Importance of EU Label Requirements: An Application of Ordered Probit Models to Belgium Beef Labels

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The objective of this paper is to determine which information cues related to quality and origin really attract consumer interest, specified as the level of attention paid to and perceived importance attached to label cues. The focus is (1) on indications of quality through quality marks, (2) on indications referring to the mandatory European beef labelling regulation, and (3) on indications reflecting origin. Data are collected from a sample of 278 beef consumers in Belgium. Ordered probit models are specified and estimated to assess the impact of household characteristics and a beef labeling information campaign. Findings reveal that consumer interest is generally low for traceability, moderate for origin and high for direct indications of quality. Interest in label cues is specifically low among younger males. Further, the publicity campaign had a measurable positive impact on consumer's attention to direct indications of quality and origin. Strategies including traceability for backing up on-label indications of quality are recommended.

Product labeling as a policy instrument that regulates the presentation of product-specific information to consumers has gained a lot of interest during the last two decades. The success of food labeling policies builds on the potential role of labeling for correcting market inefficiencies by expanded product attribute information. Labels may increase consumer welfare through providing better consumer protection, while potentially generating economic rents to particularly producers and/or manufacturing groups when certain types of label messages such as country-of-origin are required. Labeling policies may be used as a substitute for more restrictive forms of government regulation, such as command-and-control options and process or performance standards (Caswell, 1998). Labeling as a policy device is generally considered to be the least costly and least restrictive method in cases in which

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food safety and healthiness concerns are involved (Henson and Caswell, 1999). As compared to many other policy measures, labeling initiatives are quite specific because of their potential direct impact on consumer decision-making (Jacoby et al., 1977; Zarkin & Anderson, 1992; Coulson, 2000; Kim et al., 2000; Nayga et al., 1998; Nayga, 2001). This explains why labeling debates are largely about information and the processing and use of the information by consumers (Teisl and Roe, 1988). In many of today's food markets, rational decision-making and utility maximization are hampered because information is imperfect, incomplete, inaccessible, asymmetrically distributed, non-standardized or costly to collect (Caswell and Mojduszka, 1996). These problems hold particularly in situations where product differentiation is low and mainly based on so-called credence attributes, i.e., those attributes that cannot be readily judged by consumers (Nelson, 1970; 1974; Darby and Karni, 1973; Grunert et al., 2000). Situations prevail where individuals can not adequately assess product quality or safety, even after experiencing the good, thus having to rely on trust in the information provided (e.g., on product labels.)

Recent examples of vivid consumer-involved labeling debates pertain to the use of artificial bovine somatotropin (rBsT) (Turner, 2001; Burrell, 2002), nutritional labeling regulations (Byrd-Bredbenner et al., 2000; Mojduszka and Caswell, 2000; Nayga, 2002), functional food health claims (Kwak and Jukes, 2001), labeling of genetically modified foods (Valceschini, 2000; Klintman, 2002; Noussair et al., 2002), irradiated meat (Frenzen et al., 2001), organic product labeling (Loureiro et al., 2001) and raw milk cheese (Stefani and Henson, 2001). One of the most recent issues of food labeling deals with origin labeling of beef. This has been an issue in Europe since the BSE crisis starting in 1996 and is currently in the regulatory debate in the U.S. The success of using labeling as a policy instrument definitely holds in the specific case of beef where market failures arose due to inadequate

information and consumer concerns about beef safety. The beef safety crises and consequent decline in beef consumption and prices in Europe have forced governments and the meat industry to react and to work toward restoring consumer confidence. For reaching this aim, realization of traceability systems and origin labeling of beef were considered as major targets (Gellynck and Verbeke, 2000; Verbeke, 2001).

The current situation with beef labels is comparable to the introduction of the U.S. Nutrition Labeling and Education Act in 1990, in that factual information and guarantees about product attributes were missing (Capps, 1992). Only a few studies have addressed consumer responses to new beef labeling regulations. Roosen et al. (2003) showed that private brands could be expected to have less potential to alleviate European consumer concerns toward beef as compared to government mandatory labels. Lusk and Fox (2002) reported evidence of U.S. consumer interest and willingness-to-pay for mandatory labeled beef grown with administered growth hormones or fed genetically modified corn. Within Europe, Henson and Northen (2000), Verbeke (2001), and Giraud and Amblard (2002) reported that consumers request additional information with respect to meat safety. Other studies have demonstrated that information on meat labels can be effective in improving consumer's perception of meat quality (Oude Ophuis, 1994; Issanchou, 1996; van Trijp et al., 1997; Steenkamp and van Trijp, 1996; Verbeke and Viaene, 1999; Herrmann et al., 2002). Verbeke et al. (2002) reported that consumers classified some of the new compulsory EU beef label indications (e.g., traceability and processing reference codes) as the least important compared to other cues on beef labels. Three U.S. consumer surveys reported that a large majority of U.S. consumers support country-of-origin labeling of meat products with Wirthlin Worldwide (1999) reporting 86 percent; Vance Publishing (2002) indicated 80 percent; and Schupp and Gillespie (2001) pointed to 93 percent. In contrast IFIC (2001)

reported that 74 percent of U.S. consumers claimed not to need additional information on food labels and findings by FMI (2000) suggested that two-thirds of U.S. supermarket shoppers prefer no labeling at all or something other than country-of-origin labeling on meat. Clearly, a definitive conclusion is yet to be made.

Instead of adding to the previous debate whether and how many consumers are interested in country-of-origin labeling as such, the objective of this paper is to provide a deeper insight into the information cues on meat labels in terms of consumer expressed attention and importance attached to several label cues (Day, 1976; Jacoby et al., 1977). The focus is on which label cues are of value in terms of attention given to the cue and its importance when making purchasing decisions. The question of which label cues consumers are using is highly relevant since human cognitive capacity may limit consumers' information processing abilities and, hence, producing information overload. Space limitations on the label places limits on how much can be included on the label and the risk of information overload is a real potential (Caswell, 1998; Deliza and MacFie, 2001; Mojduszka and Caswell, 2001).

For labels to have value, they must be understood. Cues such as expiration date are easily understood and require little consumer education. Other cues relating to traceability may be more difficult to understand. Mandatory labeling requirements may necessitate having some type of promotion campaign to help consumer assimilate the information. Therefore, a second objective is to investigate the impact of a publicity campaign aimed at raising consumer awareness and knowledge of the new beef labeling rules in Europe (Jacoby et al., 1977; Caswell and Padberg, 1992; Cardello, 1995; van Trijp et al., 1997). To address both objectives, a survey of Belgium consumers was completed in the fall of 2000 for periods before and after the Belgium government promoted its new beef label. Consumers were asked to scale their levels of attention to and importance attached to the

new label. Ordered probit models were then used to measure the probability of giving higher and lower scores to each of the label cues. Ranking the probabilities then provides empirical evidence of the relative value of the label requirements. If a particular label cue has little perceived value to the consumer, then the mandatory inclusion of that particular label cue must be based on something other than helping consumers make decisions. A label's value for contingency legal purposes may be an adequate reason. The value could be in the recovery if food safety problems require full traceability. Also, it is clear that if consumers place no value on a particular label cue, it is not going to generate economic rents back to certain sectors of an industry. Interestingly, some advocates of country-of-origin place their position on the expectation of realizing rents. Such rents are directly tied to consumers perceptions of the benefits of country-of-origin labeling. A good example of potential rents from country-of-origin labeling can be seen in a study of olive oil by Ward, Briz, and de Felipe (2003).

Beef Labeling Issues and Policy

U.S. country-of-origin labeling of beef entered a new era with the adoption of the Farm Security and Rural Investment Act of 2002 (Farm Bill 2002), requiring the United States Department of Agriculture's Agricultural Marketing Service (USDA-AMS) to issue country-of-origin labeling. State-or-origin beef labeling rules have been established in some U.S. states including Kansas, Idaho, Louisiana, and Mississippi. USDA-AMS issued voluntary country-of-origin labeling guidelines on October 8, 2002 (Federal Register, 2002) with the expectation of having a full regulation for mandatory country-of-origin labeling by September 30, 2004. Thus far, both the role of traceability or identification systems and consumer perception of the new labeling approach are unclear (USDA, 2002).

Today's EU beef labeling policy was initiated with the establishment of a new system for identification and registration of beef and beef products. Strengthening of consumer confidence in beef after the BSE crisis through the establishment of full traceability was the most important policy objective (Entel, 2000; Stapela, 2000). As of September 1, 2000, beef and beef products have to include a label indicating the country of slaughter and cutting/deboning, as well as a traceability reference code ensuring a direct link between the piece of beef and the animal of origin. The second phase, started on January 1, 2002, mandated EU member states to additionally indicate the country of birth, raising and slaughtering. In result, beef from animals born, raised and slaughtered in the same country can officially be labeled by country-of-origin (Regulation 820/97 and Regulation EC 1760/2000, EC-EurLex, 2001). Full traceability systems, most of which are extensions to pre-existing systems of cattle identification and registration aimed at eradication of animal herd diseases since the 1960s, form the backbone of the EU beef labeling system (Viaene and Verbeke, 1998). Thus principally, full traceability is mandatory while EU country-of-origin labeling is voluntary, though perfectly feasible and controllable thanks to the established tracking systems. Together with the establishment of the traceability and labeling regulations, the European Commission made provisions for setting up consumer information campaigns in the individual member states (Regulation EC 2071/1998, EC-EurLex, 2001). Such an information campaign was set up in Belgium during September 2000 as the first phase of the mandatory labeling program became effective. The campaign included newspaper/magazine advertisements and direct response leaflets. The effort succeeded in terms of exposure and claimed restoration of confidence in beef, though evoking direct response from consumers

largely failed (Verbeke et al., 2002). The analysis presented below builds further on the cross-sectional data set obtained during the campaign evaluation study.

Consumer Survey

Primary data were collected through a consumer survey during Fall 2000. A total number of 278 Belgian meat consumers were personally interviewed. All respondents were responsible persons for meat purchasing within their household. Relevant socio-demographic characteristics are presented in Table 1. From the total sample, 40% were interviewed before the information campaign (pre campaign), whereas 60% were interviewed after the publicity event (post campaign). From the post campaign subsample, 31% reported aided recall of the campaign (post aware) versus 69% who did not recall to have seen the information campaign (post unaware). Consumer interest in beef labeling was measured through assessing "importance attached to" and "attention paid to" twelve beef labeling cues. Both importance and attention were measured on 5-point rating scales. From the twelve items, 9 labeling cues were chosen to represent the present and potential future outlook of a beef quality label. The first category included "meat type" and "sell-by-date", which are mandatory government-regulated and standard information irrespective of any recent policy evolution. The second category included cues with a specific indication of quality: seals or stamps functioning as "quality label" or "quality guarantee" as well as information related to the "controlling organization". These kind of cues emerged during the nineties as a response to growing consumer concerns, mainly related to growth hormone use and result from voluntary programs (private industry initiatives). The third category includes the beef label

cues related to traceability as regulated in the first phase of the EU beef labeling program: "traceability reference code", "slaughterhouse licence number" and "cutting unit licence number". The fourth type of indication pertains to "country-of-origin" as part of the second phase of the EU beef labeling program. The three remaining indications, i.e. "label in general", "country slaughtered" and "slaughter date" were included as filler items. These indications are neither commonly used nor issues of debate in the current labeling policy. Therefore, the analyses will focus on the 9 relevant indications as discussed before.

Ordered Probit Labels Model

In the previous section 9 relevant label cues were identified with households expressing both their level of attention and importance attached to each label cut. A five point Likert scale was used with one being the lowest level of attention/importance and five, indicating the strongest favorable expression. Let R_{ij} denote the Likert score for label cue 'i' where $1 \leq i \leq 9$ and consumer expression 'j' letting j=1 (attention) or 2 (importance). Note that any subscript for the specific household is dropped without any loss in the meaning of R. Furthermore, define the vector X as those exogenous variables expected to have some influence on the scoring and β is the corresponding vector of coefficients associated with those variables. While $R_{ij} = s$ implies a precise measurement equation, there exists an unobservable (latent) variable R_{ij}^* such that $\eta_{s-1} \leq R_{ij}^* < \eta_s$ with s=1 to 5. Since the Likert score is an ordered ranking but still binary the score is further defined with Eq. (1) using the latent variable R_{ij}^* where $R_{ij}^* = f(\mathbf{X}\beta, \epsilon)$. In Eq. (1) when R_{ij}^* lies in the defined interval the measurement variable takes the discrete Likert score. Hence, from Eq. (1) the Prob($R_{ij} = 1 \mid x$) = Prob($\eta_0 \leq R_{ij}^* < \eta_1 \mid x$) where x is a specific set of values from **X**.

$$R_{ij} = \begin{cases} 1 \Rightarrow strongly\ disagree & if\ h_0 = -\infty \le R_{ij}^* < h_1 \\ 2 \Rightarrow disagree & if\ h_1 \le R_{ij}^* < h_2 \\ 3 \Rightarrow neither & if\ h_2 \le R_{ij}^* < h_3 \\ 4 \Rightarrow agree & if\ h_3 \le R_{ij}^* < h_4 \\ 5 \Rightarrow strongly\ agree & if\ h_4 \le R_{ij}^* < h_5 \end{cases} \quad \textbf{(1)}$$

Using a linear functional form for the specific set of variables Prob(R_{ij} =1 | x) = Prob($\eta_0 \le x\beta+\epsilon < \eta_1 | x$) $\equiv$ Prob($\eta_0 - x\beta \le \epsilon < \eta_1 - x\beta | x$). This states that the probability of a random variable is between two values is the difference between the cumulative normal distribution values evaluated at these two points or Prob(R_{ij} =s | x) = Prob($\epsilon < \eta_s - x\beta | x$) - Prob($\epsilon \le \eta_{s-1} - x\beta | x$) $\equiv$ $\Phi(\eta_s - x\beta) - \Phi(\eta_{s-1} - x\beta)$ with Φ denoting the cumulation normal distribution. For the first score the right-hand term drops out then Prob(R_{ij}=1|x) = $\Phi(\eta_1 - x\beta)$ and since the scores are exhaustive and mutually exclusive the probability of the highest score follows where Prob(R_{ij}=5 | x) = 1 - $\Phi(\eta_4 - x\beta)$ (Long, 1997). Given these probabilities, measuring the impacts of x on attention and importance attached to each label cue (i) can be completed. High and low probabilities of the score for each label cue then provide a quantitative way for assessing the overall usefulness of a required label to consumers since the probabilities are comparable across label cues.

Elements of the **X** were presented earlier with the information falling into three main categories: (a) household demographics; (b) household evaluation; and (c) information. Demographics were based on who completed the survey with gender, age, education, and presence of children used to capture demographic differences. Since a person may be aware of a specific piece of information such as labels but still place little value in the information, households were asked to score but "attention" and "importance" as two distinct

means for evaluating the label cues. Clearly these two scores can be correlated but that does not affect the analysis. Finally, the promotions were defined in Table 1 denoting the pre and post campaigns about the new Belgium labeling system. Since all of the X variables are binary, the complete specification $\mathbf{X}\beta$ is based on dummy variables. Using the definitions and the fact that the variables are all binary, then a linear specification of the functional form is appropriate for each 'ij' category as in Eq. (2). Again the household subscript is dropped for convenience. A priori expectations are that $\beta_{1(ij)}$, $\beta_{2(ij)}$, $\beta_{3(ij)}$, $\beta_{4(ij)}$, and $\beta_{8(ij)}$ should be positive while $\beta_{7(ij)}$ (post unaware) should be insignificant as long as those consumers stating they were unaware of the campaign were truly unaware of the information they have been explosed too. One cannot discount the subconscious effects of information exposure.

$$R^{*}_{ij} = \alpha_{0(ij)} + \beta_{1(ij)}\,(\text{GEND}) + \beta_{2(ij)}\,(\text{EDU2}) + \beta_{3(ij)}\,(\text{EDU3}) + \beta_{4(ij)}\,(\text{CHILD2}) + \beta_{5(ij)}\,(\text{AGE2}) + \beta_{6(ij)}\,(\text{AGE3}) + \beta_{7(ij)}\,(\text{PROM2}) + \beta_{8(ij)}\,(\text{PROM3}) + \epsilon_{(ij)} \tag{2}$$

Incorporating Eq. (2) into the log likelihood function for the probability of each scale occurring, then the coefficients are estimating using maximum likelihood procedures (Woolridge, 2002 page 504-509).

Ordered Probit Estimates

Tables 2 and 3 provide the resulting model estimates for both the attention and importance of each label cue. While the response to each label is best shown graphically, a few general insights are first in order. Probably foremost, there is considerable difference in both the attention and importance attached to different cues. In both tables the estimated coefficients and t-values are shown for the demographics and label campaigns. Then A1 through A4 are the estimated thresholds or cut points between scores. These thresholds

provide the essential input for measuring the probabilities for each scale (i.e., 1 to 5) attached to a label cue. Even without the demographics and other measuring variables, these cut points show the likelihood or probability of scoring high or low in term of attention to and importance of a specific label cue . Hence, when exploring consumer's preferences (or lack of) for a specific dimension on a label, the thresholds are used to show the level of attention and importance to a cue . In contrast, the other variables are used to derived the probability of each score occurring with the probability either increasing or decreasing according to the sign and significance of the parameter. Again, these probabilities will be shown later when considering each input variable. Since each variable in the models is binary, it is relatively straight forward to derive and compare the probabilities.

Attempting to have some measure of the goodness-of-fit for these binary scores, methods for comparing the likelihood values with and without the explanatory variables are generally used. Maddala (1983) defines the pesudo-R^2 letting $G^2 = -2*(\ln(M_{a\beta}) - \ln(M_a))$ where in M_a the variable coefficients are restricted to zero (Long, 1997, p. 105). Then the pesudo-R^2 is defined as $ML\_R^2 = 1 - \exp(-G^2/N)$. Cragg and Uhler made a slight improvement in this value by expressing the ML_R^2 relative to the upper limit of the index where:

$$CU\_R^2 = \frac{1 - \exp(-G^2 / n)}{1 - \exp(2 \ln(M_a) / n)} \qquad (3)$$

For the case in equation (3), the impact with the demographic and other variables are measured against the likelihood with the threshold values. One can visualize the CU_R^2 as the additional gain explained with the variables above that already reflected with the threshold values. In both the attention and importance models, the Cragg-Uhler values are in the range above zero and less than .10, indicating some gain associated with the

demographic and related variables but not substantial. Again, the gain shown is that above that with the threshold values.

Specific demographic impacts are mixed as seen with the range of t-values above and below a general reference value of two. Again the more important effects are shown later. One pronounced impact is seen with the promotions or label campaigns where the campaigns only impacted "Origin" and "Quality" variables. The label promotion campaigns produced a highly significant impact on attention to the quality guarantee and quality label. Similar positive impacts are estimated when viewing the importance attached to quality and origin. Likewise, the campaign generally had little statistical impact on the attention and importance attached to the other label cues, except for origin and quality.

Ranking the Label Cue Scores

Since some of the label cues are mandatory the most basic question for policy purposes is the relevance of each cues to consumers. Using the ordered probit models from Tables 1 and 2, the probability of each score (Likert scale) can be estimated for each label cue, recalling that a score of five is the most favorable indicator. Combining the probabilities for scores of four and five provides insight into the favorability of each cue relative to neutrality or non-favorable opinions. In Figure 1, the probabilities of scoring four and higher are shown with the probabilities ranked using the importance criteria. Note the left graph is for the attention to each label cue and the right is for the importance.

First and foremost there is a wide range of scores where some of the label cues are relatively unimportant to the consumer while others are extremely important. Those cues that directly address the dates and quality consistently receive the highest probabilities with the expiration date probability being 98 percent. These cues are readily interpretable and apparently function as highly relevant quality indicators to consumers. Also most of the

probability for this cue was from the highest score (5) instead of 4. Similarly, consumers showed the most attention to the expiration cue.

For the lower side of the probabilities, those cues relating to product identification such as traceability, processor number, and cutting units showed a probability of indifference or less to be over 60 percent. Consumers pay little attention to these cues and ranked them low in terms of scores. Among all the cues traceability and slaughterhouse identification received the lowest attention scores with the probability of a score of one being around 33 percent for each. Given the recent problems with BSE and foot and mouth disease, it is somewhat surprising that the country-of-origin also received relative low attention and importance scores. The probability of a score of 5 for attention to country-of-origin is 22 percent and importance, 38 percent. Clearly, country-of-origin does not have the impact that one would have initially expected given the massive negative press associated with the recent problems with beef in different European countries (see Verbeke and Ward, 2000). Yet country-of-origin was ranked higher than the more technical traceability cues.

These rankings were calculated using the base set of consumer characteristics and for the pre-promotion campaign for the introduction of the new label requirements. Clearly, while traceability, origin, and other product identification may have value from a legal and political standpoint when dealing with food safety, consumers place little value in those cues in terms of their preference ordering. In direct contrast, those characteristics providing direct and immediate insight into the quality of the beef are most important with the dates implying something about the quality in terms of duration in time. Given these pre-campaign probabilities, can they be changed through promotions and over a range of buyer (household) characteristics?

Pre and Post Label Promotion Campaign

Fundamental to the introduction of new public food safety policy such as the mandatory labeling as introduced earlier is that consumers are aware and understand what they are seeing with the new label. An intensive promotion campaign was used to inform consumers about the new label program. For example, a specific campaign header read "Quality beef with guarantee of origin ... EU beef is registered and labeled from producer to retailer ... and that is the best guarantee for quality beef you can get." Hence, an important policy issue is to determine if the promotion showed any measurable impact on consumer's attitudes about labels, and if so what was the impact. As presented in the model earlier, three campaign dimensions were identified: pre-campaign; post-campaign unaware; and post-campaign aware. Measuring the impact of such a campaign can be useful to determine if other comparable food safety regulations should be preceded by some type of promotion or informational campaign.

In Tables 2 and 3, the variables Prom2 and Prom3 denote the post-campaign measures with Prom3 representing if consumers were aware of the label promotions. If the promotions impacted the scoring it should have been within this campaign awareness variable. Responses to Prom2 provides a type of indirect check on the reliability of the efforts to measure the promotions. In both tables, the only clear statistically significant impacts are seen in the two direct quality measures and the country-of-origin. Beyond those variables the role of advertising the new beef labels showed little response.

Figures 2, 3 and 4 show the predicted probabilities of each Likert score with and without the label promotions. First for attention to the quality label, there is no statistical difference between the pre and post-unaware probabilities. Where, among those consumers aware of the campaign the impact is readily seen with the higher probabilities in the top score

level increasing from 42 to 64 percent for nearly a 22 percentage point gain. Note the t-statistics are 2.59 and 2.69 which are significant at the 99 percent confidence level. Furthermore, the fact that the un-aware was statistically insignificant provides supporting evidence that what is being measured with the post-aware is truly promotions and not just something else that occurred during the campaign period. Not only did the attention increase, but the importance given to the quality label also increased from 50 to 65 percent for the highest score.

Beyond the impacts of the campaign, the overall distributions of the probabilities provide insight into the role of this label cue. Most scored the cue quite high and that score can be influenced via the promotions. Similar responses are seen for the quality guarantee cue where the attention probability increases from 46 to 68 percent and importance from 50 to 62 percent. Note in Tables 2 and 3 the conclusion about the campaign for the attention is unambiguous whereas the same for the importance and quality guarantee is a little more ambiguous since the post-unaware was significant. Since quality label and quality guarantee have related meaning, one must overall conclude that the post-campaign did have a measurable positive impact on consumer's evaluation of this label cue.

As shown, the expiration date is important and most households score the expiration date quite high (see Figure 1). Given that consumers already place considerable value on the expiration date and that this was not an issue in the campaign, the expectation of additional gains from the label campaign should be reasonably small. Figure 3 shows the probability of scoring 5 on the expiration date increased from 75 to 78 percent for attention and 80 to 83 percent for importance. While the direction of change is consistent with the theory, the difference in both cases is statistically insignificant (see the t-values for expiration in Tables 2 and 3). Since consumers already valued this aspect of the label, the campaign had little additional impact.

Finally, consumers showed some respond to the campaign in terms of there ranking of the country-of-origin label as illustrated with Figure 4. While the country-of-origin remains relatively unimportant, the probabilities of both attention and importance increased from 23 to 33 percent in terms of attention and 37 to 57 percent for the importance. The importance gain was particularly significant with a t-value fo 1.95. The promotion campaign has played an important function with consumers placing greater value on the country-of-origin while still recognizing a much greater role of quality and dates when buying beef.

While we have graphically concentrated on the positive impacts, it is equally noteworthy that the campaign had little to no statistical impact on those cues that were initially ranked quite low such as traceability and identification. Most of scores were quite low and the awareness of the new labels through the promotions had almost no impact on the rankings, although being the focus of the campaign. The label advertising with a positive message cannot effectively change negative or low scoring for some cues. Those cues are simply not valued by most households.

Impact of Demographics on Label Cue Scoring

Demographics were included in the label cue models as previously shown in Tables 2 and 3 with gender, education, presence of children, and age. As seen with the t values in these tables, gender, education, and children generally had little impact on the label cues with a few notable exceptions discussed below. Also, conclusions about the demographics were mostly consistent between the attention and importance scales. For those cues considered less important such as traceability and identification general conclusions are mixed. For example, males tend to scale traceability higher than females and the coefficient is statistically significant. In contrast, quality measures are scored higher by females as seen with both the quality guarantee and quality label coefficients with the negative signs showing

the male gender effect. The middle age group (30 to 50 years) shows the higher awareness and importance of country-of-origin. The expiration date was the highest ranked cue and none of the demographics were statistically significant for a two-tail test. Males did tend to score the expiration date lower than females and the t-value was -1.66 in Table 3.

Since the quality cues are shown to be particularly important but still subject to a range of probabilities scores, it is more interesting to look at these cues in more detail with respect to the demographics. Figures 5a, 5b and 5c show the estimated probabilities of scoring the highest level assuming the range of demographics when considering attention. For the base set of demographics the probability of scoring a five on the quality label is estimated to be 42 percent in the pre-campaign period. This probability increases to nearly 61 percent among those consumers over 50 years of age or nearly a 20 percentage point increase across the age range. At similar range of gain is seen for the quality guarantee over the three ages (Figure 5a).

As noted above attention to both the quality label and the quality guarantee drops by almost 10 percentage points between females and males with the guarantee being particularly significant. Finally, in both figures education and children are shown both neither are statistically different from the base. The obvious implication from these probabilities is that the younger males should be the primary target group (but not to the exclusion of the others) to achieve a greater focus on the quality information from the labels.

Finally, Figure 5c shows the same demographics for the country-of-origin cue and a similar demographic pattern emerges. For the pre-campaign the probability of scoring a five is 23 percent. Among the older consumers this probability increases to around 40 percent or close to a doubling of the likelihood of the highest level of attention to this label cue. Among males the attention to the label cue drops from 23 percent to 18 percent. As with the quality indicators the target group for potential improvements is younger males, again not necessarily

to the exclusion of other demographic profiles. Other studies in Belgium have shown that men are more straightforward and less concerned when making meat purchasing decisions as compared to women. Furthermore, consumers aged below 25 years were found to be rather indifferent, thus putting little importance and paying little attention to label cues (Verbeke and Vackier, 2003).

Attention versus Importance in Label Cues

In the ordered probit the attention paid to the label and the level of importance were considered separately in order to generate the probabilities of each level of consumer ranking using the five-point scoring. Importance reflects the value consumers place on the information while attention is simply an index of awareness or focus given to the label cue. One should generally expect the level of focus to change with the importance attached to the labels. In particular, as the labels become more important reflected with the higher scores, theoretically the attention paid to the labels should increase. In contrast, the level of attention may waver with the lower scores. To test this linkage assuming the flow from importance to attention, all possible combinations of attention probabilities for each score were regressed against the importance score while accounting for the level of the score (i.e., important or not important). Since these are probabilities, a logistics regression was used to assure the estimates lie within the 0 to 1 interval. In this model the estimates are across all label cues in order to provide some generalizations about the linkage between focus and importance. Define ATTN as the probability of attention for any label cue and score and IMPT the corresponding probability of importance. Then Equation (3) is the logistic linkage while accounting for the score level using low importance SC1=1 if the score=1or 2; SC2=1, if score=3 or neutral; SC3=1 when the score=4 or 5. SC1 and SC3 are the two binary variables for the low and high scores while using the neutral score (S2) as a base. Furthermore, to

allow for nonlinearity between attention and importance, a polynomial in the importance was included in the model and the final form is quite flexible allowing for different responses between the score levels. This equation is particularly useful since a consumer may indicate that the labels are important to some degree but still pay little attention to them. Also, over time the causality implied with this model could even reverse as a particular label cue becomes ingrained in the consumer's mind. Since some are new label cues there is little chance of that reverse linkage at this point in time. The resulting estimates for Equation 3 are shown in Tables 4.

$$ATTN = \frac{1}{1 + \exp^{\{b_0 + b_1 IMPT + (b_2 + b_3 SC_1 + b_4 SC_3) IMPT^2 + b_5 SC_1 + b_6 SC_3\}}} \qquad (3)$$

Using the estimates from Table 3, then the response across importance probabilities can be simulated as presented in Figure 6. The bottom axis shows the probability of occurrence of each level of importance noted as not importance, neutral, and of high importance based on the five Likert scores. Starting with the neutral level of importance, there is very little level of attention paid to the labels across the range of importance probabilities. Clearly, when the probability of a neutrality score is above around 30 percent the level of attention given to the labels even begins to drop off rapidly. When most of the scores are neutral, the attention level is very low as one would logically expect. A similar pattern is seen for the probabilities for low scores. The attention to the labels rise when the probabilities of not important first increase but, again, when these probabilities are above around the 40 percent level, the attention level drops off quickly. There may be some initial curiosity but eventually the attention level drops off quickly when there is a strong indication of the unimportance of the labels. Finally, the third level is when the probabilities associated with a high importance level. As the probability of expressing a score of 4 or 5 increases, the level of attention to

the labels increases first at an increasing rate but eventually tends to approach an upper limit in the range near 70 percent. While there is not a one-to-one linkage between importance and attention when the cues are important, the level of focus on the labels moves in the expected direction. Clearly, when consumers value the label content (importance) they are more likely to focus on the label. If a public policy is to make consumers more informed via a label when the label is judged not to be important, then the challenge to get consumers to focus on the label is doubly challenging. For example, the traceability was shown to be not that important and, hence, it is a greater challenge to get consumers to focus on that label. Figure 6 is generally what would be expected and, hence, does add further creditability to the overall modeling efforts.

Conclusions

Consumer interest in beef labeling can not be taken for granted. Interest is low for cues directly related to traceability and product identification while much higher for others like readily interpretable indications of quality and mandatory standard information. Therefore, it is important to include exactly those cues that are used and wanted by consumers. These probit results point directly to what consumers value when making buying decisions. Different types of consumers in terms of socio-demographic profile want different information. In line with previous studies, this study confirms lower interest in some label cues among younger males. Yet the same analysis shows that through the use of promotions, those values can be changed for some of the cues. Specifically, the campaign is was found to have a measurable positive impact on consumer's attention to direct indications of quality and country-of-origin. Whereas the campaign also aimed at impacting consumer interest in traceability, such effects have not been detected. This yields the conclusion that the promotions worked for cues that received a substantial degree of

consumer interest already at the initial stage before the campaign. Increasing consumer interest for unknown and unfamiliar cues failed, which is in line the hierarchy-of-effects paradigm and with information processing theories stating that awareness comes first before any attitudinal and behavioral effect.

Furthermore, the analysis has significant policy implications for longer term regulations as to what should and should not be included on the labels. Traceability and country-of-origin have legal importance, especially when a problem occurs. Possibly a system for providing the traceability without causing the consumer information overload is needed since they place little importance on many of those identification cues. Consumer awareness of established traceability without further notice on labels may suffice to reassure the majority of consumers about beef safety. Alternatively, a single numerical code that ties back to may of the identification cues can be shown on the label, however without expecting consumers to interprete and use this information. Instead, indirect cues like quality guarantees are highly appreciated by consumers and may therefore yield rents for the industry. Clearly, these indirect cues are to be backed by traceability "behind the scene" in order to avoid concerns and merit trust at the consumer level. The code could be used to trace back when a problem occurs. Then consumers simply see a subset of cues such as expiration and quality indicators that are most important in making buying decisions while to ability of trace back is still preserved with the single code. In conclusion, strategies including identification and traceability as the defensive component backing up on-label quality indications as offensive component can be recommended form the current study.

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Table 1.Distribution of consumer survey demographics.

	Pre	Post	Pooled
	n=113	n=165	n=278
Gender		- - - - - - - - % - - - - - - - -	
Female	71.7	74.5	73.4
Male	28.3	25.5	26.6
Age			
30 and under	45.6	48.8	47.8
31 to 50 years	31.6	36.2	34.2
over 50 years	22.8	15.0	18.0
Education			
Under 18	28.4	28.8	28.7
Over 18	71.6	71.2	71.3
Beef consumption frequency			
Daily	14.3	11.5	12.6
Several times a week	42.9	54.5	49.8
Once a week	33.0	22.5	26.8

Table 2. Ordered probit estimates for attention to label cues.

Attention to:	Origin		Meat Type		Slaughterhouse No.	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Gender2	-0.1895	-1.2021	0.0770	0.4711	-0.0471	-0.2546
Edu2	-0.6302	-1.5422	-0.2065	-0.4864	-0.7468	-1.8115
Edu3	-0.2861	-0.7152	-0.1895	-0.4581	-0.9967	-2.4740
Child2	0.0180	0.1014	-0.0514	-0.2809	0.4343	2.0712
Age2	0.4565	2.4211	0.3742	1.9121	0.0068	0.0308
Age3	0.5054	2.0711	0.1287	0.5141	-0.2514	-0.9035
Prom2	-0.0152	-0.0987	-0.0163	-0.1027	-0.2670	-1.5086
Prom3	0.3123	1.6060	-0.0639	-0.3138	-0.1250	-0.5599
A4	0.7313	1.7258	0.2199	0.5060	0.9598	2.1959
A3	0.1133	0.2693	-0.8279	-1.8992	0.5770	1.3404
A2	-0.5494	-1.3045	-1.4137	-3.2119	-0.1225	-0.2857
A1	-0.9342	-2.2039	-1.9516	-4.2739	-0.4557	-1.0617
Standardized Y	1.0791	0.0000	1.0285	0.0000	1.1053	0.0000
Cragg Uhler R2	0.0692		0.0249		0.0796	

Attention to:	Cutting Unit Number		Traceability Reference No.		Quality Guarantee	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Gender2	0.0677	0.3672	-0.0252	-0.1316	-0.4547	-2.8267
Edu2	-1.0588	-2.5384	-0.8129	-1.7079	-0.1915	-0.4200
Edu3	-1.3924	-3.3969	-1.0278	-2.2199	-0.3686	-0.8324
Child2	0.2529	1.2064	0.2178	1.0323	-0.1111	-0.5920
Age2	0.1016	0.4559	0.1299	0.5812	0.4153	2.0955
Age3	-0.1630	-0.5760	-0.3199	-1.0823	0.5716	2.2228
Prom2	-0.1440	-0.8064	-0.3056	-1.6553	0.1294	0.8184
Prom3	-0.0459	-0.2036	-0.0431	-0.1906	0.5721	2.6991
A4	0.7794	1.7718	0.7744	1.5813	0.0895	0.1917
A3	0.3696	0.8527	0.6884	1.4111	-0.7455	-1.5945
A2	-0.3398	-0.7835	-0.0704	-0.1456	-1.2937	-2.7428
A1	-0.7018	-1.6143	-0.4362	-0.9001	-1.5818	-3.3198
Standardized Y	1.1036	0.0000	1.0848	0.0000	1.1429	0.0000
Cragg Uhler R2	0.0835		0.0635		0.1095	

Attention to:	Quality Label		Control Organization		Expiration Date	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Gender2	-0.2589	-1.6216	-0.0350	-0.2188	-0.1908	-0.9723
Edu2	-0.2475	-0.5250	-0.7775	-1.8002	-0.0205	-0.0411
Edu3	-0.3236	-0.7039	-0.7296	-1.7412	0.1095	0.2257
Child2	0.0083	0.0451	0.2838	1.5559	-0.0178	-0.0814
Age2	0.3052	1.5690	0.0916	0.4738	0.2255	0.9569
Age3	0.4685	1.8468	0.0707	0.2888	-0.1473	-0.5007
Prom2	0.0003	0.0018	-0.0049	-0.0312	-0.0687	-0.3569
Prom3	0.5496	2.5929	0.0337	0.1679	0.0944	0.3654
A4	0.1916	0.3980	0.4346	0.9844	-0.7040	-1.3730
A3	-0.6532	-1.3555	0.0462	0.1051	-1.5410	-2.9670
A2	-1.1643	-2.4015	-0.6118	-1.3836	-1.6599	-3.1771
A1	-1.5156	-3.0963	-0.9719	-2.1875	-1.7049	-3.2524
Standardized Y	1.1003	0.0000	1.0459	0.0000	1.0321	0.0000
Cragg Uhler R2	0.0798		0.0406		0.0223	

Table 3. Ordered probit estimates for importance of label cues.

Importance of:	Origin		Meat Type		Slaughterhouse No.	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Gender2	-0.2369	-1.4723	-0.1396	-0.8396	0.0646	0.3891
Edu2	-0.5076	-1.0430	0.0191	0.0408	-0.5255	-1.1227
Edu3	-0.1164	-0.2446	0.0019	0.0041	-0.8080	-1.7633
Child2	-0.1276	-0.6879	-0.1039	-0.5459	0.3639	1.9474
Age2	0.5109	2.5722	0.2632	1.2990	0.1572	0.7934
Age3	0.4533	1.8036	0.4213	1.6068	0.0000	-0.0127
Prom2	-0.0545	-0.3441	-0.2233	-1.3621	-0.0720	-0.4508
Prom3	0.4090	1.9522	0.0133	0.0610	-0.1459	-0.6895
A4	0.3148	0.6330	0.0799	0.1692	0.7826	1.6299
A3	-0.3980	-0.8022	-0.8821	-1.8620	0.5160	1.0762
A2	-1.2278	-2.4451	-1.9796	-4.0017	-0.6597	-1.3773
A1	-1.6608	-3.2454	-2.2673	-4.3947	-0.9379	-1.9571
Standardized Y	1.0841	0.0000	1.0397	0.0000	1.0915	0.0000
Cragg Uhler R2	0.0698		0.0343		0.0764	

Importance of:	Cutting Unit Number		Traceability Reference No.		Quality Guarantee	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Gender2	0.1014	0.6172	0.3195	1.9373	-0.3649	-2.1116
Edu2	-0.6830	-1.4267	-0.4530	-0.8809	-0.0340	-0.0637
Edu3	-1.0594	-2.2580	-0.7314	-1.4559	-0.0870	-0.1684
Child2	0.1441	0.7804	0.2037	1.1016	-0.0270	-0.1272
Age2	0.2902	1.4722	0.1728	0.8809	0.3036	1.4071
Age3	0.1686	0.6684	-0.0301	-0.1182	0.7537	2.5491
Prom2	0.0741	0.4631	-0.0152	-0.0943	0.3715	2.1066
Prom3	-0.0348	-0.1647	0.1392	0.6651	0.3087	1.3621
A4	0.7141	1.4566	0.8900	1.6908	-0.0100	-0.0164
A3	0.3398	0.6939	0.5967	1.1365	-1.0321	-1.8989
A2	-0.7431	-1.5228	-0.4356	-0.8344	-1.7969	-3.2088
A1	-1.0471	-2.1445	-0.7295	-1.3965	-2.4839	-3.9323
Standardized Y	1.0935	0.0000	1.0708	0.0000	1.1206	0.0000
Cragg Uhler R2	0.0772		0.0596		0.0852	

Importance of:	Quality Label		Control Organization		Expiration Date	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Gender2	-0.4987	-2.9866	0.1030	0.6451	-0.3583	-1.6683
Edu2	-0.3901	-0.7062	-0.6405	-1.1789	-0.1378	-0.2227
Edu3	-0.3240	-0.6011	-0.7825	-1.4705	0.0940	0.1554
Child2	0.0257	0.1309	0.3242	1.7727	-0.1080	-0.4289
Age2	0.2632	1.2682	0.1246	0.6467	0.3880	1.4506
Age3	0.3868	1.4538	0.0911	0.3656	0.4401	1.2531
Prom2	0.2792	1.6782	-0.0818	-0.5215	0.1108	0.5057
Prom3	0.6068	2.6911	-0.0236	-0.1156	0.1267	0.4458
A4	-0.0899	-0.1612	-0.0415	-0.0755	0.0000	0.0000
A3	-1.1530	-2.0520	-0.6481	-1.1775	0.0000	0.0000
A2	-1.8914	-3.3003	-1.4614	-2.6350	-0.8618	-1.3812
A1	-2.4229	-4.0442	-1.8663	-3.3397	-2.1153	-3.2160
Standardized Y	1.1148	0.0000	1.0657	0.0000	1.0506	0.0000
Cragg Uhler R2	0.0901		0.0568		0.0361	

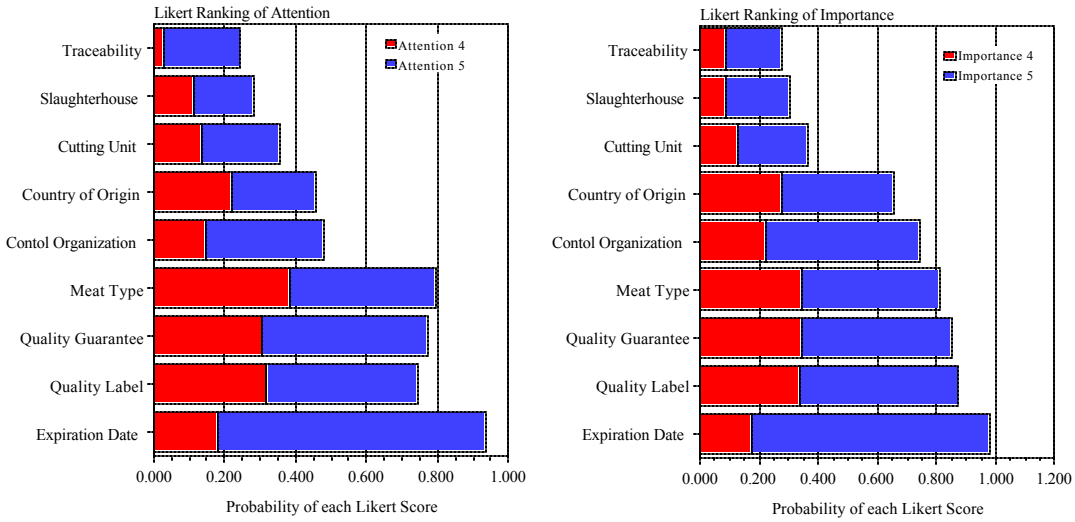


Figure 1. Ranking the label cues or cues based on the order probit probabilities.

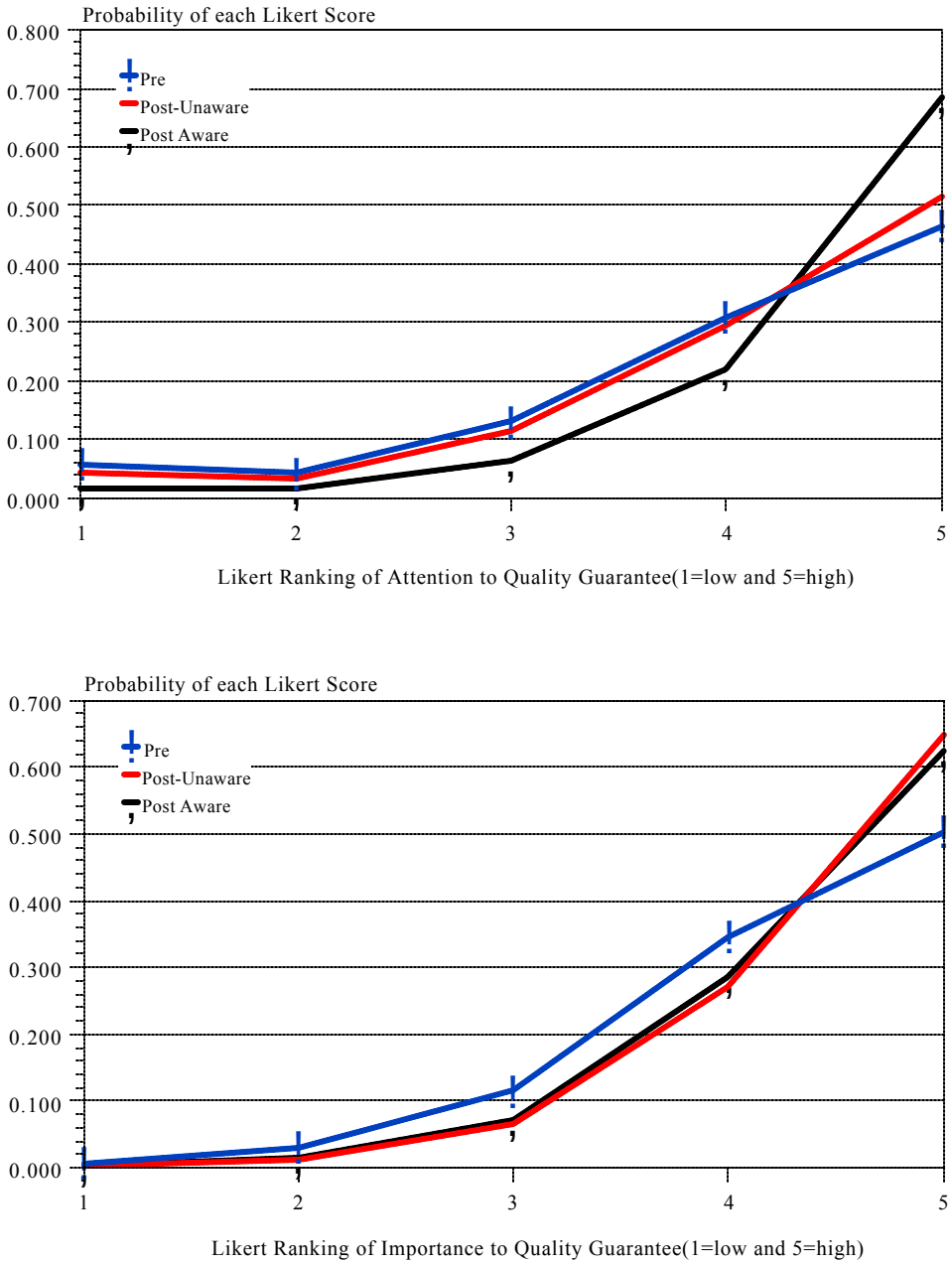
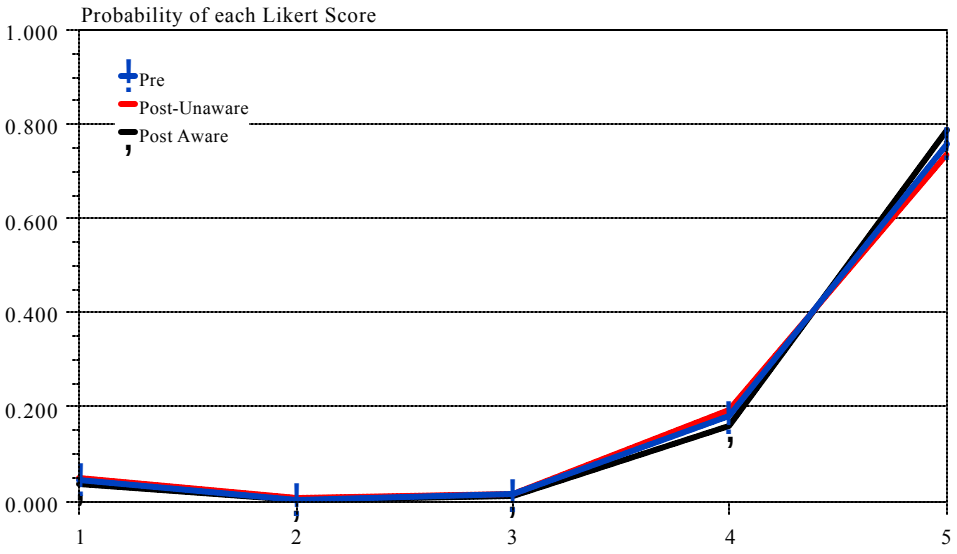


Figure 2. Probabilities of Likert scores for the "quality guarantee" cue during the pre and post campaign periods.



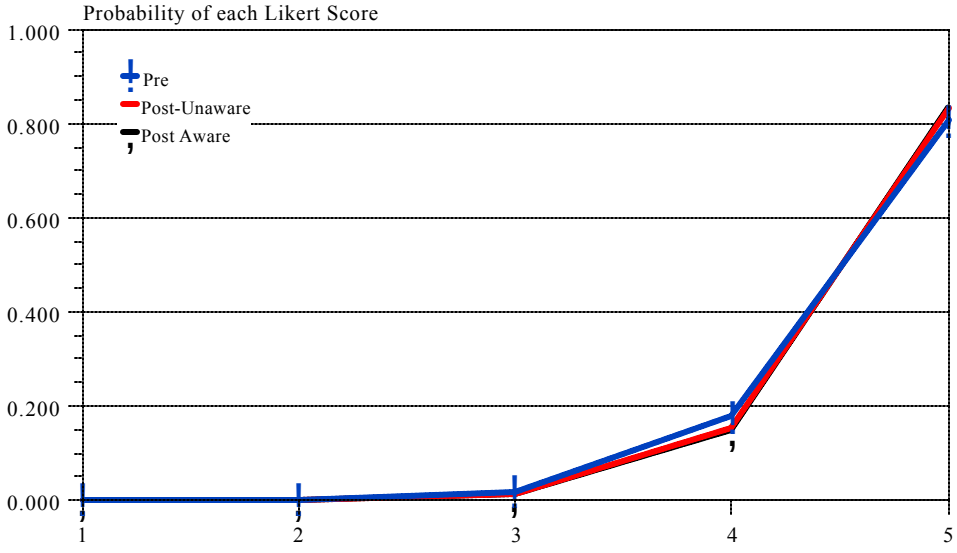
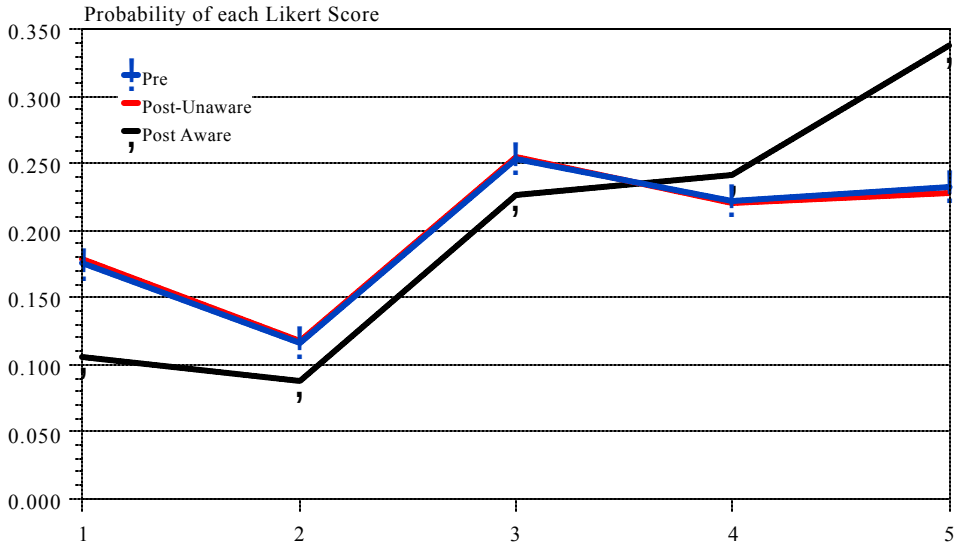


Figure 3. Probabilities of Likert scores for the "expiration date" cue during the pre and post campaign periods.



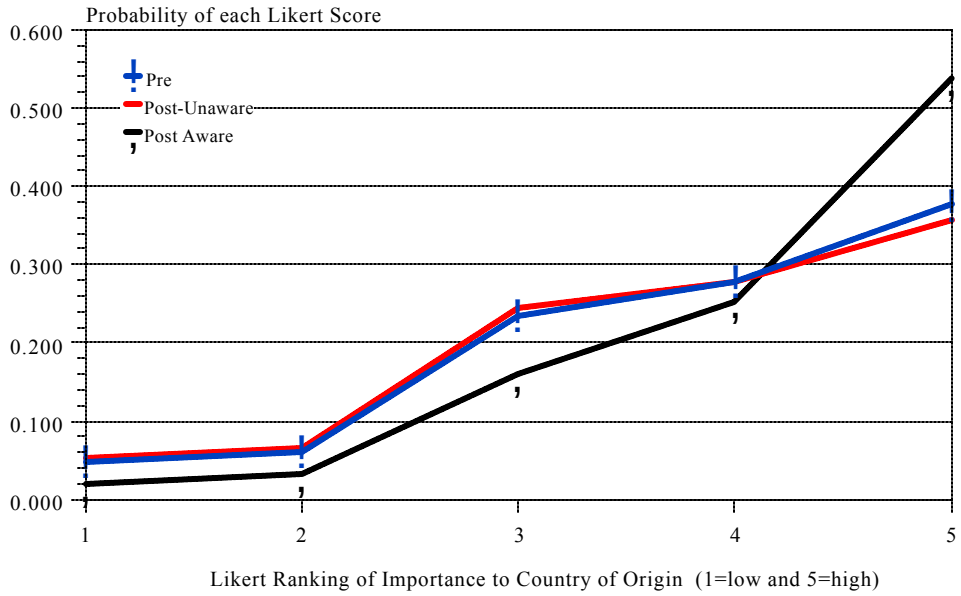
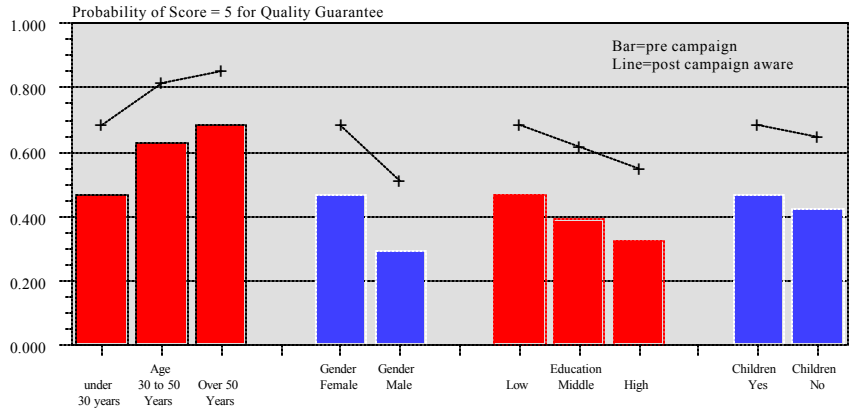
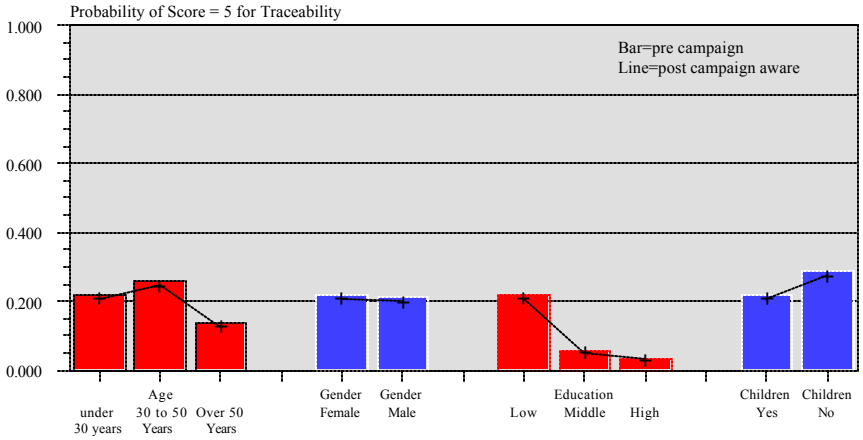


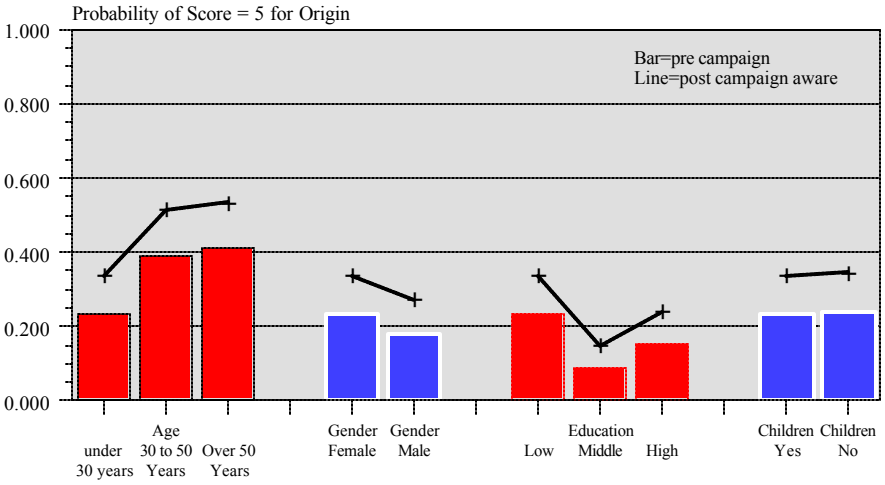
Figure 4. Probabilities of Likert scores for the "country-of-origin" cue during the pre and post campaign periods.



Attention to Quality Guarantee by Demographics



Attention to Traceability by Demographics



Attention to Origin by Demographics

Figure 5a-c. Probabilities of attention to label cues across demographics.

Table 4. Linkage between attention and importance probabilities.

Y=LOG(1/ATTN -1)	Coefficients	t-values
C	3.4139	64.8161
IMPT	-14.5812	-23.9257
$IMPT^2$	22.6641	16.6945
SC1× $IMPT^2$	4.6810	2.8014
SC3× $IMPT^2$	-18.1638	-14.5609
SC1	-7.5091	-11.9481
SC3	5.9360	12.5197
R^2 = .753		
F = 638.27		

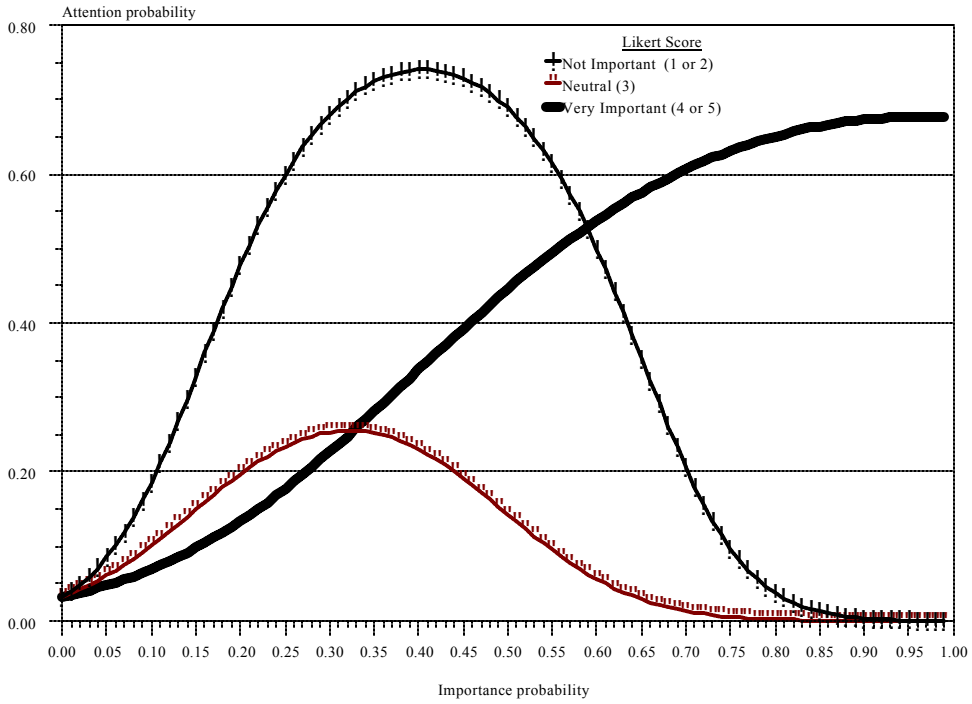


Figure 6. Distributions in the importance probability across the Likert scales.