

# An Analysis of the Use of Grades and Housebrand Labels in the Retail Beef Market

Linda J. Cox, B. Starr McMullen, and Peter V. Garrod

The congruence of beef consumers' purchases with their stated preferences regarding internal fat content are examined. The role of U.S. Department of Agriculture (USDA) grades and housebrand labeling of beef in providing information to consumers is studied in the theoretical framework of search theory. The empirical results indicate that the current system of USDA grades and housebrand labels is not disseminating information regarding internal fat content effectively to consumers. Suggestions are made for providing consumers with better information and education necessary to increase congruence of expressed preferences regarding internal fat content and actual beef purchases.

*Key words:* consumer preferences, housebrand beef, internal fat content, USDA grades.

Retail customers benefit from an effective agricultural grading system that reduces search and transactions costs, saving consumers both time and money. In addition to providing consumer information, grading facilitates marketing and pricing efficiency between producers and various segments of the processing and distribution system. Although the U.S. Department of Agriculture's (USDA) beef grading system appears to be relevant for producers, developments in recent years have made it less relevant to consumers (Kenney).

The USDA beef grading system ranks beef according to the amount of marbling in the carcass: higher USDA grades have more marbling, lower grades have less.<sup>1</sup> The observed

positive relationship between palatability and marbling provides the rationale for this grading system. Marbling refers to the internal fat content of the meat, not the trim fat. The highest USDA grade is Prime, followed by Choice, Select, and Standard.

Two events since the mid-1970s have reduced the effectiveness of the USDA grading system in informing consumers about beef quality. First, new USDA rules adopted in 1975 made beef grade standards leaner, allowing more beef to qualify for the Choice and Prime grades. This change narrowed the actual difference between Choice and Select grades of beef, rendering grade less effective as an indicator of quality to consumers (Purcell and Nelson; Miller, Topel, and Rust). Second, a preference for leaner beef has been expressed by some consumers who are concerned with the potential health hazards associated with dietary fat (Capps, Moen, and Branson; Branson et al.; Skaggs et al.).

For a grading system to disseminate information to consumers effectively, it needs to separate the commodity into different categories, each of which has distinctive relevance to consumers. Also, a grading system must conform to differences in demand among consumers (Rhodes). The current USDA grading

---

Linda J. Cox is an associate professor of agricultural and resource economics, University of Hawaii-Manoa; B. Starr McMullen is an associate professor of economics, Oregon State University, and during 1988-89 was a visiting professor at the University of Hawaii-Manoa; and Peter V. Garrod is an associate dean of the Graduate Division and a professor of agricultural and resource economics, University of Hawaii-Manoa. Senior authorship is not assigned between the first two authors.

The authors gratefully acknowledge helpful comments from the editor and three anonymous reviewers. Any remaining errors or omissions are, of course, the responsibility of the authors.

<sup>1</sup> While marbling is not the sole criterion used in grading, it accounts for about 80% of the total factors that determine USDA beef grades (Miller, Topel, and Rust).

system may be of limited use to consumers both because of (a) its utilization of a proxy for quality (marbling) that is not a universal standard of quality to consumers and (b) its failure to satisfactorily distinguish among alternative grades of beef.

A study by Miller, Topel, and Rust found that consumers either could not, or simply did not, use the USDA grade hierarchy when making beef selections for home consumption. Since the mid-1970s, many retailers began using housebrand labels rather than, or in addition to, USDA grades (Kaufman and Burbee). The purpose of this article is to determine whether the USDA grade and housebrand labeling schemes now used in beef retailing help consumers purchase beef that is compatible with their expressed preferences regarding marbling and internal fat content.

### Trends in Beef Retailing

The 1975 change in beef grading standards brought objections from consumer groups claiming that consumers would end up paying Choice prices for Good (now Select) grade beef (Purcell and Nelson). Prior to the 1975 adoption of a "flat-line" marbling criterion, a 10% increase in marbling was necessary to maintain the same USDA grade when the age of the beef fell by 10%. The switch to "flat-line" eliminated this tradeoff and established grade solely on marbling content. Consumer advocates argued that this change reduced the difference between Choice and Select grades, so the retail consumer receives a lower overall quality of beef, meaning lower fat content and less marbling by USDA standards.

In informal conversations beef retailers expressed the opinion that differences between Choice and Select grades of beef were not sufficient to justify the cost differential found at the wholesale level. The retailers' response was to market less expensive, ungraded cuts of beef under their own store or housebrand labels. As of 1984, only 45% of all commercial carcass beef was USDA graded, and packers typically requested grading only for carcasses that would qualify for one of the higher grades (Kaufman and Burbee). Since ungraded beef usually has less marbling than Choice, the prophecy of lower quality retail beef has been fulfilled.

The use of housebrand labeling encourages consumers to identify a product with a retail

store which then assumes responsibility for assuring quality. Consumers may unintentionally buy a lower grade of beef, not realizing that housebrand-label beef may be a lower grade than Choice. This may arise if consumers cannot correctly evaluate desired product characteristics before buying and consuming the good.

Housebrand-labeled beef is widely available, although there are regional differences as indicated in table 1. Few stores sell both Choice and housebrand beef; they usually sell either one or the other. Midwest retailers tend to use USDA grades, whereas western stores rely more heavily on housebrand labels.

The widespread use of housebrand labels indicates that consumers probably are buying more lean beef than in the past when beef was purchased by USDA grade alone. However, some consumers may not consider a trend to leaner beef as a decrease in quality.

### The Theoretical Framework

In the case of a nonhomogeneous good, consumers acquire information regarding the product by engaging in search activity, such as sorting, prior to purchase. Consumers continue to engage in search activity only as long as the marginal benefit derived from additional search exceeds the marginal cost of search. This model of search is based on Stigler's cost-benefit approach to the acquisition of information.

The cost of information search is affected primarily by the opportunity cost of time spent in search and the efficiency of search activity (Feick, Herrmann, and Warland). Search activity may cease altogether if search costs are sufficiently high that consumers decide to obtain information by purchasing and actually experiencing the good. In this situation the good would be classified by Nelson as an experience good. A good is more likely to be an experience good if (a) the cost of search is high and/or (b) the price of the good and, therefore, the cost of acquiring information via experience are low.

If consumers cannot visually distinguish among different grades of a good prior to purchase, the cost of search activity may be quite high. Anything that lowers the cost of search will tend to increase the amount of search activity and, presumably, result in the consumer purchasing a higher quality good. Search costs

**Table 1. Supermarket Use of Beef Grades by Region**

	Prime	Choice	Other or Store Label	Choice with Other				
					%			
Pacific	4.7	14.1	65.6	15.6				
West North Central	16.0	46.0	28.0	10.0				
East North Central	4.3	54.8	33.3	7.5				
Mountain	1.9	28.9	61.5	7.7				
South Central	4.8	37.1	41.9	16.1				
South Atlantic	4.6	56.9	23.1	15.4				
Middle Atlantic	8.8	46.5	41.2	3.5				
New England	9.5	4.8	78.6	7.1				
TOTAL*:	7.1	38.0	44.0	10.9				

Note: This table was compiled using information presented in Kaufman and Burbee.

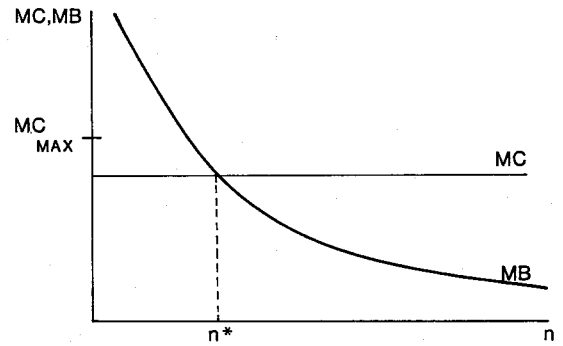
\* TOTAL represents totals for conventional format supermarkets as opposed to warehouse and superstore combination stores which may sell a variety of nonfood items.

can be reduced by use of grades and labels which provide additional information prior to search. A good which starts out as an experience good may turn into a search good if there is a decrease in search cost or an increase in the efficiency of search activity.

Information prior to purchase may be especially crucial in the marketing of beef because (a) consumers of beef do not all agree on a definition of quality and (b) consumers may have difficulty distinguishing among beef grades from visual inspection. The internal fat content (marbling) of beef, the major factor used in the USDA grading system, is an indicator of high quality to some consumers and low quality to others. It is generally accepted that more marbling produces beef that is more palatable, thus explaining the preference for Choice expressed by some consumers. Other consumers, concerned with the health hazards associated with ingestion of dietary fat, prefer lower-fat beef. There is evidence that nutrition-conscious consumers are willing to accept less palatability in return for lower fat content (Skaggs et al.; Capps, Moen, and Branson).

Thus, the demand for beef can be classified as heterogeneous, meaning that all beef consumers do not rank beef quality in the same way (Rhodes). A general reference to beef quality is ambiguous—it could mean high-fat content to some, low-fat content to others.

To avoid the semantic pitfalls associated with the term "quality," the concept of congruence

**Figure 1. Optimal search activity**

is introduced here. Congruence ( $C$ ) is defined as:

$$C = S/T; \quad S = S(n),$$

where  $S$  represents the number of times a consumer succeeds in selecting a unit of a good that is compatible with his or her preferences and  $T$  is the total number of purchases.  $S$  depends on the amount of search activity,  $n$ , whereas  $T$  is independent of  $n$ . The more search activity, the greater the likelihood of a successful purchase.

Search costs reflect the opportunity cost of search activity to the consumer and the efficiency of search activity. At any given point in time, marginal search costs are assumed to be constant. Marginal search costs are depicted by the horizontal line labeled  $MC$  in figure 1.  $MC_{\max}$  indicates the marginal search cost above which the good becomes an experience good and information is acquired via purchase rather than search activity.

The marginal benefits ( $MB$ ) are defined as the marginal increase in congruence resulting from additional search. Marginal benefits are depicted in figure 1 as a negative function of the amount of search activity. While it may be relatively easy to sort a nonhomogeneous group into two groups, as additional sorting takes place, the remaining goods become increasingly homogeneous. Thus, the more search activity that has already taken place, the harder it is to identify quality differences between the remaining units and the marginal benefit from additional search declines.

Search activity will continue until  $MC = MB$  at  $n^*$ . Search activity would fall to zero if marginal cost rose above  $MC_{\max}$  and the good would become an experience good. As suggested earlier, an experience good may convert to a search

good if a reduction in search costs lowers  $MC_{\max}$  and increases optimal search activity. A reduction in search costs may occur either through the introduction of more information prior to purchase or because the information acquired via experience lowers search costs for repeat consumers by increasing the efficiency of search activity.

If grades and labels sort the commodity into more homogeneous groups, search costs fall since less search activity is required to achieve a given level of congruence. In terms of figure 1,  $MC$  will fall,  $n^*$  will rise, and  $C$  will increase because  $S$  is a positive function of  $n$ .

If the product is an experience good and consumers are unable to visually distinguish among units of the good, there may be no way for the consumer to repurchase a unit with desired quality characteristics unless it is labeled. Introduction of grades and/or labels should enable consumers to identify such goods for repurchase based on experience, thus increasing congruency for these consumers.

The literature on information suggests that price is sometimes used by consumers as an indicator of quality, especially when other information on quality is limited and/or expensive to obtain (Stafford and Enis; Wheatley and Chiu; Shapiro; Bowbrick). When demand is heterogeneous, informed consumers may still use the information provided by price if it divides the commodity into more homogeneous groups, even when the buyers disagree on the relative merits of the different groups (Rhodes).

Price is positively correlated with marbling and USDA beef grade over time because it is more expensive to produce high-fat content beef. Thus, for consumers who prefer well-marbled beef, price may serve as a reliable quality indicator in the absence of other information. However, if consumers who prefer lean beef assume that price is positively related to quality, a low congruence between beef preference and purchase will occur. Price will serve as a useful indicator of quality for both groups of beef consumers only if those preferring lean beef are well-enough informed to know that lean beef usually has a lower price.

Other factors that may influence a consumer's ability to select a product compatible with preference include an individual's income and level of education. Assuming that beef is a normal good, an individual earning a higher income will tend to purchase more beef, providing that consumer with more experience on

which to base future purchase decisions. Market experience is expected to increase the efficiency of search, decreasing search costs and increasing congruency.

Increased education may reduce search costs as information should be processed more quickly and efficiently by informed consumers. Market researchers have found a positive correlation between education level achieved and the use of food label information (Feick, Herrmann, and Warland). However, the cost reduction from increased search efficiency may be partially or totally offset by the higher opportunity cost of search time since well-educated people usually earn higher incomes.

Finally, consumers with different preferences regarding fat content may require different information to successfully match beef purchase with preference. For instance, consumers who prefer low-fat beef may require more information regarding the relationship between price and quality (and grade) than consumers who prefer higher fat content and may simply "luck" into the correct purchase by using price as an indicator of quality.

Thus, an individual's success in matching preference with actual beef purchases, congruence ( $C$ ), is theoretically modeled as:  $C = f(\text{preference group, presence of grades or labels, price, education, income})$ , where an individual's preference group refers to whether the individual has a preference for high-fat (well-marbled) beef or low-fat beef.

## The Empirical Results

In April 1986 a market research firm conducted a telephone survey of 500 Honolulu residents (*a*) to examine consumers' stated preferences regarding beef fat content and (*b*) to determine whether consumers were successful in purchasing beef consistent with their expressed preferences. Each respondent was asked: (*a*) whether he/she preferred beef with more marbling, less marbling, or had no preference regarding marbling; (*b*) what grade or brand of beef he/she usually purchased; and (*c*) where he/she shopped for beef.

The first question was designed to extract information on consumer preferences regarding fat content in beef. Of the 306 survey respondents, 70% claimed they preferred less marbling and lower fat content, 21% preferred more marbling, and the remainder expressed

no preference regarding internal fat content (table 2). Those preferring more marbling are referred to here as the high-fat preference group, those preferring a lower fat content are referred to as the low-fat group. A majority of the consumers surveyed preferred leaner beef, confirming that there is a group of consumers who rank beef quality differently than the quality ranking inherent in the USDA grading standard.

The second survey question was used to obtain information on consumers' perceptions of what type of beef they were buying. The third question was included to identify the type of beef actually purchased by a consumer. Three of the four major beef retailers in Honolulu sold only their own housebrand beef while the fourth sold only USDA Choice. Discussions with retailers in Honolulu indicated that Select or lower grades of beef were being sold under housebrand labels at the time of this survey.

The top half of table 2 reports that about two-thirds of all respondents, whether they indicated a preference for high- or low-fat beef, purchased a Select quality housebrand rather than Choice beef. While selection of the housebrand indicates congruence of tastes and purchases for those in the low-fat preference group, it indicates purchases that are inconsistent with tastes for two-thirds of those in the high-fat preference group. A Chi-square test, using a 95% confidence interval, showed no significant relationship between a consumer's stated preference and the grade actually purchased (Chi-square = .021, one degree of freedom).

Further, a hypothesis of independence between the grade consumers thought they were purchasing and what they actually purchased could not be rejected using a Chi-square test and a 95% confidence interval (Chi-square = .018, one degree of freedom) (bottom portion of table 2).

Although the telephone survey found two distinct preference groups for beef (high and low fat), consumers appeared unable to make purchases that were consistent with their stated fat preference. Part of the problem may be that consumers habitually shop in certain stores for reasons other than beef selection but purchase beef at the same store for convenience. In this situation the convenience of "one-stop" shopping may lead consumers to purchase a housebrand label when they might actually prefer Choice grade quality. It is quite possible that the average consumer does not realize that

**Table 2. Telephone Survey Results (Total Number of Respondents = 306)**

Comparison of Stated Preference with Actual Purchase			
Consumer's Stated Preference	Consumer's Actual Purchase (Numbers of Respondents)		Total
	Choice	House-brand	
<i>HF</i>	20	46	66 (22%)
<i>LF</i>	69	145	214 (70%)
<i>NP</i>	11	15	26 (9%)
$\chi^2 = .021$	100	206	306
Comparison of Consumer's Perceived and Actual Beef Purchase			
Consumer's Perceived Purchase	Consumer's Actual Purchase (Numbers of Respondents)		Total
	Choice	House-brand	
Choice	38	112	150 (49%)
Housebrand	5	16	21 (7%)
Not Sure	57	78	135 (44%)
$\chi^2 = .018$	100	206	306

Note: *HF* stands for high fat, *LF* stands for low fat, and *NP* stands for no preference.

housebrand-label beef usually qualifies as Select grade or lower. Further, the telephone survey did not consider price as a factor influencing the purchase decision.

An in-store experiment, allowing shoppers the option of either Choice or housebrand beef, was conducted to control both for the possibility of "one-stop" shopping bias and to examine the influence of price on the purchase decision. The in-store experiment took place in several stores belonging to a Honolulu supermarket chain. The supermarket agreed to buy both Choice and Select Porterhouse and T-Bone steaks from its regular supplier. Each store's meat department cut, trimmed, and wrapped all of the steaks identically. Thus, the difference among steaks was in their internal fat content (marbling) and not the trim fat. It is marbling and not trim fat that is used in the grading system and the question of interest is whether consumers can correctly identify grade.

Four alternative scenarios were enacted. In alternative 1 the steaks were not identified either by grade or label, and they were priced identically at \$3.99/pound (lb.). Alternative 2 left the steaks unlabeled but adopted a price differential that reflected the actual cost dif-

**Table 3. In-Store Experiment Design**

Alternative	Labels	Price
1	No	\$3.99/lb. (Choice) \$3.99/lb. (Select)
2	No	\$4.19/lb. (Choice) \$3.99/lb. (Select)
3	Yes	\$3.99/lb. (Choice) \$3.99/lb. (Select)
4	Yes	\$4.19/lb. (Choice) \$3.99/lb. (Select)

ference between grades—\$4.19/lb. for Choice and \$3.99/lb. for Select. Labels were introduced in alternatives 3 and 4, using both USDA Choice and the store's own housebrand label. Alternative 3 set the price at \$3.99/lb. for both grades whereas alternative 4 set the price at \$4.19/lb. for the Choice grade beef and \$3.99/lb. for the housebrand beef (see table 3). This experimental design allowed study of the impact of both label and price on consumer purchases. Previous studies such as Skaggs et al. did not consider the possibility of different prices being charged for different grades of beef.

The shopping day was divided into four periods and one of the four alternative scenarios (table 3) was randomly assigned to each period.<sup>2</sup> A trained observer watched while shoppers selected steaks, and the type of steak was recorded. Once a steak was chosen, the trained interviewer approached the shopper, explained that an experiment was in progress, and asked the individual to identify characteristics influencing the steak selection. Also collected were data on the consumer's income, level of education, and race.

Data collected by the interviewers were used to divide the sample of consumers into three groups according to their stated preference regarding marbling. The three preference groups were those preferring highly marbled beef (high fat, *HF*), those preferring less marbling (low fat, *LF*), and those who did not express a preference regarding fat content (*NP*). It was considered essential to analyze these groups separately because the grading system used by USDA is compatible with the tastes of those in the high-fat group but not with those consumers in the low-fat group.

Information on education and income was

solicited to determine whether these socioeconomic characteristics had the hypothesized influence on a consumer's ability to achieve congruence of tastes and purchases. Data on race were collected because the study was conducted in Hawaii where there is a very diverse ethnic population, and it is often argued that individuals with different cultural orientations may seek different characteristics in their beef purchases.<sup>3</sup>

The data were analyzed using a conditional logit model<sup>4</sup> developed by McFadden and others. (See Amemiya and Maddala for detailed discussions of this methodology; see Capps, Moen, and Branson for an application to consumers' choice of a lean-beef product.)

Due to the binary nature of the dependent variable, observations were omitted when a shopper purchased both Choice and Select grade meat.<sup>5</sup>

The following equation was estimated separately for each of the three fat preference groups (*HF*, *LF*, and *NP*):

$$(1) \quad LPC = a_1 + a_2PRICE + a_3LABEL + e,$$

where *LPC* is the log of the odds that a Choice steak is selected.  $LPC = \ln[PPC/(1 - PPC)]$  where *PPC* is the probability of selecting a Choice steak. *PRICE* is the price of the steak. *LABEL* is a dummy variable representing labeling. If *LABEL* = 1, the steak was labeled (alternatives 3 and 4); *LABEL* = 0 if the steak was not labeled (alternatives 1 and 2).

The equations were estimated using the maximum likelihood procedure in SHAZAM (White).

A negative coefficient on *PRICE* is consistent with the law of downward-sloping demand curves: an increase in price results in a decrease in quantity demanded. If the price of

<sup>3</sup> Dummy variables were included for the following racial groups: Caucasian, Japanese, Chinese, Filipino, and a category for all other groups. The inclusion of so many dummies reduced the degrees of freedom in the estimation process. Because none of these dummies achieved statistical significance, they were omitted from the regressions so as to increase the degrees of freedom in the estimations.

<sup>4</sup> There is some confusion in the literature concerning whether this model should be referred to as "logit" or "conditional logit." McFadden coined the label "conditional logit" rather than simply "logit" and since this application is based on McFadden's work, the term "conditional logit" has been employed here. In this study a conditional probability is being estimated where  $P(x/B,s)$  is the probability that an individual will choose alternative *x*, given measured attributes, *s*, and alternative *B*.

<sup>5</sup> There were 155 observations in the original sample. Elimination of those who purchased both Select and Choice beef at the same time reduced the sample size to 133.

<sup>2</sup> The in-store experiment was conducted on 19 October 1985.

Choice increases, the probability that a consumer will choose Choice grade beef is expected to fall. However, as discussed earlier, it is possible to observe a positive coefficient on *PRICE* if it is being used as a proxy for quality.

A negative *LABEL* coefficient indicates that the presence of a label reduces the probability that a Choice steak will be purchased. This would be expected of consumers in the low-fat group if labels provide them with information required to select lean beef. A positive coefficient on *LABEL* would be expected for the high-fat group if the label effectively disseminates information and increases the probability that Choice will be selected. Thus, labeling should increase congruence for both preference groups.

The model was initially estimated with the socioeconomic characteristics of the consumers: education, income, and race variables. In no case were any of the socioeconomic characteristics statistically significant. This finding is consistent with the Miller, Topel, and Rust results where socioeconomic variables had no significant effect on consumers' ability to correctly identify grades of beef. Thus, socioeconomic variables were not included in the final version of the model.

The model was estimated separately for each of the three fat preference groups to determine whether choice behavior differed depending on consumers' preferences regarding fat content. Results are reported in table 4.

The model correctly predicted the purchase of Choice 72% of the time for the high-fat preference group, 65% of the time for the no preference group, and 74% of the time for the low-fat preference group. The *PRICE* coefficient was negative for both high-fat and no preference groups but was statistically significant at the 95% level only for the no preference (*NP*) group.

However, for the group of consumers indicating a preference for low-fat beef (*LF*), the *PRICE* coefficient was positive, although not statistically significant using a 95% confidence interval. A positive *PRICE* coefficient means that an increase in the price of Choice increased the probability that Choice would be selected, suggesting that consumers in the low-fat preference group may (inappropriately) use price as an indicator of quality. This is consistent with the observation that shoppers in the low-fat group were twice as likely to pur-

**Table 4. Estimated Coefficients from Equation (1)**

Variable	Preference Group		
	High Fat ( <i>HF</i> )	No Preference ( <i>NP</i> )	Low Fat ( <i>LF</i> )
Constant	2.53* (1.16)	1.03 (0.52)	-0.94 (0.85)
<i>PRICE</i>	-8.01 (5.81)	-7.01* (2.54)	4.20 (5.23)
<i>LABEL</i>	-0.70 (0.89)	-0.43 (0.41)	-1.74 (1.21)
Summary Statistics:			
Percent Correct Predictions	72	65	74
Log-Likelihood Function	-15.4	-51.8	-11.6
-2 × Log-Likelihood Ratio	3.29	8.46	3.25

Note: Asymptotic standard errors are in parentheses.

\* Indicates coefficients that are statistically significant using a 95% significance level.

chase Choice when it was priced higher than Select than when prices were equal for the two grades.

A negative, but statistically insignificant, sign for the *LABEL* coefficient was observed for all three preference groups. The negative coefficient on *LABEL* means that the probability of purchasing Choice beef dropped when labels were introduced, a result expected for the low-fat group but not for the high-fat preference group.

The difference in the sign of the *PRICE* coefficient between the fat preference groups suggests that those consumers preferring leaner beef may use price information differently than those in the other two preference groups. A likelihood ratio test confirmed that there was a statistically significant difference between the estimated regression results for the low-fat preference group and the other two groups of consumers.<sup>6</sup>

Following Branson et al., covariance analysis (ANCOVA) was conducted to obtain more information on the model specification. It was found that the coefficient on *LABEL* did not differ significantly between the three fat pref-

<sup>6</sup> The test statistic used was  $-2 \ln(LR)$  where *LR* was the likelihood ratio. This statistic has a Chi-square distribution (Judge et al.), and results confirmed that the low-fat preference group results differed significantly from the other two groups at the 95% level of significance.

**Table 5. Alternate Model Specification (Sample Size = 133)**

Independent Variable: <i>LPC</i>		
Variable	Coefficient	Asymptotic Standard Error
Constant	-1.238	
<i>PRICE</i> ( <i>HF</i> and <i>NP</i> )	-7.380*	2.325
<i>PRICE</i> ( <i>LF</i> )	11.388*	5.524
<i>LABEL</i>	-.661	.392
<i>HF</i> Dummy (=1 if <i>HF</i> )	3.638*	.986
<i>NP</i> Dummy (=1 if <i>NP</i> )	2.445*	.886
Summary Statistics:		
Log-Likelihood Function	-79.36	
-2 × Log-Likelihood Ratio	25.60	
Degrees of Freedom	5	
Number of Correct Predictions	91	

Note: *LPC* = the log of the odds that a Choice steak is selected; *HF* = high fat, *LF* = low fat, and *NP* = no preference.

\* Indicates statistical significance using a 95% confidence interval.

erence groups, but the low-fat group maintained a significantly different *PRICE* coefficient than the other two groups. An alternative, single-equation model was run where each fat preference group was assigned a dummy variable to reflect differences in the intercept term. The *PRICE* coefficient for the low-fat preference group was allowed to differ from the *PRICE* coefficient for the other two groups. Results are reported in table 5.

The *PRICE* coefficient was positive and statistically significant at the 95% level for the low-fat group. The high-fat and no preference groups had a negative and statistically significant *PRICE* coefficient indicating that a higher price reduces the probability of purchasing Choice beef. The positive dummy intercepts show that both high-fat and no preference groups had higher probabilities of buying Choice beef than the low-fat group.

Finally, the *LABEL* coefficient was negative and significant at the 90% level for all three groups, indicating a tendency to purchase less Choice grade beef when labels are present. Again, this result is consistent with theoretical expectations for the low-fat, but not for the high-fat, preference group.

There is obviously some confusion over the meaning of housebrand and Choice labels for those in the high-fat preference group. These consumers may assume that housebrand-label beef is a higher grade than Choice, thus using

the housebrand label as a proxy for quality. Whatever the reason, it appears that there is room for consumer education regarding the internal fat content of housebrand beef.

## Discussion and Conclusions

Two major criticisms of the USDA grading system were addressed in this study. First, USDA grade quality depends on fat content in a way that does not correspond to the tastes of low-fat preference consumers. Results confirm that there exists a nonhomogeneous demand for beef; there is a definite group of consumers who prefer low-fat beef and another group that prefers beef with a higher internal fat content. Second, the lack of a significant distinction between USDA Choice and Select grades, a criticism levied by both consumer and retailer groups, has encouraged retailers to adopt housebrand-label beef. Thus, the USDA grading system is not used as much in retail beef marketing as in the past, and consumers appear confused regarding the use of grades and labels in this new market environment.

This study used the theoretical framework of search theory to explore the role of USDA grades and housebrand labels in providing useful information to the consumer. Empirical findings indicate that USDA grade and housebrand labels may help consumers preferring low-fat beef make purchases consistent with their preferences, whereas consumers who prefer higher fat content do not seem to benefit from current labeling practices. Results suggest that there may be confusion regarding the fat content of housebrand and USDA grade beef.

It is not surprising that consumers are confused regarding the information provided by grades and labels and the internal fat content of beef. In some parts of the country stores are marketing Choice grade beef from which the trim fat has been removed as "lean" cut (Capps, Moen, and Branson). In this situation a consumer seeking the health benefits associated with lower internal fat content could be misled into purchasing beef with higher fat content. Informal discussions with beef industry experts around the country led to a variety of opinions; some argued that housebrand beef could be of equal or higher quality than Choice, others argued it would be lower. How are consumers to find out this information?

A major problem is that consumers do not seem able to visually distinguish internal fat



content in beef well enough to make purchases consistent with their preferences. Beef appears to be what Nelson classifies as an experience good; consumers acquire information to evaluate the good only after purchase and consumption.

Additional empirical results suggest that consumers who prefer low-fat beef may use price as a quality indicator when, in fact, price is usually positively correlated with internal fat content. More information must be provided if consumers are to be successful in purchasing beef that has an internal fat content consistent with their preferences. One of the problems with the current USDA grading system is that it combines multiple dimensions of beef quality (fat content, palatability, tenderness, etc.) into a single measure. A multiple dimensional scheme that provides separate ratings for fat content, palatability, and tenderness, for example, might benefit consumers.

For instance, the USDA could simply label internal fat content in percent terms. Even less complicated would be a 1-to-10 scale where "1" represents lowest internal fat content and "10" is the highest. This would allow consumers to set their own quality standards without having to deal with preconceived notions regarding such grade labels as "Choice" or "Select." To provide consumers with maximum information, an internal fat content scale could be supplemented with recommendations on cooking methods and information on nutritional content. Not only does a recommended cooking technique inform the consumer regarding the tenderness of the beef, low-fat beef can be made more palatable when prepared correctly.

Increased consumer awareness from more informative labeling and consumer education programs should enable consumers to buy beef that is more compatible with their preferences. Consumers would benefit and a more predictable market for lean beef would give producers a greater incentive to develop and market leaner beef.

[Received June 1989; final revision  
received February 1990.]

## References

- Amemiya, T. "Qualitative Response Models: A Survey." *J. Econ. Lit.* 19(1981):1483-536.
- Bowbrick, P. "The Economics of Grades." *Oxford Agrar. Stud.* 11(1982):65-92.
- Branson, R. E., H. R. Cross, J. W. Savell, G. C. Smith, and R. A. Edwards. "Marketing Implications from the National Consumer Beef Study." *West. J. Agr. Econ.* 11(1986):82-91.
- Capps, O., Jr., D. S. Moen, and R. E. Branson. "Consumer Characteristics Associated with Selection of Lean Meat Products." *Agribusiness* 4(1988):549-57.
- Feick, L. F., R. O. Herrmann, and R. H. Warland. "Search for Nutrition Information: A Probit Analysis of the Use of Different Information Sources." *J. Cons. Affairs* 20(Winter 1986):173-93.
- Judge, G. G., W. E. Griffiths, R. C. Hill, H. Lütkepohl, and T.-C. Lee. *The Theory and Practice of Econometrics*. New York: John Wiley and Sons, 1980.
- Kaufman, P. R., and C. R. Burbee. "Beef: Graded and Ungraded in the Meat Counter." *National Food Review*, NFR-27(1984):3-5, Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture.
- Kenney, M. C. "Commodity Grades Help Consumers." *National Food Review*, NFR-27(1984):1-2, Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture.
- Maddala, G. S. *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge, England: Cambridge University Press, 1983.
- McFadden, D. "Conditional Logit Analysis of Qualitative Choice Behavior." In *Frontiers in Econometrics*, ed., P. Zarembka. New York: Academic Press, 1974.
- Miller, J. A., D. G. Topel, and R. E. Rust. "USDA Beef Grading: A Failure in Consumer Information?" *J. Mktg.* 40(January 1976):25-31.
- Nelson, P. "Information and Consumer Behavior." *J. Polit. Econ.* 78(1970):311-29.
- Purcell, W. D., and K. E. Nelson. "Recent Changes in Beef Grades: Issues and Analysis of the Yield Grade Requirement." *Amer. J. Agr. Econ.* 58(1976):475-84.
- Rhodes, V. J. *The Agricultural Marketing System*. New York: John Wiley and Sons, Inc., 1983.
- Shapiro, B. P. "Price Reliance: Existence and Sources." *J. Mktg. Res.* 10(1973):287-91.
- Skaggs, R. K., D. J. Menkhaus, S. J. Torok, and R. A. Field. "Test Marketing of Branded, Low Fat, Fresh Beef." *Agribusiness* 3(1987):257-71.
- Stafford, J. E., and B. M. Enis. "The Price-Quality Relationship: An Extension." *J. Mktg. Res.* 6(1969):456-58.
- Stigler, G. J. "The Economics of Information." *J. Polit. Econ.* 69(1961):213-25.
- Wheatley, J. J., and J. S. Y. Chiu. "The Effects of Price, Store Image, and Product and Respondent Characteristics on Perceptions of Quality." *J. Mktg. Res.* 14(1977):181-86.
- White, K. J. "SHAZAM: A General Computer Program for Econometric Methods (Version 5)." *Amer. Statist.* 41(February 1987):80.