattle through the program, and premiums are generally based on yield or quality. Less formal marketing arrangements are possible because of the broad requirements and focus on breed, which can be easily observed.

Regarding ground beef leanness and product form, and quality of the steak cut, ground beef that was 90 percent lean or greater commanded a premium of $0.68/lb compared to ground beef without a leanness specification. Ground beef that was 80 to 89 percent lean received a premium of $0.12/lb, while the less than 80 percent lean category was discounted by $0.16/lb compared to no leanness specification.[17] Preformed ground beef patties were purchased at a premium of $0.26/lb compared to bulk ground beef. This may reflect further processing costs associated with the beef patties or the convenience preferred by time-pressed consumers. For steak, as expected, the higher quality cuts received the largest premiums.

Prices also varied by geographic location and season. All cuts were priced lower in the Central region, and highest in the East or West. Prices were lowest from January to June for

[13]When compensation is based on average price, differences in quality among cattle within the pen are not considered, which quells economic incentives to produce higher quality cattle. High-quality cattle will be under compensated, while low-quality cattle will be over compensated.

[14]The company also has diversified its product offerings to include buffalo and chicken. A strong brand with respect to perceived quality can be exploited by extending the brand to other product categories (Aaker, 1991).

[15]A quality grade is a composite evaluation of factors that affect palatability of meat (tenderness, juiciness, and flavor). Basic quality grades include Prime, Choice, and Select, where Prime represents the highest quality and Select represents the lowest. Yield grades reflect the amount of boneless, closely trimmed retail cuts.

[16]With grid pricing, the price paid for an animal depends on various quality attributes, in addition to weight (Hueth and Lawrence, 2006). This differs from traditional spot markets where price is based on live or carcass weight, with no explicit adjustments for quality.

[17]These results are consistent with previous studies that found a price premium for leaner ground beef (Brester, Lhermite, Goodwin, and Hunt, 1993; Parcell and Schroeder, 2007; Ward, Lusk, and Dutton, 2008b).

ground beef, and February to October for roast, while steak exhibited much more price variation across months.

UPC-Coded Ground Beef

Table 5 (see Appendix) contains summary statistics and frequency distributions for UPC-coded ground beef data used to estimate the hedonic price model (equation 1). The brand names examined include those associated with the top 20 brands in purchase volume, along with the private label category in 2004 and 2005.[18] In addition to ground beef purchased as preformed patties, the UPC-coded data also provides information on ground beef purchased in chub packages.

Regression results are presented in Table 6 (see Appendix). The model explains more of the variation in prices compared to random-weight ground beef, as indicated by the adjusted R^2 of 0.56 compared to 0.40 for random-weight beef. Other than brands, results for most variables were similar to those found in the non-UPC coded random-weight ground beef model.

Brand premiums/discounts ranged from -$1.06/lb to $1.12/lb. The number of brands and brand categories priced at a statistically significant discount compared to unbranded beef was nearly equal to the number that received premiums. As with random-weight beef, the highest premiums were paid for brands produced through alternative pricing systems and vertical coordination arrangements, including brand 12 and brand 7. Brand 12 garnered the highest premium. According to company literature, the line includes natural beef and beef that is cobranded with a breed-specific label. The company that produces cattle for the breed-specific label operates as a division of a breed association to produce high quality, tender, and flavorful beef. The company does not own cattle or beef at any stage of production or processing. As part of the program, cattle must comply with certain carcass specifications, and licenses are sold to processors, distributors, retailers, and restaurants to harvest, fabricate, and sell the beef. In May 2010, it was one of 62 programs certified by USDA inspectors that go beyond requirements for official USDA grades to facilitate the marketing of branded beef products.

The brand 7 company, which had the second highest premium of $1.06/lb, produces naturally-raised, lean beef. Price premiums, relative to the spot market, are paid for lean, heavily muscled cattle that are free of antibiotics and added growth hormones. The beef achieves its leanness through specialized inputs, including the selection of cattle breeds and a feed program that includes grazing and natural feeds. Farmers who produce cattle for the program sign a legal contract agreeing to adhere to the company's requirements regarding feed and other management. Bonus or discounts apply to the contract price on an individual carcass basis.

Among those brands receiving the largest discounts, brand 11 frozen beef patties had the largest discount of $1.06/lb, followed by brand 2 which was purchased at a $0.87/lb discount. In 2005, brand 2 beef patties were voluntarily recalled because of possible E. coli contamination. Following the recall, the brand price was discounted an additional $0.15/lb.[19] According to company literature, the brand 11 company offers a range of branded products are offered to appeal to different customer preferences, including one that is targeted to the cost-conscious consumer. Private label brands were priced at a discount of $0.13/lb compared to unbranded beef, which suggests that these brands are generally positioned as generic, lower-priced alternatives.

We found discounts for less than 80 percent lean (-0.28/lb), and higher premiums for leaner beef ($0.20/lb for 80 to 89 percent lean and $0.63/lb for 90 percent lean or greater) compared to packages with no leanness specification. Premiums were also paid for ground beef purchased in preformed patty form ($0.34/lb) and in chub packages ($0.44/lb) compared to bulk ground beef. The largest price discounts were found in the South (-$0.08/lb), followed by the Central region (-$0.03/lb) (relative to the East). Prices were highest in the West. There was no statistically significant price difference

[18]In 2005, over 100 UPC-coded beef brand names were listed in the Nielsen Homescan Panel data, compared to only 46 non-UPC-coded random-weight brand names.

[19]To capture price adjustments following the recall, an additional dummy variable was added that equals one in the months following the recall, and zero otherwise.

between the East and West. Price discounts were greater at warehouse clubs (-$0.25/lb) than supercenters (-$0.11/lb) (relative to grocery stores). Seasonal differences were also found as prices were statistically significantly lower from January to June compared to the rest of the year. For package size, resulting coefficient estimates were similar to those of random-weight beef, suggesting volume discounting.

Implications and Conclusions

Nielsen Homescan data were used to estimate the effect of observable beef product attributes on retail beef prices. Our results indicate that beef cuts on sale are significantly less than nonsale items, and larger package sizes are purchased at a significant discount. Prices also vary by store format (grocery store, supercenter, or warehouse club), depending on type of beef cut. Use of more recent data (after 2007) would allow us to examine the effect of the recession on sales discounts. Steak prices are higher at warehouse clubs and lower at supercenters, compared to grocery stores. For roasts, prices are higher at both warehouse clubs and supercenters compared to grocery stores, while for both random-weight and UPC-coded ground beef, prices are highest at grocery stores.

The data were national in scope and collected over the 2004 and 2005 calendar years. Results indicate that prices vary by region, with the lowest prices occurring in the Central region for random-weight beef. For UPC-coded ground beef, the lowest prices are found in the South, but regional differences are smaller than random-weight ground beef. Random-weight steaks and roasts exhibit greater seasonal variation than both random-weight and UPC-coded ground beef.

Most random-weight beef brands contained in the Nielsen Homescan data garner premiums compared to unbranded products, but premiums varied widely across brands. For example, for steak, premiums range from $0.21/lb for a store brand to $4.15/lb for a brand produced with specific production protocols, including grass fed and source verified. There is much greater variation in brand premiums across specific steak brands than for the aggregate brand categories found by Schulz et al. (2010). For most private-label brands, random-weight beef brands are purchased at a premium compared to unbranded beef. Conversely, the UPC-coded ground beef private label category as a whole is discounted. UPC-coded ground beef brands are evenly split between those purchased at a premium and those purchased at a discount compared to unbranded beef. This suggests that a considerable number of these brands target cost-conscious consumers. While the classification of brand types is restricted by the data source used, efforts to develop common nomenclature would facilitate brand comparisons across studies.

By evaluating specific brands, we were able to identify the production protocols used for the branded products. The highest premiums are paid for those brands with specific production or quality requirements. Branding programs receiving the highest premiums also rely on alternative marketing arrangements (e.g., alliances, contracts, cooperatives). This suggests that premiums for value-added, branded products may strengthen incentives for producers and processors to enter into these arrangements to achieve the necessary coordination and quality control.

Shifts to alternative marketing arrangements in the beef industry have led to concerns about market power, and policy proposals to restrict the types of marketing arrangements used (Anderson and Hudson, 2008; Ferrell and Rumley, 2011). The potential role of these arrangements in facilitating industry efforts to capture premiums associated with consumers' willingness to pay for quality attributes in branded product lines should also be considered. Less market-distorting policy alternatives to restrictions on marketing arrangements may be those that facilitate the marketing of value-added, branded products, such as USDA quality certification programs.

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Appendix

Table 3. Description of variables and frequency distribution for non-UPC-coded random-weight beef discrete variables

		Percent of total		
Variables	Description	Ground beef	Steaks	Roasts
	Independent variables			
YEAR	= 1 in 2005, 0 otherwise	47.6	49.1	48.0
$Promotion_i$	Type of promotion (base=no deal)	70.9	57.0	49.6
	i= store feature	23.9	35.7	44.0
	store coupon	3.6	5.4	4.8
	manufacturer coupon	0.2	0.2	0.2
	other deal	1.5	1.7	1.5
$StoreType_i$	Type of retailer (base=grocery stores)	84.2	85.2	85.7
	i= supercenter	4.8	4.1	3.3
	warehouse club	5.0	5.3	6.2
	other	6.0	5.4	4.8
$Region_i$	Region of household (base=East)	23.3	20.3	27.9
	i= South	42.9	40.4	35.1
	West	15.8	20.8	20.6
	Central	18.1	18.5	16.4
$PercentLean_i$	Ground beef percent lean (base=lean not specified)	12.4	N/A	N/A
	i= less than 80%	13.9	N/A	N/A
	80%-89%	45.0	N/A	N/A
	90% or greater	28.7	N/A	N/A
ProductForm	= 1 if ground beef purchased as preformed patties, 0 if bulk	8.2	N/A	N/A
$SteakCut_i$	Quality of steak cut (base=low)	N/A	25.7	N/A
	i= Medium	N/A	52.6	N/A
	High	N/A	21.7	N/A
$Brand_i$	Brand name (base=no brand)	79.4	75.8	76.4
	National brands			
	i= National brand 1	0.1	N/A	N/A
	National brand 2	N/A	0.2	0.1
	National brand 3	N/A	0.1	N/A
	National brand 4	N/A	0.1	N/A
	National brand 5	N/A	0.1	N/A
	National brand 6	N/A	0.04	N/A
	Private label			
	Grocery store 1	0.4	0.5	0.2
	Grocery store 2	0.4	0.4	0.4
	Grocery store 3	0.1	0.1	N/A
	Club store	1.1	1.3	1.2
	Company-specific brand	0.2	0.1	N/A
	Breed-specific brand	0.1	0.2	0.3
	All other brands	18.3	21.1	21.3
$Month_i$	Purchase month (base=Dec.)	6.5	5.8	8.2
	i= Jan.	10.7	9.5	10.7
	Feb.	8.4	8.1	8.3
	March	8.4	7.9	8.7
	April	8.5	8.4	8.8
	May	9.1	9.4	8.0
	June	7.9	9.0	7.5
	July	8.3	9.5	7.2
	August	8.2	9.4	7.7
	September	8.0	8.6	8.2
	October	8.6	8.4	9.7
	November	7.2	6.2	7.1

N/A=Not applicable.

Table 4. Regression results for non-UPC-coded random-weight beef prices, 2004-2005

	Ground beef		Steaks		Roasts	
	Parameter estimate	*Standard error*	*Parameter estimate*	*Standard error*	*Parameter estimate*	*Standard error*
Intercept	3.15*	.014	5.35*	.043	4.62*	.048
Year (base=2004)	.14*	.004	.11*	.016	.11*	.014
Unit size (pounds)	-0.33*	.006	-.85*	.020	-.39*	.022
Unit size squared	.02*	.001	.05*	.003	.03*	.003
Price promotions (base=no sale)						
Store feature	-.38*	.005	-.76*	.018	-.46*	.015
Store coupon	-.77*	.012	-1.61*	.036	-1.03*	.035
Manufacturer Coupon	-1.19*	.060	-2.35*	.193	-1.30*	.180
Other deal	-.40*	.022	-.76*	.063	-.28*	.054
Store format (base=grocery stores)						
Supercenters	-.28*	.008	-.59*	.030	.07*	.024
Warehouse clubs	-.22*	.012	1.07*	.038	.61*	.034
Other	-.71*	.011	-.72*	.040	-.33*	.036
Percent lean (base=lean not specified)[1]						
Less than 80%	-.16*	.008	N/A	N/A	N/A	N/A
80%-89%	.12*	.007	N/A	N/A	N/A	N/A
90% or greater	.68*	.008	N/A	N/A	N/A	N/A
Product form (base=bulk ground)						
Preformed patties	.26*	.009	N/A	N/A	N/A	N/A
Steak quality (base=low)						
Medium	N/A	N/A	1.53*	.015	N/A	N/A
High	N/A	N/A	4.00*	.027	N/A	N/A
Region (base=East)						
South	-.18*	.005	-.26*	.023	-.12*	.017
West	.09*	.007	-.36*	.027	.03	.022
Central	-.25*	.006	-.62*	.027	-.40*	.020
Brands (base=no brand)						
National brands						
National brand 1	-.14*	.037	N/A	N/A	N/A	N/A
National brand 2	N/A	N/A	.03	.191	.05	.124
National brand 3	N/A	N/A	1.99*	.446	N/A	N/A
National brand 5	N/A	N/A	-.02	.211	N/A	N/A
National brand 6	N/A	N/A	1.09**	.450	N/A	N/A
Private label						
Grocery store 1	.43*	.036	.22**	.088	.25*	.095
Grocery store 2	.42*	.029	.41*	.098	1.13*	.107
Grocery store 3	.33*	.063	-.51*	.195	N/A	N/A
Club store	.22*	.015	.78*	.063	.39*	.078
Company-specific brand	1.41*	.063	4.08*	.264	N/A	N/A
Breed-specific brand	.49*	.053	.82*	.168	.43*	.112
All other brands	.12*	.006	.30*	.022	.19*	.018

Table 4. (Continued)
Regression results for non-UPC-coded random-weight beef prices, 2004-2005

	Ground beef		Steaks		Roasts	
	Parameter estimate	*Standard error*	*Parameter estimate*	*Standard error*	*Parameter estimate*	*Standard error*
Month (base=Dec.)						
Jan.	-.07*	.010	-.21*	.042	-.54*	.036
Feb.	-.08*	.011	-.18*	.043	-.64*	.037
March	-.09*	.011	-.17*	.043	-.59*	.038
April	-.08*	.011	.06	.044	-.65*	.038
May	-.08*	.010	.14*	.043	-.69*	.038
June	-.07*	.011	.13*	.043	-.70*	.038
July	-.05*	.011	.01	.043	-.67*	.038
August	-.02**	.011	-.10**	.042	-.71*	.037
Sept.	-.02	.011	-.05	.043	-.69*	.038
Oct.	-.04*	.011	-.17*	.042	-.67*	.036
Nov.	-.03*	.011	-.12*	.045	-.37*	.041
No. of observations	115,287		87,717		37,851	
Root MSE	.69		2.40		1.31	
Adjusted R^2	.40		.31		.13	
Highest condition index[2]	17.07		15.81		16.68	
White's Test[3]	3899.0		7301.0		1499.0	

N/A=Not applicable.
Notes: One asterisk indicates the coefficient is statistically significant at the 1% level. Two asterisks indicates significance at the 5% level.
[1]Ground beef only.
[2]Low condition indices for each regression suggest that collinearity is not strong.
[3]White's test for heteroskedasticity was significant for each regression. Standard errors are from White's asymptotic consistent covariance matrix, which provides heteroskedasticity-consistent test results for parameter estimates.
Source: Underlying data from Nielsen Homescan data.

Table 5. Summary statistics (continuous variables) and frequency distribution (discrete variables) for UPC-coded ground beef

Summary statistics for continuous variables

Variables	Description	Mean	Std. Dev.
	Dependent variable		
P	Price ($/lb)	2.25	0.84
	Independent variables		
SIZE	Unit weight of the meat (pounds)	2.99	2.02
SIZESQ	SIZE squared	13.01	17.08

Frequency distribution for independent discrete variables

Variables	Description	Percent of total
YEAR	= 1 in 2005, 0 otherwise	52.5
$Promotion_i$	Type of promotion (base=no deal)	47.5
	i= store feature	78.4
	store coupon	19.4
	manufacturer coupon	1.2
	other deal	0.3

Table 5. (Continued)
Summary statistics (continuous variables) and frequency distribution (discrete variables) for UPC-coded ground beef

Variables	Description	Percent of total
$StoreType_i$	Type of retailer (base=grocery stores)	65.1
	i= supercenter	22.6
	warehouse club	9.5
	other	2.8
Region	Region of household (base=East)	12.4
	i= South	45.4
	West	23.4
	Central	18.7
Percent $Lean_i$	Percent lean (base=lean not specified)	50.1
	i= less than 80%	14.6
	80%-89%	18.6
	90% or greater	16.6
Product $Type_i$	Product type (base=bulk)	59.2
	i=ground chub	4.8
	preformed patties	35.9
$Brand_i$	Brands (base=no brand)	32.0
	Top 20 brands	
	i=Brand 1	2.7
	Brand 2	2.0
	Brand 3	3.2
	Brand 4	2.7
	Brand 5	1.7
	Brand 6	0.3
	Brand 7 (company-specific brand)	2.2
	Brand 8	4.5
	Brand 9	0.6
	Brand 10	2.3
	Brand 11	0.4
	Brand 12	2.4
	Brand 13	0.3
	Brand 14	0.3
	Brand 15	0.3
	Brand 16	0.5
	Brand 17	0.6
	Brand 18	0.4
	Brand 19	0.4
	Brand 20	0.4
	Private label brands	35.2
	All other brands	4.8
$Month_i$	Month (base=Dec.)	6.2
	i= Jan.	8.7
	Feb.	6.6
	March	7.1
	April	8.1
	May	10.4
	June	9.8
	July	11.0
	August	9.4
	Sept.	8.4
	Oct.	7.9
	Nov.	6.5
Number of observations	19,381	