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**Impact of Changing Consumer Preferences  
On Willingness-to-Pay for Beef Steaks  
In Alternative Retail Packaging\***

by

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**Abstract**

The purpose of this study was to identify how consumer perceptions of selected attributes of beef steaks, individual consumer demographics

and perceived changes in purchases of substitute meats affect willingness-to-pay for beef rib-eye steaks in the traditional overwrapped styrofoam tray and vacuum skin packages. A laboratory auction was used to obtain willingness-to-pay data.

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The results suggest that health related factors, particularly the concern regarding cholesterol, reduced the willingness-to-pay for beef rib-eye steaks, regardless of package type. For the vacuum skin package to be successful, information about the package is necessary, along with providing a consistent and quality product, particularly with respect to trim.

### **Key Words**

Consumer attributes, Beef steaks, Willingness to pay, Alternative packaging

### **Introduction**

Changes in consumer preferences and the effects of these changes on consumer choice are well recognized by processors and marketers of food products. The vast array of differentiated food products available to consumers is evidence of the reaction to these changes. Food products are available which target both health conscious and convenience oriented consumers. While retail beef products now have less external fat and less bone, they have not changed appreciably to accommodate recent changes in consumer preferences. In comparison, methods of merchandising chicken are entirely different than they were twenty years ago (Reynolds, 1992).

Consumer concerns about convenience, food safety, diet, and health provide an opportunity for the U.S. food industry to expand business (Harper, 1992). Convenience remains one of the top food issues for modern consumers, while price, packaging and freshness continue to have a major impact on consumer food spending patterns (Barr, 1992). If the beef industry is going to direct efforts toward merchandising and product development, it is important to understand how individual consumer characteristics and consumer perceptions of beef attributes affect the individual consumer's demand for beef.

The demand for beef has trended downward during the past decade (Purcell, 1989). The decline in demand can be attributed to changes in relative prices between beef and other meats and changes in the lifestyles of consumers, including health and convenience related factors (Chavas,

1989; Barkemn and Drabenstott, 1990). Marketing efforts of competing meats, particularly poultry, likely have contributed to the reduction in market share for beef (Allen and Pierson, 1986; Reynolds, 1992).

Centrally prepackaged or case-ready beef has been considered by the beef industry as a means to react to the challenge from competing meats (Allen, 1989; Field and Menkhaus, 1990). Specifically, vacuum skin packaging (VSP), an alternative to the traditional overwrapped styro-foam tray (OST) packaging, has potential for large-scale utilization in the beef packing industry. The VSP offers many attributes which may be preferred by consumers including extended shelf life, leak-proof package, visibility of the meat, and longer and more convenient storage at home in the refrigerator or freezer (Pelzer et al., 1991).

The VSP has several advantages from a marketing perspective. A more consistent level of meat quality can be obtained due to the centralization of the packaging process. The VSP provides better opportunities for branded products. Additionally, this package type facilitates the use of information on the package, such as nutrition labels and cooking instructions, allowing retailers to emphasize consumer services (Linsen, 1988).

The unusual appearance of the meat is a limitation of VSP. Because the cut is not exposed to oxygen, the beef in this package is not the familiar bright red color but has a natural purplish color. However, when the meat is reexposed to the oxygen contained in the air, the meat returns to the familiar bright red color in about 15 minutes. Information about the unusual color and its cause may be important to induce initial purchase of beef in VSP (Lynch, Kastner and Kropf, 1986). Moreover, adoption of the VSP by the industry requires, in part, information about consumer attitudes toward this package type.

### **Objectives**

The objectives of this study are two-fold. The first objective is to determine how consumer characteristics and perceived concerns about the attributes of beef affect consumer willingness-to-pay for beef steaks. This information is necessary

if specific consumer groups are to be targeted with promotional information, and it also can guide the content of the promotional material. Additionally, it may provide information as to which attributes or perceived attributes of beef may be more damaging to retail demand and give direction to product development activities. The second objective is to determine to what extent an alternative package type, namely the VSP, may enhance the desirability of retail beef to consumers. The results of the analysis should be useful in developing merchandising strategies and new products for beef and in developing marketing strategies for vacuum-packaged retail beef.

### Study Design

The data used for the analysis were collected from two areas, Denver and Los Angeles, during May and August, 1989. A representative sample of consumers in each location was recruited by a marketing research firm. Study participants were required to be primary purchasers of meat in their household and to have purchased beef within the month prior to the study. Respondents were paid \$35 for participating in the study. The total number of observations included in the analysis (after eliminating incomplete questionnaires) was approximately 630.

Each individual participating in the study was asked to complete a questionnaire. A section of this questionnaire surveyed respondents regarding their concerns or dissatisfactions with selected characteristics of beef steaks. These characteristics represented a broad cross-section of concerns regarding convenience, health, and quality of beef. These questions identified attributes of beef as perceived by the respondent, such as high cholesterol content, high in calories, at-home storage, minimize waste, and expense. Study participants also were asked about their meat purchase patterns in the three years prior to the study. Specifically, respondents were asked if their family's usage of poultry, pork and fish had changed in the previous three years (less often, no change, or more often). Demographic characteristics also were obtained from each respondent.

Willingness-to-pay data used in the analysis were obtained via a laboratory experimental auc-

tion. The auctions were conducted after the participants completed the questionnaires. In a laboratory experimental auction, participants submit bids for a product and the winner(s) of the auction purchase(s) the product at a price determined by the auction rules (Coppinger, Smith and Titus, 1980; Coursey and Smith, 1984; Cox, Roberson and Smith, 1982; Cox, Smith and Walker, 1985; Forsythe and Isaac, 1982; Kagel, Harstad and Levin, 1987). This procedure reveals how much participants are willing to pay for the product. A multiple unit Vickrey (1961) auction was selected for this study; specifically a fifth price auction. This type of auction is theoretically a demand revealing allocation or price setting mechanism in that bidding one's true value is a dominant strategy against any strategy used by other bidders (Cox, Roberson and Smith, 1982; Forsythe and Isaac, 1982; Vickrey, 1961). However, the behavioral properties for revealing demand in a Vickrey auction have been challenged (Coursey and Smith, 1984). These authors found that subjects consistently underbid relative to their true reservation prices. This result suggests that the bids in the Vickrey auction should not be interpreted as true representations of a subject's maximum willingness-to-pay. Thus, for purposes of this study, the bids are deemed to reflect a participant's behavior resulting from their attitudes toward beef and package type. Caution should be exercised in interpreting the actual magnitude of the bid in response to an attitude.

During the auction phase of the study, participants in groups of eight, were asked to bid for the right to select steaks from a display case (48 auction sessions were conducted at each study site--Denver and Los Angeles.) These steaks were choice, boneless, lip-off rib-eye steaks in OST and VS packages. Each package contained two eight-ounce steaks. Individuals participating in the study were given several opportunities during the auctions to closely examine the steaks. To assure that consumers were bidding for a homogeneous product and to maintain the incentive properties of the auction, a representative steak was chosen from the display case and used in the auctions. Participants with winning bids were allowed to select steaks from the display case after the auctions were completed.

Participants were asked to take part in 10 auctions. After the instructions which explained the specifics of the auction were read to the participants, two trial auctions for each package type were conducted. These were designed to acquaint participants with the auction procedures. Following these four trial auctions, six purchase auctions were conducted, three for each package type. After bids were submitted by each of the eight participants involved in a particular auction, the bids were ranked privately. The auction monitor reported only the fifth-highest bid price to the participants. The "winners" were those who submitted the top four bids. In the purchase auctions, each winner paid the fifth-highest bid of the auction they won for the package of steaks.

All information other than the market price was kept private, and participants were instructed to count themselves as winners if they had bid more than the reported price. Ties were decided by the roll of a die and any discrepancies between monitor records and participant records were deferred until the end of the experiment. During the trial auctions, the monitor checked each participant's record sheet to make sure he/she understood how to determine when his/her bid was a winning bid and what was to be paid for a package of steaks. At the conclusion of the series of auctions, participants paid for steaks bought in any of the purchase auctions. The individuals were then given slips of paper which entitled them to pick up steaks they had purchased from the display they had viewed prior to the auction.

The auction was conducted under three information treatments with respect to VSP: no information, verbal information, and information plus a demonstration. Under the information and information plus a demonstration treatments, the following benefits and characteristics of VSP were presented to the study participants.

- What is good about this package?
  - You can see both sides of the meat.
  - It preserves freshness while allowing the natural aging process to continue.
  - It is tamperproof, assuring freshness.
  - It extends refrigerator shelf-life, meat is good for 30 days after packaging.

- The vacuum skin makes an excellent freezer package and is microwave defrostable.

- Why is the meat's color different?

- The meat is vacuum sealed immediately after cutting, preserving the rich natural burgundy color of quality beef.
- Once the package is opened and the meat is exposed to oxygen, the meat will bloom the familiar bright red color.

- Why is the juice in the package?

- This juice is naturally present in fresh beef and its presence is an indication of freshness. The amount of juice present varies from cut to cut and is dependent on temperatures. The colder the meat is kept, the less juice there will be.

In the demonstration treatment, the VSP was opened and participants observed the beef steak change color when exposed to oxygen in the air.

### Model

The analytical model relates the participant's willingness-to-pay for steaks to a set of factors which are categorized as selected beef steak concerns; individual demographic characteristics; perceived changes in usage of poultry, pork and fish; and the type information given to the study participants about the VSP. Willingness-to-pay was measured by the simple average of each individual's three bids for each package type. Bids for each package type were analyzed separately so as to determine the impact of the factors identified above on each package independently, as well as to determine whether the impact of these factors display significant differences depending on the package type.

The model takes into account that consumers make decisions based on perceptions of product characteristics and that preferences vary among consumers due to demographic characteristics. Each of these considerations is important from the standpoint of marketing, e.g., market

segmentation, product merchandising and new product development and in developing marketing strategies in general.

The theoretical framework used in this study follows that summarized by Capps and Schmitz (1991). The utility function, originally specified by Basmann (1956) in his work on variable preferences, is expressed as

$$U_t = U(q_t; \theta(\alpha_t))$$

where utility ( $U_t$ ) is dependent on the commodity vector ( $q_t$ ) and the perception of quality ( $\theta(\alpha_t)$ ) of a good by a consumer in time  $t$ . Maximization of  $U_t$  with respect to  $q_t$ , given  $\alpha_t$ , subject to an income constraint yields the demand relationship

$$q_t = q_t(p, y; \theta(\alpha_t))$$

where  $p$  is a vector of prices and  $y$  is income. In this study,  $\alpha_t$  is defined as a vector of perceived characteristics or attributes of a good in  $q_t$ . Consideration of perceived attributes in the empirical analysis is important because nutritional elements, for example, may be perceived to be different than actual levels (Schmitz and Nayga, 1991).

This basic theoretical formulation can be expanded to include the  $k$  demographic characteristics of individual  $i$  ( $\beta_{ik}$ ), to account for variation in preference due to these factors. Given the type of data available and circumstances relevant to the study design and investigation, the basic theoretical model can be modified further. For example, a cross-sectional survey, while appropriate for obtaining information regarding perceived product characteristics, generally will not yield information on quantity consumed of a good. Thus, in this study, willingness-to-pay is used to represent preference and behavior in the market by the individual consumer. Moreover, in the case of cross-sectional survey data, prices, e.g., prices of competing products, are assumed to be constant across individuals. Perceived changes in purchases of competing products are included in the model to account for changes in willingness-to-pay for beef steaks due to effects associated with competing meat products for beef-poultry, pork and fish. Finally, the model includes variables which pertain to the specific manner in

which the study was designed and conducted—location, information treatment and interactions between selected product attributes and the information which was presented to the study participants.

The specific variables used in the model are identified and described in Table 1. Perceived attributes of beef steaks are categorized into health, convenience, appeal and merchandising characteristics. These variables measure a respondent's concern or dissatisfaction (0 - no concern; 1 - concern) with beef steaks. Expected relationships also are identified in Table 1. Some of these expected relationships are identified recognizing the properties of the study product—well trimmed rib-eye steak, e.g., trim level; some relationships cannot be determined a priori. Means for the variables also are reported in Table 1.

Some of the study participants bid zero in each of the three auctions for a given package type. These participants represent approximately five percent of the total number of observations for each package type. This bidding strategy provides for a censoring of the dependent variable at the zero level. Censoring of the dependent variable can lead to biased and inconsistent ordinary least squares (OLS) estimates (Kmenta, 1985). Heckman (1979) proposes a two-step procedure for estimating such models. The first step of this procedure uses a probit model to determine the probability that a specific observation will be non-censored. This probability, the ratio of the standard normal density function divided by the cumulative standard normal density function, is then included as a factor in a second stage OLS estimation. This ratio is the inverse of what is commonly referred to as the Mills ratio. The second stage estimation omits all of the censored observations. Heteroskedasticity, a correlation between the magnitudes of the error term and the explanatory variables in the model, is inherent to the Heckman procedure. A variety of tests for this correlation were conducted using the diagnostic procedures provided in SHAZAM, Version 6.2. These tests indicated that heteroskedasticity was present in the data. Therefore, the second stage estimates were calculated using Weighted Least Squares (WLS). Tests and weights were based on

**Table 1. Description of the Variables.**

Variable	Description	Means	Expected Sign (OST)	Expected Sign (VSP)
<b>Dependent Variables</b>				
WTP <sub>ost</sub>	Willingness-to-pay, simple average for three OST auctions	2.352		
WTP <sub>vsp</sub>	Willingness-to-pay, simple average for three VSP auctions	2.682		
<b>Study design</b>				
Inform 2	Information treatment, 0-1, no information base	0.353		+
Inform 3	Information + demonstration treatment, 0-1, no information base	0.345		+
Loc	Location, 0-1, 0-Denver, 1-Los Angeles	0.488		
<b>Health</b>				
Toolarg	Cuts and packages too large (portion size), 0-1	0.139	-	-
Chol	High cholesterol content, 0-1	0.523	-	-
Cal	High in calories, 0-1	0.282	-	-
Artng	Contains artificial ingredients (hormones, antibiotics), 0-1	0.537	-	-
Trimng	Not well trimmed, too much fat, 0-1	0.691	+	+
<b>Convenience</b>				
Micro	Cannot prepare in a microwave, 0-1	0.192		
Micro 2	Interaction - Micro x Inform 2, 0-1	0.068		
Micro 3	Interaction - Micro x Inform 3, 0-1	0.071		
Store	Cannot easily store package in refrigerator or freezer, 0-1	0.134		
Store 2	Interaction - Store x Inform 2, 0-1	0.054		
Store 3	Interaction - Store x Inform 3, 0-1	0.041		
<b>Appeal</b>				
Grist	Too much gristle, 0-1	0.391	-	-
Waste	Too much waste, 0-1	0.279	-	-
Ntender	Tough, not tender, 0-1	0.553	-	-

Table 1. Continued

Variable	Description	Means	Expected Sign (OST)	Expected Sign (VSP)
<b>Merchandising</b>				
Cseep	Cannot see entire product in package, 0-1	0.455	-	+
Bdislu	Beef displayed in store looks unappetizing, 0-1	0.134	-	-
Pack	Package wrapping does not protect the meat, 0-1	0.302	-	+
Tooexp	Too expensive, 0-1	0.641	-	-
Redcol	Color	0.208	+	-
Redcol2	Interaction - Redcol x Inform 2, 0-1	0.083		+
Redcol3	Interaction - Redcol x Inform 3, 0-1	0.071		+
<b>Demographic</b>				
Age	Age, continuous	42.106		
Gender	Gender, 0 - female, 1 - male	0.748		
Educ2	Education, < 4 years H.S., grad. work base, 0-1	0.049		
Educ3	Education, 4 years H.S., grad. work base, 0-1	0.244		
Educ4	Education, 1-3 years college, grad. work base, 0-1	0.439		
Educ5	Education, 4 years college, grad. work base, 0-1	0.154		
Inc2	Income, \$30,000 - \$59,999, < \$30,000 base, 0-1	0.687	+	+
Inc3	Income \$60,000 - \$79,999, < \$30,000 base, 0-1	0.181	+	+
Inc4	Income, > \$80,000, < \$30,000 base, 0-1	0.036	+	+
<b>Competing meats</b>				
Pltypp	Perceived change in purchases of poultry, 0 - less or no change, 1 - more	0.743	-	-
Pkpp	Perceived change in purchases of pork, 0 - less or no change, 1 - more	0.182	+	+
Fhpp	Perceived change in purchases of fish, 0 - less or no change, 1 - more	0.518	-	-
Mill	Mills ratio	0.090		

the Breusch-Pagan test (see Kmenta, 1985, p. 294-295).

Outlying data observations are a concern using data such as that used in this study when least-squares estimation techniques are employed. In the case of an outlying observation, one observation (one respondent in this case) may exert undue influence on the overall model results. The presence of such observations can be detected by the use of influence diagnostics (Belsley, Kuh and Welsch, 1980). Observations which are identified as exerting undue influence were removed from the estimation procedure. These data represent about five percent of all non-zero observations.

One important goal of this study is to determine whether package type statistically affects the magnitude of the estimated model coefficients. In order to test whether these magnitudes are affected, it is necessary to isolate coefficients for both the OST and the VSP within one model formulation. This is accomplished through the use of an intercept shifter and slope shifters for each variable in the model. An intercept shifter is accomplished by the inclusion of a dummy variable for the package type (0 for OST and 1 for VSP). Slope shifters are developed by multiplying the dummy variable by each of the other variables in the model. This multiplication results in new variables which equal zero for the OST and equal the value of the factor for the VSP.

Results from such a model indicate the magnitudes of the coefficients for both package types as well as provide a test of significant change across package type. Coefficient estimates for the intercept and the traditional variables provide the coefficients for the OST directly. Coefficient estimates for the VSP are obtained by the summation of the variable (intercept) and its respective slope (intercept) shifter. T-tests for the VSP are conducted using standard approaches for the summation of two coefficients. Coefficients obtained by this method are the same as would be obtained if both models were estimated independently. However, the intercept and slope shifter variables provide a direct test of whether the coefficient is significantly different across package types. Significant t-values on these shifters indicate that a significant change in the coefficient

occurred. Probability (P) values associated with these t-test are used to determine the probability that the coefficients are different.

## Results

The results of the analysis of the influence of the combined variables in each of the categories are presented in Table 2. The results suggest the combined model variables explained a significant amount of the variation in willingness-to-pay for each of the package types. Combined health, appeal and demographic variables (excluding income) significantly influenced bids for rib-eye steaks in both the OST and VSP. Information pertaining to the VSP significantly affected the bids for steaks in both package types. None of the cross-effects significantly influenced the bid prices for beef in either of the package types. In addition to the health, appeal, demographic and information variables, the bids for beef steaks in the VSP were significantly influenced by the combined income and competing meats variables. Package type significantly affected the influence of the combined health and information variables on willingness-to-pay.

The estimated model is presented in Table 3. In general, health related concerns negatively affected the willingness-to-pay for rib-eye steaks in both the OST and VSP. For both package types, the cholesterol concern significantly reduced the average bid price. Individuals identifying trim as a concern bid significantly more for beef in the OST, but bid significantly less for steaks in the VS package. Under the information treatment, a concern with respect to microwaveability significantly increased the willingness-to-pay for both package types, while a concern about the inconvenience of at-home storage of beef significantly reduced the bid for OST packaged beef. Among the appeal variables, the waste concern was significant in reducing the bid price for the OST and the variable not tender significantly decreased the bid for steaks in VSP. Respondents who express a concern that the package wrapping does not protect the meat bid significantly more for the VS packaged product. Other appeal and merchandising attributes of beef steaks did not significantly influence the bids for beef steaks in the OST.

**Table 2. Results of Combined Effects of Variables on Willingness-to-Pay by Package Type, F-Statistics.**

Variable Category	Overwrapped	Vacuum-Skin	Change
All Coefficients	6.375 *	8.652 *	1.610 *
Health	4.340 *	3.182 *	2.760 *
Appeal	2.062 *	2.724 *	0.632
Merchandising	1.456	1.411	0.928
Demographic	4.536 *	4.042 *	0.641
Income	0.857	4.252 *	1.875
Competing meats	1.161	2.395 *	0.827
Inform + color	3.146 *	8.176 *	3.411 *
Cross-effects			
Micro x inform	1.489	1.586	0.015
Store x inform	1.482	1.404	0.301
Color x inform	1.681	1.757	0.986

\* Significance level  $\alpha = 0.10$ .

Demographic variables played a key role in explaining variation in the willingness-to-pay for steaks in each of the package types. Age and income significantly increased the bids in both packages. In general, education was significant in decreasing the bids for beef in the OST, but did not significantly affect the VSP bids. Individuals reporting increased purchases of poultry or fish bid significantly less for steaks in the VSP.

Information pertaining to the VSP, and beef in the VSP, as well as information plus the demonstration of opening the VSP, significantly increased the willingness-to-pay for steaks in both package types. However, there was no significant difference between the coefficients associated with the information and information plus demonstration treatments in the VSP equation. This may suggest the demonstration is not necessary.

Individuals who expressed a concern about the color of beef steaks bid significantly more for the beef in the VSP. This result is at odds with the belief by some in the industry that color is a major deterrent for acceptance of the VSP. There

are two possible explanations for this result; both are related to the way the study was conducted. First, it is possible that consumers think color indicates freshness. Before the auction, in order to assure participants that the product was not tainted, researchers told the respondents that the steaks were purchased from a local distributor that day and were similar to those that could be purchased at a local retail outlet. This introduction might have persuaded participants that the product was wholesome and fresh, regardless of its color in the VSP. Second, the question about the concern or dissatisfaction with color simply listed "color" and respondents were asked to identify if color was a concern or not a concern. A more detailed question or prompting with respect to the color issue may have been more appropriate.

The location variable was positive and significant in each of the two equations. Specifically, average bids were significantly higher in the Los Angeles site for both the OST and VSP, as compared to Denver. Differences in the general price level between the two locations may have contributed to bid differences by location.

**Table 3. Estimated Parameters and Summary Statistics, Willingness-to-Pay for the OST and VSP**

Variable	Overwrapped		Vacuum-Skin		Probability of Equal Coefficients
	Coefficient	T-Value	Coefficient	T-Value	
Intercept	1.512 *	4.99	1.096 *	4.06	0.153
Toolarg	0.014	0.15	-0.030	-0.29	0.376
Chol	-0.254 *	-3.13	-0.122 *	-1.50	0.126
Cal	-0.015	-0.19	-0.039	-0.45	0.419
Arting	-0.082	-1.19	-0.028	-0.35	0.303
Trimng	0.194 *	2.59	-0.180 *	-2.30	0.001 *
Micro1	0.037	0.23	0.207	1.04	0.254
Micro2	0.330 *	2.21	0.557 *	3.62	0.145
Micro3	-0.002	-0.02	0.184	1.22	0.184
Store1	-0.229	-1.25	-0.223	-1.28	0.490
Store2	-0.393 *	-1.91	-0.111	-0.67	0.144
Store3	0.002	0.09	0.160	0.89	0.287
Grist	-0.046	-0.60	-0.044	-0.49	0.494
Waste	-0.201 *	-2.58	-0.060	-0.70	0.112
Ntender	0.039	0.53	-0.139 *	-1.81	0.047 *
Cseeper	0.044	0.62	-0.002	-0.02	0.329
Bdislu	0.104	0.90	-0.091	-0.75	0.123
Pack	0.075	0.95	0.190 *	2.08	0.170
Tooexp	0.090	1.03	0.076	0.86	0.453
Age	0.013 *	3.88	0.015 *	4.30	0.349
Gender	0.039	0.49	0.093	1.12	0.321
Educ2	-0.443 *	-2.01	-0.096	-0.40	0.144
Educ3	-0.143	-1.12	-0.018	-0.14	0.246
Educ4	-0.251 *	-2.17	-0.018	-0.15	0.053 *
Educ5	-0.240 *	-1.64	-0.041	-0.31	0.158
Inc2	0.094	0.82	0.341 *	3.30	0.056 *
Inc3	0.129	0.80	0.621 *	4.56	0.010 *
Inc4	0.312 *	1.60	0.722 *	2.78	0.104
Pltypp	-0.069	-0.88	-0.243 *	-2.59	0.078 *
Pkpp	0.067	0.81	0.021	0.23	0.356
Fhpp	-0.096	-1.24	-0.102 *	-1.29	0.480
Inform2	0.424 *	3.87	0.857 *	7.27	0.004 *
Inform3	0.134 *	1.29	0.702 *	5.94	0.001 *
Redcol1	0.231 *	1.40	0.419 *	2.25	0.226
Redcol2	-0.151	-1.03	0.113	0.72	0.110
Redcol3	0.091	0.71	-0.044	-0.28	0.255
Mill	-0.917	-1.02	-0.052	-0.07	0.228
Loc	0.660 *	9.11	0.746 *	9.65	0.209
R-Sqr	0.284		0.404		0.366 <sup>b/</sup>
Adj. R-Sqr	0.240		0.368		0.326 <sup>b/</sup>
Observations	630		635		1265 <sup>b/</sup>

<sup>a/</sup> Probability the coefficients between the two equations are the same.

<sup>b/</sup> Combined model.

\* Significance level  $\alpha = 0.10$ .

Coefficients which exhibited magnitudes significantly different between the two equations were associated with the trim, tenderness, education, income, perceived changes in purchases of poultry and information variables. Information regarding the VSP significantly increased the bids for the VSP, as compared to the OST, relative to the no information treatment. The response in bids for the two package types was significantly lower for the VSP, as compared to the OST, by individuals who expressed a concern with respect to trim and tenderness. The difference in the coefficients associated with trim may be due to the increased visibility of the product in the VSP. Since study participants were given the opportunity to view and handle the packages before the auction, it is possible the perception of the overall quality of beef in the VSP, as compared to beef in the OST, contributed to the perception that the beef in the VSP may have been less tender than that in the OST. Thus, it is possible the tenderness property of beef steaks may be realized through how the consumer perceived the overall quality of the product. Finally, respondents reporting increased purchases of poultry bid significantly less for steaks in the VSP, as compared to steaks in the OST.

### Summary and Implications

The results of this study suggest health related factors, particularly the concern regarding cholesterol, reduced the willingness-to-pay for beef rib-eye steaks, regardless of package type. Overall, these results lend support for the recently initiated Beef Industry Council promotion campaign which features endorsements from health professionals.

The development of new beef products capitalizing on the desirable attributes of competing meats is important. Reducing waste and providing packaging which better protects the product and also has convenient storage properties appear to be warranted.

For the VSP to be successful, information about the package and the color of the meat in the package is necessary, while a demonstration of beef returning to a bright red color after being

reexposed to oxygen may not be needed. The concern about the color of retail beef may be associated with a consumer's perception of the freshness of the product. Moreover, given the visibility of the beef to the consumer in the VSP, it is important to provide a consistent and quality product, particularly with regard to trim.

Several of the demographic variables were significant in explaining the bids, suggesting the potential for market segmentation merchandising strategies by the industry. For example, age and income contributed to increased bids for both package types. The VSP appears to be more favorably accepted among individuals in higher income categories, as compared to the OST.

Finally, this study was conducted only for beef rib-eye steaks. It is conceivable that perceived characteristics of other beef cuts affect consumer perception of quality, and thus preference, in differing manners. This may be especially true for cuts which have more purge accumulate in the package than do rib-eye steaks. Moreover, demographic characteristics of consumers also may influence the perceptions of, and preference, for different cuts of beef differently. Thus, a better understanding of how the factors examined in this study affect the individual consumer preferences for alternative cuts of beef may provide useful marketing information for the beef industry.

Three caveats are relevant with respect to the interpretation of the findings of this study. First, the results may have been affected somewhat by university personnel providing information about the beef and packages rather than a retailer or processor. Participants were told the beef in both package types was fresh and purchased from a local distributor. Respondents had no reason to doubt the quality and safety of the product and may have submitted bids during the auction to reflect this trust. For example, the result that the demonstration of opening the VSP did not significantly increase the value of the beef in this package type, as compared to the information treatment, may have been influenced by university employees providing this information as opposed to employees of private industry. Given the manner in which the study was conducted,

there was no way to determine the influence of this probable effect.

Second, the relative values of the estimated intercepts for the package type equations do not provide an indication of the relative bids for the two package types. Average bids were higher for the VSP. However, bids for steaks in the VSP and the OST under the no information treatment were not significantly different. There is a potential for the generally higher average bids for steaks in the VSP, relative to the beef in the OST, to have been due, in part, to the novelty of the VSP. The analysis can neither determine if this effect is present or its magnitude.

Third, the study product had very little purge. This was because the beef was packaged shortly before the study and because rib-eye steaks have less purge than many other cuts. Purge in the package accumulates with time associated with transportation, storage, marketing, and people handling packages in retail counters. The VSP in retail stores often has more purge than was present in the study product.

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