EFFECTS OF ADDITIONAL QUALITY ATTRIBUTES ON CONSUMER WILLINGNESS-TO-PAY FOR FOOD LABELS

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Abstract

Contingent valuation (CV), choice experiment (CE) and experimental auction (EA) or the combinations of the three methods are often used by researchers to elicit consumer willingness to pay for food attributes (food labels). One concern about using these approaches is that quality attributes of food provided to respondents are assumed independent of other attributes which are not provided to respondents during the survey. The limited attributes provided in a survey may lead respondents to allocate their budgets to those limited attributes rather than allocate their budgets to a larger number of product attributes to truly reveal their preferences.

Surveys containing a series of online CEs were collected to investigate the effects of additional beef steak attributes on consumer WTP in two different US markets. Random parameters logit models are estimated for each CE in the questionnaires with survey results from both samples. The models with the different survey samples reveal consistent results regarding changes in WTP with more attributes added to the CEs. Consumer WTP for the most important attributes in the CE decreases when the number of attributes increases from three to four, while the WTP for the most important attributes increases when the number of attribute increase from four to five. The changes in the WTP for attributes depend on their relationships with the newly added attributes to the CEs and the number of attributes in CEs.

Keywords: Food Labels, Willingness-to-Pay, Choice Experiment

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Consumer willingness-to-pay (WTP) for certain food quality attributes is an important indicator of consumer response to food labels and a determinant of the anticipated change in demand under a food labeling program. Estimated WTP is used as an input or proxy for demand change in welfare analysis of food policy and to provide useful information for food labeling programs (e.g., Lubben 2005; Lusk and Anderson 2004). Therefore, having a better understanding of, and more accurately determining, consumer WTP for food labels is important for policy makers as well as food producers and processors.

Contingent valuation (CV), choice experiment (CE) and experimental auction (EA) or the combinations of the three methods are often used by researchers to elicit consumer willingness to pay for product attributes (e.g., Alfnes and Rickertsen 2003; Alfnes 2004; Brester, Marsh, and Atwood 2004; Fox et al. 1994; Fox 1995; Hossain et al. 2003; Hu et al. 2004; Huffman 2003; Lusk et al. 2001; Lusk et al. 2004; Lusk, Roosen and Fox 2003; Loureiro and Umberger 2003; Loureiro and Umberger 2005). In the CV method, respondents are provided with detailed information on products and are asked if, or how much, they would pay for a new product. In the CE method, products are described as bundles of several attributes varying in levels and respondents are asked to choose among those alternatives. Econometric models are used to estimate consumer willingness to pay for a specific attribute (e.g., Louviere, Hensher and Swait 2000; Lusk and Hudson 2004). In EA, consumers bid to exchange their endowed product for a product which has new attributes or they can bid directly on several competing goods. Willingness to pay for the products can be elicited from consumer bids (Lusk and Hudson 2004).

Economists and market researchers have used these methods extensively to elicit consumer WTP for food labels on attributes such as tenderness of beef, country of origin of meat and vegetables, organic foods, foods containing genetically modified organisms (GMO), and numerous other product attributes (Huffman 1996; Loureiro and Umberger 2003; Loureiro and Umberger 2005; Krystallis and Chryssohoidis 2005; Hossain et al. 2003; Hu et al. 2004; Fox et al. 1994; Fox 1995) One concern in these studies is that different quality attributes of food are assumed to be independent of those attributes that are not provided to the respondent in the survey or experiment.   For example, to estimate consumer WTP for country of origin labeling (COOL) under CV or EA, respondents are asked to choose between food with or without COOL or bid for products with or without a label, no other information on safety, nutritional level, quality, etc. on those products is provided. In CE, respondents make choices from the alternatives which differ in numerous quality attributes, but consumers lack information on other attributes that they typically have in real world shopping. In this study we estimate marginal impacts of additional food quality information on consumer WTP for food labels. In particular, this study develops a conceptual argument for why and illustrates using survey data how marginal WTP to food product attributes in CE, CV or EA studies depends upon the particular food attributes presented to respondents on the label. This information is important because it demonstrates that WTP estimates in CE, CV and EA studies are contingent on the set of product attributes provided to respondents.

Consumer WTP for food attributes is used to determine demand for food products using labels to reveal food attributes. Hallman et al. (2003) has shown that research questions reinforced consumer attention to the information of interest. However in consumer WTP studies only limited information on food quality attributes can be provided to respondents. A clear view of how additional food quality attributes affect consumer WTP for labels will help economists to better understand welfare analysis of food label policy using WTPs from published studies as well as enhance producer ability to make more appropriate decisions on labeling programs based on WTP estimates.

Model Development

Random utility theory has been widely adopted in WTP studies. Assuming a linear random utility function, consumer utility (U) could be defined by:

$$U_{ij} = \alpha_i \cdot p_{ij} + \sum_{k=1}^{T} \beta_{ik} \cdot x_{ijk} + \varepsilon_{ij} \tag{1}$$

where p_{ij} is price, x_{ijk} is the kth attribute of alternative j for person i, α_i is marginal utility of price, β_k is marginal utility of the kth attribute, and ε_{ij} is a stochastic disturbance. T is the number of attributes of alternative j.

Consumer i's WTP for the kth attribute is the amount of money that he/she would be willing to pay to stay at his/her previous utility level when the kth attribute changes. Now assume that the kth attribute in alternative j improves from level 0 (without attribute k) to level one (with attribute k), the WTP of consumer i to accept this change is the price premium he/she would pay for this change such that the following equality holds:

$$\alpha \cdot p_{ij} + \sum_{\substack{h=1 \\ h \neq k}}^{T} \beta_{ih} \cdot x_{ijh} + \beta_{ik} \cdot x_{ijk}^{0} = \alpha \cdot (p_{ij} + WTP^{k}) + \sum_{\substack{h=1 \\ h \neq k}}^{T} \beta_{ih} \cdot x_{ijh} + \beta_{ik} \cdot x_{ijk}^{1} \tag{2}$$

Where the superscript 0 of attribute *x* indicates that the attributes is unavailable to the product while superscript 1 indicates that the attributes is available to the product.

Solving (2) for WTP, we get

$$WTP^{k} = -\frac{\beta_{ik}}{\alpha}(x_{ijk}^{1} - x_{ijk}^{0}) \,. \tag{3}$$

As a result, for a linear indirect utility and utility function, consumer WTP for kth attribute is the negative ratio of the parameter of kth attribute to the parameter of price:

$$WTP^k = -\frac{\beta_{ik}}{\alpha} .$$

To test the effect of additional attributes on consumer WTP for attribute k in equation (1), we assume alternative j has additional M-T attributes (M>T). In this case, consumer i's random utility function can be expressed as:

$$U_{ij}^* = \alpha^* \cdot p_{ij} + \sum_{k=1}^{T} \beta_{ik}{}^* \cdot x_{ijk} + \sum_{k=T+1}^{M} \beta_{ik}{}^* \cdot x_{ijk} + \sum_{l=1}^{m} \delta_l^* \cdot z_{il} + \varepsilon_{ij} \quad . \tag{4}$$

Equation (4) implies that with more attributes added to the consumer utility function, the marginal utility of price and attributes change from α to α^* and from β_i to β_i^*, respectively. In addition, the marginal utilities of consumer i's characteristic changes from δ to δ^*. With these changes, consumer WTP for attribute k will change from $WTP^k = -\frac{\beta_{ik}}{\alpha}$ to $WTP^{k^*} = -\frac{\beta_{ik}{}^*}{\alpha^*}$.

If consumer WTP for one attribute x_{ijk} is not affected by the other product attributes, then consumer WTP for x_{ijk} will not change, such that $|(WTP^k = -\frac{\beta_k}{\alpha}) - (WTP^{k^*} = -\frac{\beta_k{}^*}{\alpha^*})| < \xi$ where ξ is a small positive number. If consumer WTP for attribute x_{ijk} is not independent with other product attributes, then $|WTP^k - WTP^{k^*}| > \xi$.

Model Estimation

In this study the random parameters logit model or mixed logit model is used to estimate WTP. This model is highly flexible to allow us to simulate any random utility model and it eliminates limitations of standard logit models such as homogeneous taste among individuals and restricted substitution patterns between alternatives. In addition, unlike a probit model, the random parameters logit model does not require a normal distribution of the random component in the utility function, which may result in difficulty in model estimation when the number of alternatives in a model is larger than four (Train 2005; Greene 2002).

In a random parameters logit model, coefficients in an individual random utility function are decomposed into random and nonrandom parameters. For an attribute that consumers are assumed to have homogeneous preferences, a nonrandom parameter is assigned. For an attribute that there is believed to be unobserved heterogeneity among individuals, a random parameter can be assigned. Particularly, consumer random utility functions can be rewritten as:

$$U_{ij} = \alpha \cdot p_{ij} + \varphi_{j}^{'} \cdot f_{ij} + \beta_{ij}^{'} \cdot x_{ij} + \varepsilon_{ij} = V_{ij} + \varepsilon_{ij} \qquad (5),$$

where α is the nonrandom parameter associated with product price; φ_j is a vector of nonrandom parameters associated with alternative attributes f_{ij}, for which consumers have homogeneous preference; β_{ij} is a vector of random parameters associated with alternative attributes x_{ij}, for which consumers have heterogeneous preferences. Like traditional multinomial logit model, the stochastic component ε_{ij} is assumed to be identical independent distributed (IID) with a Gumbel distribution which has probability density function (PDF), $f(\varepsilon_{ij}) = \mathrm{e}^{-\varepsilon_{ij}} \cdot \exp(-e^{-\varepsilon_{ij}})$.

In a condition where multiple alternatives exist, the probability consumer i chooses one alternative, such as j is the probability that alternative j can maximize his/her utility level. This implies, $P_{ij}(Y_i = j) = Prob(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik} \forall k \neq j) = Prob(\varepsilon_{ik} < \varepsilon_{ij} + V_{ij} - V_{ik} \forall k \neq j)$. As shown in Train (2005), and Louviere, Hensher and Swait (2004), the probability has a closed form:

$$P_{ij} = \frac{e^{\mu V_{ij}}}{\sum_{k=1}^{N} e^{\mu V_{ik}}} \qquad (6),$$

where μ is the scalar parameter that accounts for the variance of the random component of consumer random utility. Normally, μ could be set to 1. However, if two models estimated using different data sources such as different groups of people are compared μ should be estimated and accounted for in comparisons (Train 2005; Swait and Louviere 1993).

Heterogeneous preference among individuals and correlation across alternatives are introduced through the random parameters in the utility function. In equation (5), assuming alternative j has m number of attributes with random parameter β_{jk}, and consumer utility has a random or nonrandom constant α_j, then β_{ij} can be specified as $\beta_j + \Gamma v_{ij} = \beta_j + \eta_{ij}$ (Hensher, Rose and Greene 2005). Where $\beta_j = \left[\alpha_j \ \ \beta_{j1} ... \beta_{jk} ... \beta_{jm}\right]'$, accounts for the mean valuation of attribute across individuals, Γ is a lower triangular matrix, and v_{ij} is the random term with mean vector zero and covariance matrix I. The random term Γv_{ij}, or η_i captures the variations in preference across consumers or the correlations over alternatives (attributes). The full covariance matrix of random parameters β_{ij} is $\Sigma = \text{var}(\beta_j + \Gamma v_{ij}) = \Gamma \, \text{var}(v_{ij}) \Gamma' = \Gamma\Gamma'$. As a result, the specification of Γ will allow us to have different assumptions of the random parameters, thus the underlying assumption about variation in consumer preferences. For example, if $\Gamma = 0$, then the random parameters become nonrandom parameters and the model transforms to the traditional multinomial logit mode. If Γ is a full lower triangular matrix, then Σ is a full symmetric matrix with nonzero off diagonal elements. In this case, all the nonrandom parameters in the consumer utility function are correlated, and both the heterogeneous preferences across consumers and correlation across attributes (alternatives) can be introduced in the model (Greene 2002; Train 2005).

Because the assumption of the IID Gumbel distribution of the random ε_{ij} in the utility function does not change, the probability that consumer i chooses alternative j is the same as that in equation (6). However, as a random term v_{ij} is introduced in the random parameter model, the probability is conditional on v_{ij}. So, equation (6) can be rewritten as

$$P_{ij} \mid v_{ij} = \frac{e^{\mu V_{ij}}}{\sum_{k=1}^{N} e^{\mu V_{ik}}} \qquad (7),$$

where $V_{ij} = \alpha \cdot p_{ij} + \varphi_{j}^{'} \cdot f_{ij} + \beta_{ij}^{'} \cdot x_{ij} + \delta^{'} \cdot z_{i}$, and $\beta_{ij} = \beta_{j} + \Gamma v_{ij}$. The unconditional probability is the integral of v_{ij} out of the conditional probability:

$$P_{ij} = \int_{-\infty}^{+\infty} \frac{e^{\mu V_{ij}}}{\sum_{k=1}^{N} e^{\mu V_{ik}}} f(v_{ij}) dv_{ij} \qquad (8).$$

The random term v_{ij} can take on different distributions such as normal, lognormal, uniform or triangular, and thus different types of random parameter logit models can be defined. However, (8) is a multiple integral over v_{ij}, which does not have a closed form. In practice, it is approximated by R repeated random draws from the underlying distribution of v_{ij}, and takes the average, such that:

$$\tilde{P}_{ij} = \frac{1}{R} \sum_{1}^{R} \frac{e^{\mu V_{ij}}}{\sum_{k=1}^{N} e^{\mu V_{ik}}} \qquad (9).$$

With L observations, the simulated log likelihood function is

$$LogL_s = \sum_{1}^{L} \frac{1}{R} \sum_{1}^{R} \frac{e^{\mu V_{ij}}}{\sum_{k=1}^{N} e^{\mu V_{ik}}} \qquad (10),$$

which can be maximized to estimate the parameters in consumer random utility functions.

A generalization of the random parameters model is to allow panels in the error term of the random parameters, such that $\beta_{ijt} = \beta_j + \Gamma(v_{ijt} + \mu_{ij})$, where β_j is a vector of average coefficients of beef attributes, v_{ijt} is the random error with independent and identical normal distribution across individual *i*, alternative *j* and choice set *t*, and μ_{ij} is the random error normally distributed over individual *i* and alternative *j*, but not choice sets. This is particularly useful in the case where one consumer makes a sequence of choices, or the observations of one consumer are recorded in multiple years.

Experimental Methods

Choice experiments (CE) are used in this study, because this method is consistent with random utility theory and Lancaster's theory (1972) of utility maximization. Most importantly, it is easier to add additional quality attributes in a CE than that in CV and EA approaches. Two sets of attributes of beef steak (beef strip lion steak, also known as KC strip) were used to compose alternative choice sets. The first set of attributes included price per 12-ounce steak, "Certified U.S. Product" (COOL), "Guaranteed Tender" (Tenderness), "Guaranteed Lean" (Lean), and "Days before Sell-by Date" (Freshness). This set of attributes were used to test the effects of additional attribute information on consumer willingness to pay in the case when a cue attribute ("Certified U.S. Product") is present. The second set of attributes included price, "Guaranteed Tender", "Guaranteed Lean", "Days before Sell-by Date", and "Enhanced Omega-3 Fatty

Acids". This set of attributes was used to test the impact of additional information on consumer willingness to pay in the case where no cue attribute is present.

Four different steak prices were used in the choice experiments. The base price was $6.93/lb, which roughly matched market prices of beef strip steaks (USDA-ERS). Two higher prices were obtained by increasing the base price by 33% and 66% increments and a lower price was set by decreasing the base price by 33%. All other attributes were selected to have two different levels. The attributes and their levels are "Certified U.S. Product" vs. no origin label, "Guaranteed Tender" vs. not guaranteed, etc. The levels of "Days before Sell-by Date" used were "2 days" and "8 days". The reason for keeping the alternative attributes to only two different levels was to reduce the size of the choice experiments, thus to minimize respondent fatigue when presented with too many choices in a short time frame.

To test the impact of additional attribute information on consumer WTP, we constructed a sequence of choice experiments with the number of beef attributes presented to the respondent being 3, 4 and 5. This methodology was applied to both sets of attributes (with and without a cue attribute). Thus, we had a total of six choice experiments. For convenience, we call those choice experiments constructed with both sets of beef attributes C1, C2, C3 (those with the cue attribute) and W1, W2, W3 (without the cue attribute). The number 1, 2 or 3 indicates the number of attributes in the choice experiments (3, 4 and 5 respectively).

Because complexity associated with a larger number of choice sets in the choice experiment can adversely affect respondent decisions (Hensher 2004; Hanley, Wright and Koop 2002), we tried to minimize the impact of the number of choice sets by designing all three experiments with same number of choice sets. In the first step, orthogonal fractional factorial design was used to generate 3 sets of unlabeled alternatives with the number of attributes being 3, 4 and 5, each set consisted of 8 original alternatives. The first attribute of the alternatives had 4 levels, corresponding to the four prices of the beef steaks. The other attributes of alternatives had 2 levels, corresponding to other attributes of the beef steaks. The designs of all the 3 sets of alternatives had a D-efficiency of 100%. In the second step, the 8 original alternatives in each set were randomly ordered to create 8 pairs of alternatives (choice sets) altogether with the original alternatives. Because in logit models, only the differences in attributes levels matter, (Louviere, Hensher and Swait 2004), the random-ordered alternatives have the maximum difference with the original alternatives. The last step was to label the numerical attribute levels with corresponding attribute levels in beef steaks. A "none" alternative to each choice set was also provided to make the choice task more realistic as respondents might choose this option when shopping (Lusk and Schroeder 2004). Overall, there were 8 choice sets in each choice experiment, and each choice set included three alternatives "Option I", "Option II" or, "Neither I nor II" (None option).

To investigate the effects of additional quality attributes on consumer WTP for an attribute, two approaches: Between-subject comparison and within-subject comparison could be used. Both approaches have their advantages and disadvantages (Lusk and Schroeder 2004; Carlsson and Martinsson 2001). We do both between-subject and within-subject comparisons. This enables us to draw more robust conclusions on the impacts of additional attribute information on consumer WTP estimation.

Two of the three choice experiments (C1, C2 and C3 or W1, W2 and W3) were selected to include in one survey to construct a series of surveys. The first survey A1 (B1) included choice experiments C1 (W1), and C2 (W2), the second survey A2 (B2) included C2 (W2) and C3 (W3). To make the comparisons between results easier, the first choice experiment in the first survey is referred to as A11 (B11), the second choice experiment in the first survey is A12 (B12), the first choice experiment in the second survey is A21 (B21), and the second choice experiment in the second survey is referred to as A22 (B22). All together, we had four surveys and each survey comprised two choice experiments. The letter A indicates whether the choice experiment included the cue attribute (B if not), the first subscript indicates if the survey was the first or the second survey, and the second subscript indicates if the choice experiment in the survey is the first or second. To reduce respondent fatigue questions regarding respondent demographic characteristics were placed in between the two choice experiments in the survey.

Data and Results

In November, 2006, e-Rewards, Inc. an online-survey company, sent out surveys to 2200 Chicago residents, each of the four surveys went to 550 online panel members. We were charged for each response therefore, budget constraints necessitated discontinuing the survey when we achieved at total of 310 respondents. This resulted in 74 completes of experiment A1, 76 of A2, 78 of B1, and 82 of B2. In December, 2006, the surveys were also distributed via email to 3932 faculty members, staff, and graduate students at Kansas State University (K-State), Manhattan, Kansas. Each of the four surveys was sent to 983 people using the online survey system surveymonkey.com. This resulted in 211 completes of A1, 187 of A2, 198 of B1, and 171 of B2. Using two distinct locations and populations for the survey helps us to determine whether results are sensitive to location. Table 1 reports summary statistics of demographics for the eight surveys completed at Chicago and K-State.

For the Chicago sample, ANOVA (Analysis of Variance) indicated respondents of survey A2 had a higher education level and fewer children than those who completed survey A1 (0.05 significance level). Respondents to survey B2 had a lower education level than those of survey B1. The null hypothesis of equality of means of all other demographics between respondents to surveys A1 and A2, and B1 and B2 could not be rejected at the 0.05 significance level. For the

K-State sample, ANOVA revealed no statistically significant differences in the means of all demographics between respondents who completed the four surveys. Compared to the K-State sample, the Chicago sample had older respondents, more females, lower levels of education, less single people, more adults and fewer children at home, and higher income level.

For the Chicago and K-State samples, eight random parameter logit models were estimated for the choice experiments in the surveys at each location, resulting in 16 total models. In the estimation, the coefficient on product price was estimated as a nonrandom parameter. This was because the normal distribution has density on both sides of zero, assuming a normal distribution of the price coefficients would imply that some people would have positive price coefficients, which would not be consistent with the negative price-demand relationship. In addition, not allowing the price coefficient to vary randomly also assured that WTP estimated for a particular beef attribute was normally distributed (Tonsor et. al. 2005; Lusk, Roosen and Fox 2003). The coefficients of other beef steak attributes were defined as random parameters with a normal distribution to allow heterogeneous preferences for those attributes across consumers. Because each respondent made sequences of choice decisions with several (eight in our case) choice sets, individual preferences were perfectly correlated across the choice sets for a given respondent. It was appropriate to use a panel data model to allow the correlation among individual preferences in a sequence of choice decisions.

Our study uses unlabeled choice experiments in that there is no particular beef attributes attached to all “Option I” or “Option II”. Each of these two alternatives is a combination of a set of beef attributes. The main benefits of using unlabeled alternatives are that they do not require identification and use of all alternatives within the possible set of alternatives and the IID assumption of the random component in consumer utility function is more likely to be met in an unlabeled choice experiment than in a labeled one (Hensher, Rose and Greene (2005)). Because in an unlabeled choice experiment each alternative does not contain a particular attribute, the alternative specified constant in the consumer utility function does not have any meaningful interpretation. We only include one alternative specified constant for the "None "option in the consumer utility function. The constant can measure the difference in consumer utility level when the "None" option is selected in comparison with the other two alternatives.

The first four rows in Tables 2 and 3 report estimates of means of random parameters in the models with (Table 2) and without (Table 3) the cue attribute, country of origin, included. Row 5 reports estimates of the non random parameter of price and row 6 is the constant for the "None" option. The next 10 rows contain estimates of the diagonal value and off diagonal values in Cholesky matrix Γ, which gives the full covariance matrix of random parameter β_{ij} by $\Sigma = \Gamma\Gamma'$. The last four rows are the standard deviation of random parameter distributions, which are the square roots of diagonal values in Σ. The diagonal values of Σ measure the variations of preferences for beef attributes across respondents. The off diagonal values of Σ measure the correlations between the random parameters, indicating the correlations between consumer preferences for one beef attribute and the other one. For instance, if the covariance between the random parameters of "Certified U.S. Product" and "Guaranteed Tender" is negative, then consumers' choices of the alternative with "Certified U.S. Product" are negatively affected by the presence of the alternative attribute "Guaranteed Tender". However, if the covariance is positive, then the appearance of "Guaranteed Tender" in the product increases consumer marginal utility (random parameter) of "Certified U.S. Product", thus positively affecting consumer choice of the alterative with those two attributes.

For all choice experiments in surveys A1 and A2 (Table 2), the coefficients of all beef steak attributes were different from zero at the 0.05 significance level, except for the coefficients on "Guaranteed Lean" in choice experiments A21 and A22, and the coefficients of "Days before

Sell-by Date" in choice experiment A22. All the price coefficients were negative, indicating a downward sloping price-demand relationship. All coefficients of other beef attributes were positive indicating an increasing probability of consumers choosing alternatives with the appearance of other beef quality attributes. With both samples, significant heterogeneous preferences for beef steak attributes existed across respondents who completed the corresponding choice experiment. Only respondents in choice experiment A22 at Chicago showed homogeneous preferences for "Guaranteed Lean" and "Days before Sell-by Date".

For four choice experiments in surveys B1 and B2 excluding the cue attribute (Table 3), with both Chicago and K-State samples, the coefficients of "Guaranteed Tender" and "Guaranteed Lean" were statistically significantly different from zero (0.05 level), and coefficients of "Days before Sell-by Date" and "Enhance Omega-3 Fatty Acids" were not significant. Most of the signs of coefficients were as expected, except for the negative sign of "Days before Sell-by Date" in choice experiment B12 with Chicago sample and in choice experiments B21 and B22 with the K-State sample. However, those coefficients were not statistically significant. K-State respondents had statistically significant heterogeneous preferences for all beef steak attributes. However, Chicago respondents to choice experiment B21 did not have significant heterogeneous preferences for "Days before Sell-by Date". Consumer preference for "Guaranteed Tender", "Days before Sell-by Date", and ""Enhanced Omega-3 Fatty Acids" were not significantly heterogeneous in choice experiment B22.

Because the estimates in the random parameters logit models were confounded with the variance of the random term in the consumer random utility function and the variance could not be separated from the parameter estimates, direct comparison of the estimates of parameters across choice experiments did not enable us to compare the "true" preference parameters. The relative scale of the variance of the random term in the models must be isolated before we could compare true preference parameters (Swait and Louviere 1993). However, the models being compared had different numbers of independent variables (three vs. four and four vs. five) so it was difficult to find a perfect solution to pool the data from different experiments or to estimate pooled models. As a result, we did not test the equality of coefficients across models.

Comparisons of WTP across different choice experiments provide a way to investigate changes in consumer preferences. This is because WTP estimates are the ratio of parameters of product attributes and price which does not confound with the variance of the random term in the random utility function. In addition, this ratio accounts for both changes in price and attribute coefficients when different numbers of attributes are presented in the choice experiments.

The Krinsky-Robb (1986) bootstrap method was used to generate 1000 values of coefficients of each beef attribute with the estimated means and variances. With those values, 1000 WTP could be simulated for each attribute of the beef steaks in every choice experiment. Because the coefficients of beef attributes were assumed to be normally distributed and the coefficient of price was a nonrandom parameter, the ratios of attribute and price coefficients were normally distributed. As a result, the means of WTP from different choice experiments could be compared using standard t-tests. The total WTP for an alternative was also calculated as the sum of the WTP for every individual attribute in a choice experiment. The total WTP measures the amount of dollars a consumer would be willing to pay for a beef steak which had all the attributes presented in the choice experiment.

The means of simulated WTP for each individual attribute, total WTP in each choice experiment as well as the percentage of WTP for each individual attribute relative to the total WTP in each choice experiment are reported in Tables 4 (including the cue attribute) and 5 (excluding the cue attribute). The percentage WTP's highlight the relative importance of individual attributes. Because of variation in WTP estimates, some mean WTP estimates for individual attributes with WTP values near zero were negative when calculated with simulated data.

Most of the WTP estimates were statistically different from zero (0.05 level), except the WTP for "Days before Sell-by Date" in choice experiments A22, B11 and B12 with the K-State sample and the WTP for "Days before Sell-by Date" in choice experiment B21 with the Chicago sample. Most of the WTP were greater than zero, which implies that the consumer would pay a premium for a product possessing those attributes. A comparison of WTP across different beef attributes showed that consumers had highest WTP for "Certified U.S Product", followed by "Guaranteed Tender", "Guaranteed Lean" and "Enhanced Omega-3 Fatty Acids". Consumer WTP for "Days before Sell-by Date" was the smallest, and surprisingly, it was negative and statistically significant in choice experiment B22 with the K-State sample, and in choice experiment B12 with the Chicago sample. One possible explanation is that the difference in the levels ("2 days before sell-by date" and "8 days before sell-by date") of "Days before Sell-by Date" were not considered substantial to respondents, such that respondents ignored this attribute when they made choice decisions. Consumer preferences for beef steak with more "Days before Sell-by Date" depended on the presence of other attributes that consumers were more concerned about. Compared to the WTP from the K-State sample, Chicago consumers tended to have greater WTP premiums for all beef steak attributes presented. For instance, in all choice experiments in survey A1 and A2 (Table 4), Chicago consumer WTP for all beef attributes were two to three times (or more) greater than those of K-State consumers. The Chicago sample had higher income, older respondents, more females, lower levels of education, less single people, more adults, and fewer children at home than the K-State sample. Perhaps some of these demographic differences contributed to the differences in WTP. Our finding of higher WTP with Chicago respondents relative to those in the center of the country are consistent with

Umberger et al. (2003), who found that consumers in Chicago were willing to pay a premium of 23% for U.S. labeled steak compared to a 14% premium by Denver consumers.

Both with-subject and between-subject comparisons of WTP and proportion of WTP were conducted. Within-subject comparisons were across choice experiments A11 and A12 (B11 and B12) as well as A21 and A22 (B21 and B22). Between-subject comparisons of WTP were across choice experiments A11 and A21 (B11 and B21) as well as A12 and A22 (B12 and B22). A t-test with simulated total WTP and the WTP for each individual attribute was used in both within and between subject compassions. The proportions of WTP for each individual attribute in the total WTP were compared by the absolute values of the proportions.

Analysis of results in Table 4 and Table 5 showed that in most cases, the additional attributes presented in the choice experiment affected consumer WTP for individual attributes and total WTP. Among the total 56 comparisons, in only eight cases were the impacts of additional attributes not statistically significant. Consumer WTP for most beef attributes changed in an economically important way after more attributes were added to choice experiments. However, the changes in both the WTP and the proportions of WTP did not monotonically change with the number of attributes in the choice experiment. Changes in WTP for a certain beef attribute depend on its relationship with the newly added beef attributes to the choice experiment and the presence of other attributes.

With both the Chicago and K-State samples, within and between Subject comparisons showed that consumer WTP for “Certified U.S. Product” decreased when number of attributes changed from 3 to 4 (when “Guaranteed Lean” was added to the choice experiments). While the WTP increased when the number of attributes changed from 4 to 5 (“Days before Sell-by Date” was added to choice experiments making). Both changes are statistically significant for the Chicago and K-State samples. Changes in importance of “Certified U.S. Product” have the same pattern — the proportion of this attributes decreased and then increased after the number of beef attributes changed from 3 to 4 and then 5.

With-subject comparisons with Chicago and K-State samples showed that the impacts of number of attributes on consumer WTP for “Guaranteed Tender” were different from those impacts on “Certified U.S. Product”. Consumer WTP for “Guaranteed Tender” increased with the number of attributes increasing. However, changes in the proportion of WTP for “Guaranteed Tender” were different from those changes in WTP — increasing and then decreasing with the number of attributes changing from 3 to 4 and 4 to 5. This indicates that although consumer WTP for a certain attribute increased/decreased with the change in the number of attributes, it did not necessarily imply that the importance of this attribute changed in the same direction. Between-subject comparisons of WTP from Chicago and K-State samples were not consistent. With the K-State sample, consumer WTP for “Guaranteed Tender” continued to decrease as the number of attributes present increased. In contrast, with the Chicago sample, the between and within subject comparisons gave same conclusions.

The difference between within and between subject comparisons with K-State sample may due to the substantial lower total WTP in choice experiment A21. On interesting result was that although the changes in consumer WTP from Chicago and K-State samples were not same, they were the same with regard to the changed in the proportion of WTP, which was same as within subject comparisons.

After “Days before Sell-by Date” was added to the choice experiments, both with and between subject comparisons showed that consumer WTP for “Guaranteed Lean” increased with the Chicago sample and decreased with K-State sample. However, the changes in the proportion of WTP for this attribute were the same for both samples—the proportions decreased as a result of larger increase in total WTP with Chicago sample and larger decrease in individual WTP from A12 to A21 or larger increase in total WTP from A12 to A22 with K-State sample.

For the choice experiment in survey B1 and B2, within subject comparisons with both samples showed that the changes in consumer WTP for “Guaranteed Tender” had the same pattern as those in WTP for “Certified U.S. Product”—the WTP decreased and then increased as the number of attributes increased from 3 to 4 and 4 to 5. Between-subject comparisons with K-State sample drew different conclusions that consumer WTP for “Guaranteed Tender” continued to decrease with the number of attributes increasing. However, the changes in the proportion of WTP for this attributes was the same across with and between subject comparison and Chicago and K-State samples. That is, the proportions kept decreasing with the number of attributes of beef steak increasing, which indicated that “Guaranteed Tender” played less and less important role in consumer decision making when the respondents had more attributes information.

The changes in consumer perceptions of “Guaranteed Lean” varied between Chicago and K-State samples. With the Chicago sample, both within and between subject comparisons showed that consumer WTP for lean decreased and then increased with the number of attributes increasing. And the changes in the proportion of WTP for this attributes were opposite with the change in WTP-- they increased and then decreased with the number of attributes increasing. However, with K-State sample, both consumer WTP for “Guaranteed Lean” and the proportions of WTP for “Guaranteed Lean” kept increasing with the number of beef steak attributes increasing.

Conclusions and discussion

As consumer concern about food quality increases, progressively more studies on consumer perceptions and WTP for food attributes are being conducted to provide information to policy makers, producers, and processors. However, most studies assume consumer WTP for one quality attribute is independent of other attributes and provide limited attribute information on food products in consumer surveys and experiments. If WTP is conditional on the number of food attributes provided to the respondent, information garnered from WTP studies may be inaccurate reflections of real world behavior when consumers make actual purchase decisions. In actual purchase decisions consumers have a variety of sources and types of information regarding food quality attributes rather than the limited information researchers provide to them in surveys.

Our study investigated the impact of additional quality attributes information on consumer choice decisions by measuring changes in consumer WTP for attributes when more attribute information was provided to consumers. Choice experiments were conducted with samples from Chicago and K-State. Both within-subject and between-subject comparisons were used to explore the effects of addition quality attributes being present in a choice experiment. By providing additional information on food attributes, consumer WTP and preferences significantly changed. However, changes in consumer preference for an attribute were results of impacts of various factors, including the number of attributes in the choice experiment and the relationships between attributes.

One general conclusion was that when information on additional food attributes were provided, consumer WTP for the most economically important attributes ("Certified U.S Product" in surveys A1 and A2, and "Guaranteed Tender" in surveys B1 and B2) in the choice experiment were most largely affected. Furthermore, when the number of attributes in a choice experiment was small, the impacts of an additional attribute tended to be larger.

The impacts of an additional attribute on consumer WTP for an attribute could be classified into two sources: the impact on the total WTP and the impact on the economic importance of the individual attribute. Additional attributes might increase or decrease total WTP in a choice experiment, and they might also increase or decrease economic importance of an attribute in a choice experiment. As a result, the change in the WTP for an individual attribute is a result of the two effects.

Consumer WTP for a cue attribute such as "Certified U.S Product" tends to be affected more than an independent attribute such as "Guaranteed Tender" by introduction of additional attributes. However, consumer WTP for the cue attribute "Certified U.S. Product" was always the most economically important attribute even when additional attribute information was provided. This implies that: (a) "Certified U.S Product" was the most important attribute of those used in our study that consumer were concerned with; (b) there were other important attributes of beef steaks which were ignored by our study; and/or (c) the signal of overall product quality provided by this attribute could not be replaced by simply providing a number of individual product attributes.

Another important result is that, no matter how consumer WTP changed with additional attributes provided to respondents, the relative rank of those beef steak attributes never changed. "Certified U.S. Product" was always the most important attribute, followed by "Guaranteed Tender", "Guaranteed Lean", "Enhanced Omega-3 Fatty Acids" and "Days before Sell-by Date". This conclusion is especially useful to food companies who intend to launch new product lines by adding more attributes to existing products. That is, even though consumer WTP for individual attributes may be affected by other information not provided to consumers in a research study, the rank of the attributes is not affected by additional information. Thus, the most important attribute should be considered first in the new product, relative to the cost of course of providing this attribute.

The impacts of dimensionality of choice experiments on consumer WTP have been investigated by Hensher (2006a, 2006b) under the context of a transportation study. We drew the same conclusion with Hensher that the number of attributes in choice experiment design affects consumer WTP. The contribution of our study is that we focus more on the context of the attributes in the beef steaks rather than simply studying the dimensionality of choice experiment design. The impacts of an additional attribute are incurred by the information provided by the additional attribute rather than the increased dimension of the choice experiment. From this point, the effects of an additional attribute should not be restricted to the method of choice experiment; it should also apply to other WTP elicitation methods such as contingent valuation and experimental auction. In both cases, the problem of limited information provision exists.

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Table 1. Means and Standard Deviations of Respondent Demographics by Location and Survey

	Location							
	Chicago				K-State			
Variable	A1	A2	B1	B2	A1	A2	B1	B2
Age [c]	43.30[a]	45.46	44.33	46.98	41.30	40.65	40.28	39.75
	(12.10)[b]	(11.91)	(12.30)	(10.62)	(13.62)	(13.27)	(13.06)	(12.51)
Income [d]	6.57	6.30	6.35	5.96	5.20	5.20	5.25	5.19
	(2.35)	(2.12)	(2.36)	(2.27)	(2.50)	(2.44)	(2.48)	(2.53)
# of Adults[e]	2.01	2.00	1.94	1.99	1.91	1.87	1.88	1.84
	(0.81)	(0.79)	(0.72)	(0.92)	(0.78)	(0.80)	(0.76)	(0.81)
# of Children [f]	0.62	0.30	0.47	0.45	0.52	0.62	0.59	0.56
	(1.01)	(0.69)	(0.83)	(0.77)	(0.91)	(0.99)	(0.96)	(0.97)
Gender								
Male	32[g]	27	46	26	132	100	114	90
Female	42	49	32	56	79	87	84	81
Education [h]								
1	6	0	0	0	0	0	0	0
2	15	4	1	5	12	13	15	10
3	28	22	19	28	0	1	0	0
4	25	25	32	28	30	27	30	25
5	0	25	26	21	169	146	153	136
Marriage								
Single	19	21	19	20	59	52	56	60
Married	46	43	49	47	141	130	138	99
Other	9	12	10	15	11	5	4	12
Employment								
Full Time	50	59	54	59	142	123	142	116
Part Time	9	3	13	10	16	9	10	13
Unemployed	7	1	2	6	0	0	0	1
Student	3	0	2	1	47	52	46	37
Retired	5	3	7	6	6	3	0	4
# of respondents	74	76	78	82	211	187	198	171

[a] Reported statistics of Age, Income, # of Adults and # of Children are mean values.
[b] The numbers in parenthesis are standard deviations.
[c] Age: Age in years
[d] Income: Household annual income level.
1=Under 10,000; 2=10,000 to 24,999…
13=300,000 to 399,999; 14=400,000 and more
[e] # of Adults: Number of adults living in home
[f] # of Children: Number of children living in home
[g] Reported statistics of Gender, Education, Marriage, and Employment are frequency of the variable levels among respondents.
[h] Education: 1=1st through 8th grade; 2=Some high School or high school graduate;
3=Some college/2 year associate degree;
4=Four year college degree; 5=Master or Ph.D. degree

Table 2. Random Parameters Logit Model Result for Surveys A1 and A2, Including the Cue Attribute "Country of Origin"

	Location							
	Chicago				K-State			
Choice Experiment	A11	A12	A21	A22	A11	A12	A21	A22
Independent Variable	Coefficient							
Certified U.S. Product	3.11	1.98	2.20	2.58	2.06	1.59	1.39	1.48
	(0.00)[a]	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Guaranteed Tender	1.57	1.36	1.65	1.65	0.79	1.03	0.63	0.65
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Guaranteed Lean		0.85	1.09	0.87		0.65	0.34	0.15
		(0.01)	(0.01)	(0.00)		(0.00)	(0.12)	(0.33)
Days before Sell-by Date				0.138				0.01
				(0.003)				(0.78)
Price	-0.34	-0.32	-0.41	-0.30	-0.44	-0.52	-0.57	-0.39
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant for the None Option	0.19	0.34	-0.32	1.76	-2.26	-2.66	-3.63	-1.93
	(0.56)	(0.23)	(0.23)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	Diagonal values in Cholesky matrix, L							
Ns Guaranteed U.S. Product	1.51	1.29	1.47	1.79	1.83	1.52	1.43	1.45
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Ns Guaranteed Tender	1.46	1.11	1.36	0.02	1.35	1.41	1.41	0.97
	(0.00)	(0.00)	(0.00)	(0.75)	(0.00)	(0.00)	(0.00)	(0.00)
Ns Guaranteed Lean		1.44	1.44	0.44		1.76	1.36	0.59
		(0.00)	(0.00)	(0.30)		(0.00)	(0.00)	(0.02)
Ns Days before Sell-by Date				0.02				0.16
				(0.95)				(0.00)
	Below diagonal values in L matrix. V = L*Lt							
Tender : U.S. Product	-0.22	0.32	0.54	0.27	0.78	0.06	-0.07	-0.07
	(0.53)	(0.41)	(0.16)	(0.40)	(0.00)	(0.76)	(0.73)	(0.73)
Lean : U.S. Product		0.11	0.62	0.04		0.49	0.57	0.38
		(0.80)	(0.14)	(0.91)		(0.04)	(0.01)	(0.06)
Lean : Tender		0.33	0.23	-0.08		0.61	0.67	0.32
		(0.47)	(0.53)	(0.85)		(0.00)	(0.00)	(0.20)
Sell-by : U.S. Product				0.10				0.01
				(0.09)				(0.88)
Sell-by : Tender				-0.10				0.12
				(0.06)				(0.00)
Sell-by : Lean				-0.01				-0.00
				(0.90)				(0.94)
	Standard deviations of parameter distributions							
Std Guaranteed U.S. Product	1.51	1.29	1.47	1.79	1.83	1.52	1.43	1.45
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Std Guaranteed Tender	1.48	1.16	1.46	0.27	1.56	1.41	1.41	0.97
	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
Std Guaranteed Lean		1.48	1.58	0.45		1.93	1.62	0.77
		(0.00)	(0.01)	(0.35)		(0.00)	(0.00)	(0.01)
Std Days before Sell-by Date				0.14				0.20
				(0.10)				(0.00)
Log Likelihood	-438.8	-467.8	-458.0	-499.1	-1423.9	-1367.5	-1247.4	-1347.7
# of Obs	74	74	76	76	211	211	187	187

[a] The number in parenthesis are p-values.

Table 3, Random Parameters Logit Model Results for Surveys B1 and B2, Excluding the Cue Attribute "Country of Origin"

	Location							
	Chicago				K-State			
Choice Experiment	B11	B12	B21	B22	B11	B12	B21	B22
Independent Variable	Coefficient							
Guaranteed Tender	2.17	2.35	1.79	1.78	1.65	1.74	1.25	1.07
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Guaranteed Lean	0.98	1.21	1.09	1.07	0.46	0.55	0.79	0.76
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Days before Sell-by Date		-0.03	0.01	0.01		0.00	-0.06	-0.06
		(0.71)	(0.90)	(0.80)		(0.93)	(0.11)	(0.05)
Enhanced Omega-3 Fatty				0.29				0.06
				(0.22)				(0.74)
Price	-0.46	-0.57	-0.46	-0.32	-0.48	-0.59	-0.59	-0.49
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant for the None Option	-1.83	-2.44	-2.53	-0.86	-2.44	-3.05	-4.55	-3.64
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	Diagonal values in Cholesky matrix, L							
Ns Guaranteed Tender	1.63	1.07	1.04	1.06	1.64	1.11	1.11	1.37
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Ns Guaranteed Lean	1.27	0.84	0.78	0.18	1.29	1.27	1.23	1.20
	(0.00)	(0.00)	(0.00)	(0.66)	(0.00)	(0.00)	(0.00)	(0.00)
Ns Days before Sell-by Date		0.23	0.08	0.05		0.18	0.22	0.11
		(0.00)	(0.43)	(0.79)		(0.00)	(0.00)	(0.02)
Ns Enhanced Omega-3 Fatty				0.27				0.44
				(0.78)				(0.02)
	Below diagonal values in L matrix. V = L*Lt							
Lean : Tender	0.70	-0.13	-0.09	0.17	-0.57	-0.32	-0.01	-0.05
	(0.00)	(0.65)	(0.82)	(0.53)	(0.00)	(0.13)	(0.96)	(0.84)
Sell-by : Tender		0.14	0.13	0.10		-0.06	0.09	0.09
		(0.08)	(0.01)	(0.05)		(0.12)	(0.04)	(0.01)
Sell-by : Lean		-0.11	0.09	0.08		0.09	0.03	0.01
		(0.18)	(0.18)	(0.56)		(0.00)	(0.39)	(0.87)
Omega-3 : Tender				0.02				0.34
				(0.97)				(0.11)
Omega-3 : Lean				0.54				0.48
				(0.58)				(0.01)
Omega-3 : Sell-by				-0.61				-0.06
				(0.47)				(0.84)
	Standard deviations of parameter distributions							
Std Guaranteed Tender	1.63	1.07	1.04	1.06	1.64	1.11	1.11	1.37
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Std Guaranteed Lean	1.45	0.85	0.79	0.24	1.41	1.31	1.23	1.20
	(0.00)	(0.00)	(0.00)	(0.47)	(0.00)	(0.00)	(0.00)	(0.00)
Std Days before Sell-by Date		0.29	0.18	0.14		0.21	0.24	0.14
		(0.00)	(0.07)	(0.30)		(0.00)	(0.00)	(0.01)
Std Enhanced Omega-3 Fatty				0.86				0.74
				(0.47)				(0.00)
Log Likelihood	-506.8	-446.0	-538.0	-592.6	-1327.8	-1245.9	-1111.4	-1185.3
# of Obs	78	78	82	82	198	198	171	171

[a] The number in parenthesis are p-values.

Table 4 WTP Estimates in Survey A1 and A2, Including the Cue Attribute "Country of Origin"

	Location							
	Chicago				K-State			
WTP for…[a]	A11[c]	A12	A21	A22	A11	A12	A21	A22
Certified U.S. Product	9.09* (67.4%)[e]	6.31* (47.9%)	5.26* (44.6%)	9.14* (50.6%)	4.61* (73.5%)	3.03* (49.9%)	2.33* (60.4%)	3.89* (67.3%)
Guaranteed Tender	4.40* (32.6%)	4.40* (33.4%)	3.97* (33.7%)	5.44* (30.1%)	1.67* (26.5%)	1.90* (31.3%)	1.09* (28.2%)	1.48* (25.6%)
Guaranteed Lean		2.47* (18.8%)	2.55* (21.7%)	2.98* (16.5%)		1.14* (18.8%)	0.44* (11.4%)	0.40* (6.9%)
Days before Sell-by Date				0.51* (2.8%)				0.01 (0.2%)
Total WTP [b]	13.49*	13.18*	11.78*	18.07*	6.28*	6.07*	3.85*	5.78*

[a] WTP values are derived from models in Table 2. WTP values are for 12 oz beef steaks.
[b] Total WTP are the sum of WTP for all individual attribute in each choice experiment.
[c] Report statistics are mean of 1000 simulated WTP estimations.
[*] Values with star are significant different from zero at 5% significance level or lower.
[e] Values in parenthesis are the proportion of WTP for individual attributes in total WTP

Table 5 WTP Estimates in Survey B1 and B2, Excluding the Cue Attribute "Country of Origin"

	Location							
	Chicago				K-State			
WTP for…[a]	B11[c]	B12	B21	B22	B11	B12	B21	B22
	4.61*	4.06*	3.89*	5.86*	3.38*	2.89*	2.06*	2.07*
Guaranteed Tender	68.4%	66.3%	61.6%	56.8%	78.2%	73.9%	62.3%	55.5%
	2.13*	2.10*	2.41*	3.42*	0.94*	1.02*	1.35*	1.66*
Guaranteed Lean	31.6%	34.3%	38.2%	33.1%	21.8%	26.1%	40.7%	44.4%
		-0.04*	0.01	0.06*		0.004	-0.10	-0.12*
Days before Sell-by Date		-0.6%	0.2%	0.6%		0.1%	-2.9%	-3.2%
				0.98*				0.12*
Enhance Omega-3 Fatty Acids				9.5%				3.3%
Total WTP [b]	6.74*	6.12*	6.31*	10.32*	4.32*	3.91*	3.31*	3.74*

[a] WTP values are derived from models in Table 3. WTP values are for 12 oz beef steaks.
[b] Total WTP are the sum of WTP for all individual attribute in each choice experiment.
[c] Report statistics are mean of 1000 simulated WTP estimations.
[*] Values with star are significant different from zero at 5% significance level or lower.
[e] Values in parenthesis are the proportion of WTP for individual attributes in total WTP