Valuing Information: The Case of Country of Origin Labeling

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Abstract: This paper proposes a method to directly measure the value of information and compares it to the more conventional approach requiring the explicit specification of a utility function. Using data collected from a field experiment conducted in two grocery stores, we find that the calculated value of information contained in federally-mandated country of origin labels for beef and pork is 40% lower using the direct elicitation method as compared to the conventional approach. Overall, our estimates suggest that the mean value of origin information ranges from $0.08 to $1.18 per pound of steak/chop purchased depending on the valuation method used and assumptions about labeling knowledge and average volume purchased per choice. The value of information was substantively influenced by ethnocentrism and meat consumption frequency.

Keywords: value of information, country of origin, labeling, field experiment, beef, pork

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Information and labeling are at the forefront of federal food regulatory policies. Historically, food labels were designed to ensure fair competition between producers and provide consumers with information to better assess weight, quality, freshness, nutrition, and safety, but as Golan et al. (2000) point out, food labels are increasingly being used to promote other social objectives. Essential in determining the efficacy and efficiency of a labeling policy is the value of information provided by the label. Alas, the "task of actually measuring benefits may involve difficult methodological and philosophical problems" (Golan et al. 2000, p. 16). Perhaps this is the reason research often focuses on estimating the value consumers place on one food attribute relative to another as opposed to estimating the more policy-relevant value of information statistic.[1]

Foster and Just (1989) provided the conceptual foundation to determine the value of information consumers derive from a label or an information dissemination campaign. In their framework, the value is determined by comparing the utility derived from the choices people make when better informed to the utility they would receive if they were constrained to make the same choices as they did prior to receiving information despite now knowing more. Leggett (2002) extended the Foster and Just (1989) approach to the discrete-choice random utility framework and highlighted that the value of information can also be conceptualized as arising from the difference between the choices people make under imperfect information about the desirability of different options and the actual utility experienced once a choice is made. Both approaches are stylized in the sense that they make assumptions about the nature of the good being valued (i.e., it is an experience good) and consumers' cognitive processes (i.e., they are perfectly rational optimizers). Moreover, empirical implementation of the approaches requires

[1] There are, of course, notable exceptions to this general statement; see for examples, Brooks and Lusk (2011), Hu et al. (2005), Rousu et al. (2007), and Teisl (2001).

knowledge of consumers' utility functions and associated functional form, beliefs about product quality, assumptions about choices available to consumers, and market conditions.

Despite the usefulness of the value of information approach advanced by Foster and Just (1989) and Leggett (2002), violations of any of the underlying assumptions of their model can invalidate the resulting benefit measure. Additionally, seemingly innocuous choices made by the analyst may have nontrivial impacts on the results. For these reasons, this paper proposes a method of directly estimating the value of information. Our approach involves directly asking people how much they are willing to pay for information instead of how much they are willing-to-pay for the product itself. We compare our direct approach to the indirect approaches of Foster and Just (1989) and Leggett (2002) and find substantial differences.

The empirical context for our study is the controversial mandatory country of origin labeling (MCOOL) law which became effective for beef and pork in 2009. MCOOL requires grocery retailers to provide country-of-origin labeling information for fresh beef, pork, lamb, chicken, goat, wild and farm-raised fish and shellfish, peanuts, pecans, ginseng, and macadamia nuts (Link 2009). The beef and pork industries represent the largest sectors directly affected by MCOOL, and the effects of the policy have been intensely debated. Although the effects of the policy have been widely studied[2], the policy has recently raised further scrutiny because the Canadian and Mexican governments filed a grievance with the World Trade Organization (WTO) claiming that MCOOL represents an illegal nontariff trade barrier under the General Agreement on Tariffs and Trade (GATT).[3] As the various governments make their cases at the WTO, there is renewed interest in the determining the costs and benefits of the policy. One key

[2] Several *ex ante* studies of the impacts of MCOOL were conducted (e.g., see Brester et al. 2004 and Lusk and Anderson 2004) as well as a couple *ex post* analyses (Informa Economics 2010; Kulcher et al. 2010)
[3] Rude et al. (2006) present some calculations on the potential losses to Canadian producers resulting from the U.S. MCOOL policy.

piece of information missing from the debate is the value of information conveyed by MCOOL to U.S. consumers.

Previous consumer research has illustrated that U.S. consumers are willing to pay a premium for U.S.-origin labeled beef and pork products over products from other countries (e.g., Gao and Schroeder 2009; Link 2009; Loureiro and Umberger 2007; Mennecke et al. 2007; Miranda and Kónya 2006; Umberger et al. 2003; Ward et al. 2005). While willingness-to-pay (WTP) for U.S. over foreign meat is relevant to the debate on MCOOL, it is not what is needed in a cost-benefit analysis of MCOOL. Rather, analysts need to know the value of information (VOI) related to product origin. As such, this research focuses on how consumers value "knowing" vs. "not knowing" country of origin information.[4] Our study uses a non-hypothetical, in-store field experiment to measure consumers' values for label information. Another important contribution of this research is the comparison of two approaches (direct and indirect) to determine VOI. To our knowledge, this is the first paper to provide a method of directly estimating the VOI in a non-hypothetical setting.

Methods and Procedures

Two approaches for valuing food label information are compared. The first, which we refer to as the *direct* experiment, was structured to directly determine consumers' WTP for information on the origin of a meat product (i.e., the VOI was directly estimated). Importantly, the direct approach does not measure consumers' preference for U.S. versus foreign beef *per se*, but rather measures the value of having information about the origin of the meat. The second approach

[4] To our knowledge, Loureiro and Umberger (2007) is the only study providing an estimate of this VOI; however, more work is needed because their study: 1) was a hypothetical mail survey potentially prone to hypothetical bias, 2) was conducted several years ago prior to MCOOL implementation, and 3) involved a survey approach which entailed consumers making unusual choices between hypothetical products that were described as either having or not having an origin label without any information on the actual content of the label.

involves asking consumers to choose between meat products from different origins. These choices can be used along with the conceptual model in Leggett (2002) to indirectly infer the value of information. Thus, we refer to this approach as the *indirect* choice experiment. Under certain assumptions, the value of information obtained from the direct and indirect choice experiments are theoretically equivalent despite the fact that the two approaches involve consumers making different types of choices; however, as we discuss later, there are a number of reasons these assumptions may not hold and the two measures may diverge in practice.

Data Collection

Consumers were recruited from two supermarkets located in a Dallas, TX suburb and in San Antonio, TX during October 2010 and January 2011.[5] The consumers were invited to participate in the study as they passed by a booth we set up near the fresh meat counter.

Customers who agreed to participate were assigned to one of the 15 treatments shown in table 1. Treatments varied by approach (either direct or indirect), participation fee offered ($2 or $4), commodity (beef or pork), location (Dallas or San Antonio), and for the direct valuation approach the price range used in the experiment (from $0 to $2.50 or from $0 to $5). The various treatment-combinations were used to determine the extent to which the estimated value of information was sensitive to variations in the experimental protocol (i.e., participation fee and price ranges) as opposed to "true" underlying values of country of origin information.

[5] We have also conducted a nation-wide survey on this issue to determine the extent to which the results from our limited geographic sample are representative of the population at whole. The nation-wide survey included a set of questions meant to mimic the direct value elicitation approach used in the grocery store field experiment. We cannot reject the hypothesis that the mean VOI we measured from our field experiment is the same as the mean VOI from the nation-wide survey, leading us to believe our field experiment data can be reasonably extrapolated to the population at large. We explore the results comparing the field experiment and survey more fully elsewhere.

Each participant was recruited by offering a free 12 oz cut of meat (either a New York strip steak or a pork chop) in addition to $2 or $4 cash. Participants were notified that they would make a series of non-hypothetical choices and the cash could be used to pay for any purchase made, but we stressed that ultimately the cash was theirs to keep. In cases where the prices exceeded the endowed cash amount, participants were informed that they would be required to pay the additional amount out of pocket. We provided the cash endowment because we were concerned that without it, many people would not participate because shoppers often come to the store without cash, planning to pay with credit card. Of course, providing a cash endowment might inflate WTP values, so we varied the level of endowment to extrapolate what would happen were none given. We also included prices that exceeded the level of the endowment to empirically determine the seriousness of this potential problem. As shown later, the magnitude of the endowment had little effect on the choices people made, and as such, when we moved to the second location in San Antonio, we only used the lower $2 endowment. The endowment of the meat product was an integral part of our design to elicit the VOI, and it also allows us to selectively encourage participation from actual fresh meat consumers. After completing the choice tasks, each participant completed a survey. Participation took approximately 5-10 minutes.

Direct Experiment

In the direct experiment, consumers choose between receiving a steak (or pork chop) with a country-of-origin label versus an identical product without a country-of-origin label, where at the time the decision was made, the consumer did not know the origin of the labeled product they would receive. In essence, our approach elicits consumers' WTP for the origin information

irrespective of the origin obtained. The unlabeled steaks (or pork chops) were placed in a red cooler and the labeled steaks (or pork chops) in a blue cooler. The participants were asked to read a set of instructions and they were verbally notified that the meat products in both coolers "all have been USDA inspected and are of the same size, weight, and quality grade" and the meat product "could be from the U.S., Canada, Mexico, Australia <<Denmark for pork>>, or a combination of these origins." Participants were informed that the only difference between these two options was that the meat product from the blue cooler had a label denoting its country-of-origin whereas meat products in the red cooler contained no origin information. Participants chose from which cooler they wished to pick a steak (or pork chop) without being able to see the contents inside the cooler.

In order to determine consumers' WTP for the country-of-origin information, a multiple price list (MPL) format was used where each participant answered six discrete choice questions. In each choice, the participant could pick from the unlabeled cooler for free (price of $0; this was the free steak (or pork chop) the participant was promised for participation), but choosing from the cooler with the labeled steaks (or pork chops) would cost from $0 to $2.50 in some treatments and $0 to $5 in other treatments.

The MPL was used because it is incentive compatible. Moreover, Andersen et al. (2006) argue the MPL is easily understood and can be quickly answered in our retail setting – something which may not be true of auction-based approaches like the BDM procedure used, for example, by Lusk et al. (2001). Two price variations were used to create a situation in which participants would have to potentially pay out of pocket for the labeled meat product, and to determine the sensitivity of estimates to this experimental design choice (Andersen et al. 2006). After a participant made all six choices, a 6-sided die was rolled to determine which choice was binding

and from which cooler they would receive their meat product. Figure 1 shows the instructions and an example of the choice questions.

Analysis of Direct Experiment Data

As shown in figure 1, the first choice question in the MPL asked respondents whether they wanted a labeled or unlabeled steak where the prices of both were \$0. The next question was the same except the price of the labeled steak increased \$0.50 (or \$1 depending on the treatment). If a respondent choose the labeled steak on the first question but the unlabeled on the second, then their willingness-to-pay for the origin information is between \$0 and \$0.50.

By observing when a respondent switched their choice between the increasingly higher-priced labeled steak and the lower-priced unlabeled steak, the MPL provides a range on respondents WTP (Andersen et al. 2006).[6] In particular, let WTP_i^* be respondent i's true willingness-to-pay for origin information. As shown by Cameron (1988), WTP_i^* can be expressed as:

$$(1) \qquad \boldsymbol{WTP_i^* = \beta + X_i \rho + \varepsilon_i}$$

where β is a constant ; $\boldsymbol{X_i}$ is a vector of explanatory variables including dummy variables describing the particular experimental treatment and variables defining the socio-economic characteristics of individual $\boldsymbol{i}$; $\boldsymbol{\rho}$ is a vector of coefficients; and $\boldsymbol{\varepsilon_i}$ is a stochastic error term.

Let $P_{i,low}$ and $P_{i,high}$ indicate the lowest and highest prices individual i was willing to pay for the labeled steak as indicated by their six discrete choices. Now, we know that $P_{i,low} \leq WTP_i^* < P_{i,high}$. If ε_i is independently and identically distributed Normally with a standard deviation of σ, then the log-likelihood function for an interval censored regression can be written as:

[6] It is also possible to analyze the choices directly and estimate a random utility model, as we do with the indirect approach. However, the two approaches are observationally equivalent (see Cameron, 1988), and as such we analyze the direct choices in WTP-space rather than utility-space as it makes the coefficients easier to interpret.

$$(2) \quad \boldsymbol{LLF^{Direct} = \Phi\left(\left(P_{i,high} - \beta - X_i\rho\right)/\sigma\right) - \Phi\left(\left(P_{i,low} - \beta - X_i\rho\right)/\sigma\right)},$$

where $\boldsymbol{\Phi}$ is the cumulative standard normal distribution function. Estimates of ρ indicate the marginal effect of X_i on WTP_i^*. If the model is estimated with only the constant term, $\boldsymbol{\beta}$, and excluding any other explanatory variables, then the constant is an estimate of the mean WTP for origin information.

Indirect Choice Experiment

The indirect choice experiment uses a question format now common in transportation, environmental, and food economics literatures (see Louviere, Hensher, and Swait, 2000). In particular, respondents choose from eight options between steaks (or pork chops) from specific origins that differed in terms of cost. Figure 2 shows the instructions that were presented and explained to each participant before the choice experiment. In each choice question, respondents were asked to choose between keeping an unlabeled steak (or pork chop) or exchanging it for one of seven steaks (or pork chops) labeled specifically as being from the U.S.; Canada; Mexico; Australia (Denmark for pork); Canada and U.S.; Mexico and U.S.; or Canada, Mexico, and U.S. Participants were also verbally notified that all the meat products were "USDA inspected and are of the same size, weight, and quality grade." The price of the labeled options was varied between the values of \$0, \$2 and \$4, whereas the "keep unlabeled steak" option was the status-quo option equal to a price of \$0 in each choice (this was the free steak respondents were promised for participating).

Because there were seven labeled steak options varying at three price levels each, there were 3^7=2,187 possible choices that could have been presented to respondents. From this full factorial, we selected an orthogonal main-effects fractional factorial that consisted of 27 price

combinations. The design is such that the prices of each steak type are completely uncorrelated across all 27 choice questions. Rather than asking each participant to answer all 27 choice questions, we blocked the choices into three sets of nine to achieve a more manageable sized activity for our in-store participants. Each participant in the indirect valuation treatments randomly received one of the three blocks. To make the choice task incentive compatible, after the participants completed all nine choices, a 9-sided die was rolled to determine the scenario that was binding and actually paid out.

Analysis of Indirect Experiment Data

A random utility framework is used to analyze the choices from the indirect experiment. Specifically, individual $\boldsymbol{i}$ derives utility $\boldsymbol{U_{ij}}$ from choice option *j*:

$$(\mathbf{3}) \quad \boldsymbol{U_{ij} = V_{ij} + \varepsilon_{ij}}$$

where $\boldsymbol{V_{ij}}$ is the deterministic portion of utility described by the attributes of a steak (or pork chop) provided by choice option $\boldsymbol{j}$ and $\boldsymbol{\varepsilon_{ij}}$ is an unobserved stochastic element. The product attributes include price and the country–of-origin: United States (*US*); Canada (*Can*); Mexico (*Mex*); Australia or Denmark (*Aus/Den*); United States and Canada (*USCan*); United States and Mexico (*USMex*); or United States, Canada and Mexico (*USCanMex*). We empirically define $\boldsymbol{V_{ij}}$ as:

$$(\mathbf{4}) \quad \boldsymbol{V_{ij} = \alpha(Price)_{ij} + \beta_1(US)_{ij} + \beta_2(Can)_{ij} + \beta_3(Mex)_{ij} + \beta_4(Aus/Den)_{ij} + \beta_5(USCan)_{ij} + \beta_6(USMex)_{ij} + \beta_7(USCanMex)_{ij}}$$

where $\boldsymbol{\alpha_{ij}}$ is the marginal utility of price (or the marginal utility of income multiplied by negative one), $\boldsymbol{Price_{ij}}$ is the price faced by individual $\boldsymbol{i}$ for option $\boldsymbol{j}$; and $\boldsymbol{\beta_n}$ represents the marginal utilities of the respective origins relative to the unlabeled option. For specification purposes, we

normalized the utility of the "no label" option to zero. Due to this normalization $\boldsymbol{\beta_1}$ is, for example, interpreted as the utility of having a meat product labeled as being from the United States relative to a meat product that does not have an origin label.

The probability of individual $\boldsymbol{i}$ choosing alternative $\boldsymbol{j}$ is:

$$(5) \quad \boldsymbol{Prob}\{\boldsymbol{V_{ij} + \varepsilon_{ij} \geq V_{ik} + \varepsilon_{ik} \ \forall \ k \in C_i}\}$$

where $\boldsymbol{C_i}$ is the choice set for individual $\boldsymbol{i}$ and $\boldsymbol{C_i} = \{\boldsymbol{1, 2 \ldots 8}\}$. The eight choice options include the seven origin-labeled cuts listed previously and the "no label" option. If the random errors in equation (5) are independent and identically distributed across the $\boldsymbol{j}$ alternatives with a type I extreme value distribution, then the probability of consumer $\boldsymbol{i}$ choosing alternative $\boldsymbol{j}$ in the familiar multinomial logit (MNL) model is equal to

$$(6) \quad \boldsymbol{\pi_{ij} = Prob(j \ is \ chosen)} = \frac{\boldsymbol{exp^{V_{ij}}}}{\boldsymbol{\sum_{k \in C} exp^{V_{ik}}}}.$$

Applying the conceptual model developed by Just and Foster (1989) to the discrete choice context, Leggett (2002) derived the value of information (VOI) on which we base the following analysis. In particular, we conceptualize a case in which information improves (via the provision of MCOOL), but where true quality remains constant. In this case, Leggett (2002) shows that the welfare change is:

$$(7) \quad \text{VOI} = \frac{\boldsymbol{1}}{\boldsymbol{\alpha}}\left[\boldsymbol{ln}\sum_{\boldsymbol{j \in C}} \boldsymbol{exp}\left(\boldsymbol{V_j^{1*}}\right) - \boldsymbol{ln}\sum_{\boldsymbol{j \in C}} \boldsymbol{exp}\ (\boldsymbol{V_j^{0*}}) - \sum_{\boldsymbol{j \in C}} \boldsymbol{\pi_j^{0*}}\left(\boldsymbol{V_j^0 - V_j^{0*}}\right)\right]$$

where $\boldsymbol{V_j^{1*}}$ is the consumer's perception of quality after origin labeling, $\boldsymbol{V_j^{0*}}$ is the consumer's perception of quality before origin labeling, $\boldsymbol{V_j^0}$ is the true quality before origin labeling (which happens to also equal $\boldsymbol{V_j^{1*}}$ since it is assumed that consumers have perfect information about

quality after labeling), and $\boldsymbol{\pi_j^{0*}}$ is the probability of choosing option *j* based on pre-labeling perceptions.

The first portion of equation (7), $\frac{\mathbf{1}}{\boldsymbol{\alpha}}\left[\boldsymbol{ln}\sum_{\boldsymbol{j}\in\boldsymbol{C}}\boldsymbol{exp}\left(\boldsymbol{V_j^{1*}}\right)-\boldsymbol{ln}\sum_{\boldsymbol{j}\in\boldsymbol{C}}\boldsymbol{exp}\left(\boldsymbol{V_j^{0*}}\right)\right]$ is the conventional welfare measure based on (potentially incorrect) *perceptions*, something Leggett (2002) refers to as the "anticipated benefit." The last term in equation (7), $\frac{\mathbf{1}}{\boldsymbol{\alpha}}[\sum_{\boldsymbol{j}\in\boldsymbol{C}}\boldsymbol{\pi_j^{0*}}\left(\boldsymbol{V_j^0}-\boldsymbol{Vj0*}\right]$, adjusts this welfare measure for inaccurate perceptions that result from imperfect information. It represents the lost welfare from consumers making a different set of choices than what they would have chosen had they possessed better information.

Equation (7) can be implemented in a variety of ways depending on how one envisions the pre- and post-labeling scenarios playing out. We implement equation (7) so as to provide a calculation of the indirect value-of-origin information that can be compared with our direct elicitation approach. For this calculation, we envision the post-label scenario as representing the blue cooler in which there were steaks/chops from seven labeled origins. In this case, the utilities of the seven options, $\boldsymbol{V_j^{1*}=V_j^0}$, are given by the respective coefficients in equation (4). For example, the utility of the US labeled steak is $\boldsymbol{V_{US}^{1*}=V_{US}^0=\beta_1+\alpha Price_{US}}$, the utility of the Canadian steak is $\boldsymbol{V_{CAN}^{1*}=V_{CAN}^0=\beta_2+\alpha Price_{CAN}}$, and so on. All prices are set at \$2, which is the midpoint of the design.[7] In the pre-label scenario, seen as representing the red cooler in which there were unlabeled steaks/chops, the utility from each steak is assumed to equal $\boldsymbol{V_{Unlabeled}^{0*}=0+\alpha Price_{Unlabled}}$. Recall that the "no label" coefficient was normalized to zero in the econometric model for identification purposes. So that a "choice set size effect" does not drive the welfare estimate, we assume people also chose between seven options in the pre-label scenario, where the utility of all options were given

[7] The VOI calculation is invariant to the choice of prices as long as they are held constant pre- and post-label.

by $\boldsymbol{V^{0*}_{Unlabeled} = 0 + \alpha Price_{Unlabled}}$. Given this set-up, the VOI given by equation (7) can be calculated and compared to the direct approach.

Post-Experiment Questionnaire

After the experimental choices, each respondent completed a brief questionnaire. The survey was the same for all respondents except for the substitution of the word "pork" for "beef" depending on the treatment. The responses from participants were designed to determine basic demographics (gender, education, age, race and income), meat consumption behavior (consumption per week), knowledge of the existence of MCOOL, typical behavior of using COOL information, beliefs about the origins of typically purchased products, and level of ethnocentrism using a modified version of the CETSCALE developed by Shimp and Sharma (1987).

The term "consumer ethnocentrism" is adapted from the classical concept of ethnocentrism but has been specifically tailored toward the study of consumer behavior (Shimp and Sharma, 1987). Consumer ethnocentrism is a physiological term that describes those who believe that it is a moral, patriotic, or American obligation to purchase or support American-made products. Ethnocentrism may lead to heightened demand for origin information that goes beyond simple concerns about product quality or safety. Some have argued that motivations for COOL are primarily driven by ethnocentrism, which might exasperate concerns that the policy is merely a protectionist measure (for some discussion on this issue see Lusk et al. 2006).

The original CETSCALE consisted of 17 Likert-scaled questions. This was, however, too many questions to ask in our store setting. We selected the three items from Shimp and Sharma's (1987) that had the highest factor loadings with the overall ethnocentrism scale. Our

measure of ethnocentrism is calculated by averaging the respondent's answer to three questions where each individuals' responses ranged from "strongly agree" to "strongly disagree" on a five-point Likert-scale. The precise wording of the three agree/disagree statements were: "Americans should not buy foreign products, because this hurts American business and causes unemployment," "It is not right to purchase foreign products because it puts Americans out of jobs," and "A real American should always buy American-made products." We coded the responses such that a higher score implies a higher level of ethnocentrism and a lower score implies a lower level of ethnocentrism.

Results

Summary statistics are shown in table 2. There were 259 participants from Dallas and 267 in San Antonio. More females participated because there were more females in the grocery stores. The majority of participants were between the 45 and 54 years of age, but all age groups (18 to 65+ years) were represented. Racial backgrounds reflect the region as the majority was Caucasian, followed by Hispanic/Latino, African American and other races. Incomes were higher in San Antonio reflective of the neighborhood in which the particular store was located.

Consumers were asked about their knowledge and purchasing behavior regarding country-of-origin labeling. Consumers were asked if "grocery stores [are] currently required by law to indicate the country of origin for all fresh beef (pork) products." Only 14% to 25% of respondents across treatments indicated that a COOL law existed, even though the policy had been in effect for nearly two years (table 2, variable MCOOL knowledge). Most participants did not know whether a COOL policy was in place. Respondents were also asked whether they look for origin labels when buying fresh meat. A majority (60%) stated that they never look for origin

information when shopping for fresh beef or pork products. This low level of knowledge about COOL might imply that focusing people's attention on this attribute could lead consumers to perceive origin to be a more attribute important than in every-day shopping. For example, the country-of-origin effect has been larger in studies that only investigated origin alone as compared to studies that investigated origin in combination with other attributes (Verlegh and Steenkamp 1999).

Consumers were asked three questions to measure ethnocentrism levels, and we averaged the responses to these questions to create an overall ethnocentrism score for each person. As shown in table 2, the respondents in Dallas had higher levels of ethnocentrism than San Antonio participants. Overall, participants were more ethnocentric than not as indicated by the average value being higher than three, the midpoint of the scale.

Direct Value of Information

Table 3 presents the value of information estimated using the direct valuation approach. In particular, table 3 reports the mean WTP for origin information estimated using interval censored regressions. Separate models were estimated for each location and product as well as a combined version that includes all of the direct choice experiment participants. In San Antonio, the mean WTP values were $1.37 and $1.84 per steak for origin information for beef and pork, respectively.[8] Dallas consumers were, on average, WTP $1.10 and $0.93 per choice for beef and pork origin information, respectively. A combined value of $1.37 expresses the value of information for all participants in all of our trials. As expected, our VOI value of $1.37 per steak

[8] Conceptually, our WTP values are in the units of dollars per choice between steaks/chops. In our experiment, we used 12 oz. steaks and chops, so we can equivalently state the WTP values in the units of dollars per 12 oz. steak/chop. In the conclusions, we discuss how these values might be aggregated and what assumptions would have to be made to convert to a dollars per pound basis. In this section, we use the terminology $/choice and $/steak or $/chop interchangeably.

is significantly less than Loureiro and Umberger's (2007) hypothetical WTP estimate of $2.57 per steak for U.S. origin beef.

Table 4 expands the interval censored regression model to further investigate determinants of the value of information and to test for differences across location and commodity. Model 1 reflects the base model and excludes all explanatory variables except a constant. This model shows the mean WTP across all treatments and commodities and locations was $1.37, which is the same thing as the combined model in table 3. Model 2 includes a dummy variable for commodity type (beef versus pork) and location (San Antonio versus Dallas). Model 3 includes further controls to determine the sensitivity of the estimates to our experimental choice variables. A variable was included for the endowment or participation fee provided ($2 versus $4) and price range used in the multiple price list ($0 to $2.50 versus $0 to $5.00). None of these additional variables are significantly related to the VOI.

One interpretation of these results is that the estimated VOI was not unduly influenced by the choice of experimental procedures (and location), and that we are arriving at a relatively stable estimate of people's value for information. Alternatively, it might be tempting to conclude that the results suggest WTP is randomly distributed – not corresponding to any of the variables one might expect to have an influence. As models 4, 5, and 6 show, however, this latter conclusion would be unfounded.

Models 4, 5, and 6 all include a variable for consumer ethnocentrism and more ethnocentric consumers place a significantly higher value on origin information. For example, model 4 shows that as a consumer's level of ethnocentrism rises by one unit, willingness–to-pay for origin information increases by $0.33. Thus, comparing someone having the lowest to someone with the highest ethnocentrism level would change the expected value of information

by $0.33×(5-1) = $1.32. Results suggest patriotic tendencies are a driver of demand for origin information.

Models 5 and 6 both include several variables related to meat consumption levels, gender, education, and income levels. Model 6 differs only by the addition of a dummy variable reflecting the extent of which a consumer uses or looks for a COOL label when shopping for beef or pork products in the grocery store. Both models suggest that consumption levels significantly influenced WTP. Moderate and frequent meat consumers were willing to pay between $1.76-$1.99 and $1.66-$1.90 less than infrequent consumers for COOL information. Perhaps after consumers experience these products they are unable to correlate COOL information as being an important value-added cue relative to other cues. Another possibility is that more frequent meat consumers are generally more aware of industry practices and hence more likely to understand the predominance of U.S. origin meat that existed pre-MCOOL. Consumers who already believe much of the meat on the market is U.S. origin are likely to be WTP less for origin information than consumers who think otherwise. Either way, one important point to highlight is that *ceteris paribus*, the VOI is lower for those people who most often consume meat. To illustrate, we evaluated model 5 at the mean levels of the demographic variables and find that consumers who report eating beef/pork less than once a month have a mean VOI of $2.26, whereas consumers who exhibited moderate or frequent meat consumption levels had mean VOI of only $0.72 and $0.63, respectively.

Model 6 includes variables which are intended to control for use of COOL information when purchasing meat products in a grocery store. The variables 'LOOK Always' and 'LOOK Sometimes' refer to how often a consumers looks for a COOL label when purchasing beef or pork products. We expected consumers who state that they always look for a country of origin

label would be willing to pay more for COOL information as there are likely common underlying factors driving both behaviors (note these behaviors are correlated; one does not necessarily cause the other). As shown in table 4, consumers who claim to always look for COOL information were WTP $1.69 more for COOL information relative to a consumer who never looks.

Model 7 includes a final variable to determine whether consumers' knowledge about the existence of the MCOOL law affected the value they placed on origin information. Consumers were asked if grocery stores were "currently required by law to indicate the country of origin" for all fresh beef or pork products to determine their level of knowledge of MCOOL. The participant response options were "No", "Yes" or "I don't know." As shown in Model 7, the variables 'No MCOOL Law' and 'Don't Know MCOOL Law' were statistically insignificant. Consumers' knowledge about MCOOL did not affect their value of origin information.

Indirect Value of Information

An indirect estimate of the VOI can be obtained from the choice experiment shown in figure 2. Table 5 reports the results of the multinomial logit model estimated to determine the coefficients from equation 4. Recall that participants were asked to chose between 8 different country–of-origin options, one of which was a "no label" option (see figure 2). The results reveal consumers place a significant value on U.S. origin beef and pork. In the combined model, the implied WTP for U.S. relative to the "no label" option is 2.006/0.464 = $4.32 per choice, and the largest discount was placed on meat originating from Mexico (-2.701/0.464 = -$5.82 per choice) relative to the "no label" option. The three least preferred options included meat products that had some

relation with Mexican origination (e.g., Product of Mexico; Product of U.S. and Mexico; Product of U.S., Canada Mexico), which shows strong disapproval of Mexican originated meat.

A supplementary model was estimated to determine how other variables influenced consumer behavior in the indirect choice experiment. Expanding on the variables from Table 5, two interaction effects were added to the model presented in Table 6. One interaction was included with the price effect to determine how much more or less a consumer would pay for a specific origin when he/she received an endowment of $2 relative to $4 prior to the choice experiment. Similar to our discovery in the direct experiment, consumers were not significantly influenced by the endowment. The second interaction with the U.S. origin dummy variable shows that preference for "Product of U.S." was significantly influenced by ethnocentrism levels. In particular, in the combined model, a one unit increase in ethnocentrism is associated with a 0.344/0.402 = $0.86/choice increase in WTP for U.S. meat compared to the no label option.

The values in Table 6 were used to calculate the VOI using equation (7). Table 7 shows the VOI estimates for the different trial locations and product variations. Dallas consumers expressed higher VOI estimates for both beef and pork than San Antonio consumers. The pooled model shows that the VOI across all treatment combinations was $2.26 per steak/chop. The standard errors for these estimates were calculated using the Krinsky-Robb parametric bootstrapping method (Krinsky and Robb, 1986).

Comparing the Direct and Indirect VOI's

The direct approach determined participants VOI by asking them how much they valued "knowing" versus "not knowing" the country of origin information. Alternatively, the indirect

approach asked participants to choose a specific origin that they would prefer and the VOI estimate was indirectly derived using the conceptual models of Foster and Just (1989) and Leggett (2002).

The two approaches yielded significantly different estimates of the value of origin information. The overall mean VOI estimate derived from the direct approach was $1.37 per steak, whereas the indirect approach resulted in the larger VOI estimate of $2.26 per steak. Thus, we find that the calculated value of information contained in country of origin labels for beef and pork is 40% lower using the direct elicitation method as compared to the conventional approach. Moreover, when looking at the various treatment combinations, all the direct VOI values from each specific treatment (Table 3) were less than the respective indirect VOI values (Table 7).

The difference between the two approaches could result from a myriad of reasons. One possibility is that the underlying assumptions in the Foster and Just (1989) and Leggett (2002) conceptual models may not match the way consumers actually value information insofar as consumers may use behavioral decision rules that deviate from strict rationality requirements. The divergence could arise from a form of procedural invariance often observed in research on behavioral economics (i.e., the framing of the decision task influences decisions). Procedural invariance could arise because the specific mention of countries in the indirect approach might trigger different inferences about product quality (see Gao and Schroeder, 2009, for an example of how the presence/absence of one attribute may lead consumers to make inferences of others). The complexity of the decision tasks varies across the direct and indirect approaches. The indirect approach involved nine questions, each with eight options in each scenario, whereas the direct approach had six questions with two options in each scenario. Alternatively, the way we chose to implement the indirect approach, including our assumptions about the utility function,

the distribution of the stochastic error term, and the structure of the choice set could explain the divergence.

The current analysis cannot conclusively identify *why* the differences exist between the VOI implied by the direct and indirect approaches, but this is a ripe area for future research. The advantage of the direct elicitation approach is that it requires fewer assumptions to obtain the measure of interest. The downside is that the measure obtained is confined to the vagaries of the experimental setting constructed, and cannot be extrapolated to other settings which do not resemble the experiment. The same is not true of the indirect choice experiment. For example, once one has the utility estimates in table 6, then the indirect approach to valuing information can be used assuming grocery shoppers faced a different set of choices than was actually presented in our experiment.

Discussion and Conclusion

The objective of this study was to determine how the value of information changed when consumers were directly asked as compared to the more conventional indirect valuation approach. We also determined consumers' value of information (VOI) for beef and pork products after the implementation of the mandatory country of origin labeling (MCOOL).

Consumers exhibited lower VOI in the *direct* approach ($1.37/steak or chop) versus the *indirect* approach ($2.26/steak or chop). It remains to be determined exactly why the differences exist, but the finding could result from a number of factors. Regardless of the elicitation approach, results were insensitive to different experimental manipulations such as the amount of money given to people to participate.

A key motivating factor for this study was the need to provide an estimate of the benefits of the MCOOL policy that can be compared with the costs. Such an estimate is badly needed. For example, in their final rule on MCOOL, the USDA concluded, "The expected benefits from implementation of this rule are difficult to quantify. The Agency's conclusion remains unchanged, which is that the economic benefits will be small and will accrue mainly to those consumers who desire country of origin information."[9]

Indeed, the benefits are difficult to quantify, and as alluded to earlier the calculations "involve difficult methodological and philosophical problems" Golan et al. (2000). The first question to ask is whether the direct or indirect approach provides the most relevant value of information. At this point, it is not clear that one is objectively superior to another (although the direct approach requires fewer assumptions about utility function form and market structure), and as such the difference between the two might be viewed as providing an estimate of the sensitivity of VOI from two plausibly acceptable methods (see Lusk and Marette, 2010).

Another issue of consideration is the unit of measurement. Our valuations estimates were theoretically calculated in the units of dollars per choice between 12 oz. steaks/chops. To arrive at an aggregate benefit measure, one would need to make an assumption about the aggregate number of choices U.S. consumers make over some time period while also assuming something about how the value of information changes with the quantity (or cut) of meat involved in the choice. To get a sense of the issues involved, consider two extreme cases (neither of which is particularly desirable). The first extreme is to conclude that one cannot extrapolate beyond the context of our experiment which measured the VOI for 12 oz steaks. This assumes one cannot extrapolate to WTP for a half- or one-pound steak because these sizes were not studied in the experiment. The other extreme is to assume the VOI is proportional to the size of the steak such

[9] http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5074925

that the value of a one-pound steak is 16/12ths that of a 12 oz steak. This is not a problem that is unique to our study, but it is an issue in need of future research (i.e., whether the value for an attribute varies with the size or quantity of the commodity).

Conceptually, the units of measurement are dollars per choice, and under the conventional assumption that "a choice is a choice," one can convert to a measure of dollars per pound (so that an aggregate measure can be obtained) by determining the average number of pounds a consumer buys in a single choice. Using household purchase diaries, Parcell and Schroeder (2007) reported that consumers choose to buy about 1.9 lbs of steak and about 2.3 lbs of pork chops on each shopping occasion. If one is willing to accept the assumption that the VOI is (within reasonable limits) independent of the quantity of steak/chops purchased, this would imply a VOI of 1.37/1.9= $0.72/lb for steak from the direct experiment, 1.37/2.3 = $0.59 for pork chops for the direct experiment, 2.26/1.9 = $1.18/lb for steak from the indirect experiment, and 2.26/2.3 = $0.98 for pork chops from the indirect experiment.

Further complicating matters is the fact that VOI may change with the type of meat purchased and that people choose different quantities when buying different types of meat. For example, is the VOI larger or smaller for steak than ground beef? Again, it is useful to consider two extremes. One option is that the VOI is the same regardless of the cut of meat. This assumption may not be too tenuous given that we find statistically similar VOI between beef and pork. Another option is to assume VOI is proportional to the value of the cut. If, for example, steaks sell for an average of $7/lb and ground beef sells for $3/lb, then the VOI could be scaled by 3/7ths for ground beef.

Another issue to consider when extrapolating to an aggregate measure is that more frequent consumers of beef and pork had significantly lower VOI. Taking the mean VOI across

a sample of consumers will not yield the same estimate as taking the mean VOI across packages of meat purchased because some consumers are much more likely to buy meat than others. If "a choice is a choice" and some consumers make more meat buying choices than others, then this fact should be taken into consideration when calculating the mean VOI to be multiplied by the aggregate volume of meat choices. Recall our finding from the direct choice experiment that infrequent steak/chop consumers (who consumed steaks/chops once a month or less) had a VOI of $2.62/choice whereas moderate steak/chop consumers (who consumed steaks/chops between two and four times a month) had a VOI of $0.72/choice, and heavy steak/chop consumers (who consumed steak/chop at least once weekly) had a VOI of $0.63/choice. The mean VOI weighted by the volume of meat consumption is $2.62\times(1/9) + 0.72\times(3/9) + 0.63\times(5/9) = \$0.88$/choice, which is lower than the mean WTP across the entire sample of consumers, which was $1.37/choice. Given that roughly 2 lbs of meat are purchased with each choice, this implies a consumption-weighted average VOI of about 0.88/2 = $0.44/lb for steaks and chops from the direct experiment.

In determining the aggregate benefits of the policy, another perplexing and philosophical issue remains. Approximately 82% of our subjects were not aware of the existence of a mandatory country of origin labeling. This is despite the fact that the policy had been in place for over two years. How can consumers derive value from an information policy when they do not even know it exists? Moreover, how can information be so valuable when 60% of subjects claim to never look for origin labels when buying meat?

One argument that could be made is that some consumers only express a positive VOI for origin in the context of our experiment – perhaps because of social pressure or because their attention was focused on the attribute – but such a value does not exist in routine shopping

experiences. For example, it might be argued that the 82% of our sample who were unaware of the MCOOL policy actually place no value on the policy (after all, how can they value an information policy they do not know exists?) *even though* expressed some positive value in our experiment. Under such reasoning, only 100-82 = 18% of our sample "truly" values the origin information provided by MCOOL. Assuming consumers who are and are not knowledgeable of MCOOL have a similar value of information (a fact supported by model 7 in table 4), then one argument is that the "true" average VOI provided by MCOOL is 0.82×$0.00 + 0.18×$1.37 = $0.25/steak or chop in the direct approach and 0.82×$0.00 + 0.18×$2.26 = $0.41/steak or chop in the indirect approach. These figures fall even lower if one uses the consumption-weighted average VOI and adjusts for the typical quantity purchased in each choice, in which case the VOI provided by MCOOL is 0.82×$0.00 + 0.18×$0.44 = $0.08/lb in the direct approach.

Even this lower-bound calculation which assigns 82% of the sample a value of zero and further reduces the figure by adjusting for the fact that consumers normally buy about 2 lbs/choice would imply a large aggregate benefit measure. For example, about 19 billion pounds of beef are sold in the U.S. each year, about 20% of choice is accounted for by steaks. Even if the VOI is zero for non-steak cuts, these lower-bound estimates imply an aggregate benefit measure of $0.08×0.20×19 billion = $309 million. If the VOI is the same for all non-steak cuts as it is for steaks, then the aggregate benefit measure is $0.08×19 billion = $1.5 billion. To put these figures in perspective, and highlight the impact of alternative assumptions and adjustments on economic welfare conclusions, the aggregate costs of MCOOL to the beef industry have been estimated at about $1.1 billion (Informa Economics, 2010).

Despite the potential size of the aggregate benefit measure, it need not necessarily justify government-mandated labels. Critics of MCOOL, for example, have asked "where is the market

failure?" If consumers value origin information and are willing to pay for it, there are not insurmountable obstacles to enterprising retailers and livestock producers wishing to profit by providing origin information. Moreover, the fact that our benefit measures were significantly influenced both statistically and economically by ethnocentrism casts doubt on the argument that consumers need origin labels to properly judge safety and quality, but rather the value of origin labels seems to stem largely from patriotic and protectionist tendencies.

This paper cannot possibly solve all the difficult philosophical issues surrounding an aggregate estimate of the benefits of MCOOL. What our study shows is that some consumers place a non-trivial value on origin information for beef and pork. This was true for the traditional approach of inferring the value of information from discrete choices between steaks of different origins, and to a lesser extent also true of our new approach which directly elicited the value of information. Future research is aimed at uncovering the factors causing the difference between the direct and indirect value of information approaches, and in resolving some of the challenging questions related to how people can express a positive value for origin information in an experiment and yet be unaware of the MCOOL policy.

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You have been given a free 12 oz. steak and $2 cash. The money is yours to keep as compensation for your time. You do **not** have to use it in our study.

Beside me are two coolers containing 12oz steaks that have all been USDA inspected and are of the same size, weight, and quality grade. Both coolers contain the same steak, however one contains labels and the other does not.

- Option RED is a steak from the *Red* cooler. Your free steak is from this cooler.
  - Steaks in the *Red* cooler do not have any information about country of origin. The steak could be from the U.S., Canada, Mexico, Australia, or a combination of these origins but you will not know exactly which country the steak is from.
  - In the *Red* cooler, likelihood of a steak being from U.S., Canada, Mexico, Australia, or a combination of these origins is similar to the likelihood of finding steaks from one of these locations in a typical grocery store in the U.S.
- Option BLUE is a steak from the *Blue* cooler. You can pay a price to exchange your free steak for one from this cooler.
  - In the *Blue* cooler, each steak has a label indicating its origin. Each steak will have a label indicating whether it is from the U.S., Canada, Mexico, Australia, or a combination of these origins.

Please answer the following six questions. Note: these questions are **not** hypothetical. We will roll a die and pick one of the six choices, and you will receive the option you chose. If you choose option BLUE, you can choose a steak from the *Blue* cooler and you will be expected to pay the price.

1. Do you prefer option RED or BLUE? (Choose one)

Option RED	Option BLUE
keep steak from *Red* cooler and pay $0	choose steak from *Blue* cooler and pay **$0**
□	□

2. Do you prefer option RED or BLUE? (Choose one)

Option RED	Option BLUE
keep steak from *Red* cooler and pay $0	choose steak from *Blue* cooler and pay **$0.50**
□	□

3. Do you prefer option RED or BLUE? (Choose one)

Option RED	Option BLUE
keep steak from *Red* cooler and pay $0	choose steak from *Blue* cooler and pay **$1.00**
□	□

4. Do you prefer option RED or BLUE? (Choose one)

Option RED	Option BLUE
keep steak from *Red* cooler and pay $0	choose steak from *Blue* cooler and pay **$1.50**
□	□

5. Do you prefer option RED or BLUE? (Choose one)

Option RED	Option BLUE
keep steak from *Red* cooler and pay $0	choose steak from *Blue* cooler and pay **$2.00**
□	□

6. Do you prefer option RED or BLUE? (Choose one)

Option RED	Option BLUE
keep steak from *Red* cooler and pay $0	choose steak from *Blue* cooler and pay **$2.50**
□	□

Figure 1. Example Direct Choice Experiment Task

You have been given a free 12 oz. pork chop and $2 cash. The money is yours to keep as compensation for your time. You do **not** have to use it in our study.

Beside me are 2 coolers containing 12oz pork chops that have all been USDA inspected and are of the same size, weight, and quality grade. Both coolers contain the same pork chop, however one contains labels and the other does not. Your pork chop came from the RED cooler and it does not have a country of origin label. Your pork chop could be from the U.S., Canada, Mexico, Denmark, or a combination of these origins but you will not know exactly which country the pork chop is from. The BLUE cooler contains pork chops with country of origin labeling information.

You can keep your pork chop (and pay nothing) or exchange it for a pork chop from a specific country. Please answer the following 9 questions. Note: these questions are **not** hypothetical. We will roll a die and pick one of the nine choices, and you will receive the option you chose. For example, if you choose a pork chop from country X for $4, you will exchange your free pork chop for the labeled pork chop from country X and you will pay the price of $4.

Scenario 1: Which option do you prefer? (Choose one)

Keep unlabeled pork chop	Product of U.S.	Product of Canada	Product of Mexico	Product of Denmark	Product of Canada and U.S.	Product of Mexico and U.S.	Product of Canada, Mexico, and U.S.
⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩
$0	$0	$0	$0	$0	$0	$0	$0
❑	❑	❑	❑	❑	❑	❑	❑

Scenario 2: Which option do you prefer? (Choose one)

Keep unlabeled pork chop	Product of U.S.	Product of Canada	Product of Mexico	Product of Denmark	Product of Canada and U.S.	Product of Mexico and U.S.	Product of Canada, Mexico, and U.S.
⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩
$0	$0	$2	$2	$2	$2	$2	$0
❑	❑	❑	❑	❑	❑	❑	❑

Scenario 3: Which option do you prefer? (Choose one)

Keep unlabeled pork chop	Product of U.S.	Product of Canada	Product of Mexico	Product of Denmark	Product of Canada and U.S.	Product of Mexico and U.S.	Product of Canada, Mexico, and U.S.
⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩
$0	$0	$4	$4	$4	$4	$4	$0
❑	❑	❑	❑	❑	❑	❑	❑

Scenario 4: Which option do you prefer? (Choose one)

Keep unlabeled pork chop	Product of U.S.	Product of Canada	Product of Mexico	Product of Denmark	Product of Canada and U.S.	Product of Mexico and U.S.	Product of Canada, Mexico, and U.S.
⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩
$0	$2	$0	$0	$4	$2	$0	$4
❑	❑	❑	❑	❑	❑	❑	❑

Figure 2. Example Indirect Choice Experiment Task

Table 1. Experimental Treatments

					Number of Participants	
Treatment	Approach	Endowment	Price Range	Commodity	Dallas	San Antonio
1	direct	$2	$0 to $2.5	beef	20	45
2	direct	$4	$0 to $2.5	beef	22	-
3	direct	$2	$0 to $5	beef	20	45
4	direct	$4	$0 to $5	beef	23	-
5	indirect	$2	$0 to $4	beef	14	29
6	indirect	$4	$0 to $4	beef	15	-
7	indirect	$2	$0 to $4	beef	14	29
8	indirect	$4	$0 to $4	beef	14	-
9	indirect	$2	$0 to $4	beef	14	28
10	indirect	$4	$0 to $4	beef	14	-
11	direct	$2	$0 to $2.5	pork	21	32
12	direct	$2	$0 to $2.5	pork	20	30
13	indirect	$2	$0 to $5	pork	16	10
14	indirect	$2	$0 to $4	pork	17	10
15	indirect	$2	$0 to $4	pork	15	9
# Observations					259	267

Table 2. Summary Statistics

		Dallas		San Antonio	
Variable	Definition	Beef	Pork	Beef	Pork
Gender	Female	58%	62%	49%	48%
Age	18-34 years old	22%	16%	24%	15%
	35-44 years old	24%	21%	22%	30%
	45-54 years old	28%	31%	31%	32%
	55-64 years old	20%	18%	18%	18%
	65 years or older	7%	13%	5%	5%
Race	African American	8%	8%	6%	3%
	Caucasian	71%	78%	61%	68%
	Hispanic/Latino	15%	12%	28%	26%
	Other	6%	2%	5%	1%
Income	Less than $25,000	17%	12%	8%	7%
	$25,000 to $99,999	61%	62%	50%	47%
	More than $100,000	19%	21%	39%	44%
Degree	Bachelors' degree or higher	36%	35%	62%	66%
Eat Beef (Pork)	4 or more times per week	21%	2%	20%	0%
	2-3 times per week	52%	20%	47%	15%
	Once per week	17%	35%	16%	33%
	2-3 time per month	7%	27%	14%	26%
	Once a month or less	2%	15%	3%	23%
	Never	1%	1%	0%	2%
MCOOL Knowledge	Yes	25%	18%	14%	15%
	No	26%	22%	24%	16%
	I don't know	49%	60%	62%	68%
Look for COOL	Every time	12%	13%	11%	8%
	Sometimes	30%	20%	32%	32%
	Never	58%	66%	57%	60%
Ethnocentrism	1=Low Ethnocentrism; 5=High Ethnocentrism	3.76	3.50	3.12	3.14
# Observations		170	89	176	91

Table 3. Value of Information for the Direct Approach from Interval Censored Regressions

		Dallas		San Antonio	
Parameter	Combined[a]	Beef	Pork	Beef	Pork
Constant	1.368**	1.019[a]	0.925[b]	1.369**	1.836**
	(0.183)[c]	(0.572)	(0.494)	(0.212)	(0.383)
Scale (Std. Dev)	2.814	4.595	2.842	1.916	2.781
	(0.200)	(0.774)	(0.549)	(0.196)	(0.417)
# Observations	277	84	41	90	62

** Denotes 1% significance

[a] P-value for parameter is 0.0746

[b] The p-value for the parameter is 0.0613

[c] Numbers in parentheses are standard errors

Table 4. Direct Beef and Pork Interval Censored Regression Estimates

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	1.368**	1.243**	1.540	0.400	1.321	1.355	1.340
	(0.183)[a]	(0.376)	(0.850)	(1.024)	(1.308)	(1.293)	(1.403)
Beef[b]		-0.153	-0.122	-0.129	0.210	0.060	0.169
		(0.380)	(0.400)	(0.397)	(0.448)	(0.444)	(0.454)
San Antonio[c]		0.391	0.334	0.571	0.325	0.355	0.368
		(0.371)	(0.422)	(0.437)	(0.440)	(0.434)	(0.444)
Endowment[d]			-0.080	-0.101	-0.081	-0.121	-0.066
			(0.307)	(0.305)	(0.306)	(0.303)	(0.316)
Price Range[e]			-0.201	-0.259	-0.255	-0.203	-0.248
			(0.365)	(0.364)	(0.358)	(0.355)	(0.359)
Ethnocentrism				0.332*	0.340*	0.279	0.342*
				(0.167)	(0.166)	(0.165)	(0.166)
Eat Frequent[f]					-1.903**	-1.663*	-1.877*
					(0.746)	(0.739)	(0.747)
Eat Moderate[f]					-1.995**	-1.760**	-1.959**
					(0.707)	(0.700)	(0.709)
Female[g]					0.291	0.283	0.306
					(0.363)	(0.358)	(0.365)
Degree[h]					0.809*	0.738*	0.791
					(0.392)	(0.389)	(0.393)
High Income[i]					0.096	0.048	0.100
					(0.626)	(0.620)	-0.626
Med Income[i]					0.160	0.053	0.147
					(0.573)	(0.565)	(0.574)
Look Always[k]						1.690**	-
						(0.667)	-
Look Sometimes[k]						0.236	-
						(0.398)	-
No MCOOL Law[l]							0.122
							(0.566)
Don't Know MCOOL Law[l]							-0.198
							(0.483)
Scale (Std. Dev)	2.814	2.813	2.798	2.775	2.698	2.653	2.697
	(0.200)	(0.200)	(0.200)	(0.198)	(0.192)	(0.189)	(0.192)
# Observations	277	277	277	277	277	277	277

[a] Numbers in parentheses are standard errors; ** and * Denote 1% and 5% significance level, respectively
[b] Effect of beef trial versus pork trial
[c] Effect of San Antonio trial versus Dallas trial
[d] Level of endowment given to participant (either $2 or $4) in experiment
[e] Effect of price range of ($0.00 to $2.50) relative to price range of ($0.00 to $5.00) in experiment
[f] Effect of eating beef or pork f relative to infrequently (Less than once per month)
[g] Effect of females relative to males
[h] Effect of having a Bachelors degree or higher relative to participants with no college degree
[i] Effect of income level relative to participants with an income of less than $25,000
[k] Effect of frequency of looking for COOL label when purchasing meat relative to never looking
[l] Effect relative to believing that MCOOL law exists

Table 5. Multinomial Logit Estimates for Indirect Approach Data in Dallas and San Antonio

		Dallas		San Antonio	
Parameter	Combined[a]	Beef	Pork	Beef	Pork
Price (α)	-0.464**	-0.493**	-0.473**	-0.415**	-0.621**
	(0.021)[b]	(0.040)	(0.052)	(0.032)	(0.073)
Product of US (β_1)	2.006**	1.756**	1.296**	3.092**	2.857**
	(0.074)	(0.125)	(0.153)	(0.170)	(0.261)
Product of Canada (β_2)	-0.752**	-1.251**	-1.890**	0.684**	-0.128
	(0.113)	(0.204)	(0.319)	(0.209)	(0.326)
Product of Mexico (β_3)	-2.701**	-4.642**	-3.606**	-0.929**	-2.128**
	(0.264)	(1.003)	(0.714)	(0.351)	(0.730)
Product of Australia (or Denmark) (β_4)	-0.799**	-2.353**	-1.202**	0.962**	-1.772**
	(0.113)	(0.327)	(0.236)	(0.195)	(0.605)
Product of US and Canada (β_5)	0.018	-0.577**	-0.744**	1.471**	0.386
	(0.088)	(0.159)	(0.201)	(0.181)	(0.281)
Product of US and Mexico (β_6)	-1.541**	-2.578**	-2.374**	0.073	-1.058
	(0.153)	(0.363)	(0.391)	(0.242)	(0.447)
Product of US, Canada and Mexico (β_7)	-1.073**	-1.322**	-2.680**	0.184	-0.191
	(0.128)	(0.210)	(0.459)	(0.238)	(0.335)
Log-Likelihood	-2824	-850	-516	-1029	-283
# Choice Observations	2232	765	432	774	261

** Denotes statistical significance of 1% level or lower.

[a] Combined model includes all participants in both Dallas and San Antonio trials

[b] Numbers in parentheses are standard errors

Table 6. Multinomial Logit Interaction Estimates for Indirect Approach Data in Dallas and San Antonio

		Dallas		San Antonio	
Attribute	Combined[a]	Beef	Pork	Beef	Pork
Price (α)	-0.402**	-0.578**	-0.485**	-0.420**	-0.644**
	(-0.057)[b]	(-0.098)	(-0.053)	(-0.032)	(-0.075)
Product of US (β_1)	0.834**	0.348	-0.001	2.090**	1.434**
	(0.162)	(0.302)	(0.368)	(0.293)	(0.459)
Product of Canada (β_2)	-0.743**	-1.239**	-1.879**	0.689**	-0.106
	(0.113)	(0.204)	(0.319)	(0.209)	(0.327)
Product of Mexico (β_3)	-2.694**	-4.632**	-3.596**	-0.923**	-2.114**
	(0.264)	(1.004)	(0.715)	(0.351)	(0.731)
Product of Australia (or Denmark) (β_4)	-0.791**	-2.343**	-1.190**	0.967**	-1.761**
	(0.113)	(0.327)	(0.237)	(0.195)	(0.605)
Product of US and Canada (β_5)	0.029	-0.563**	-0.732**	1.478**	0.411
	(0.088)	(0.159)	(0.201)	(0.181)	(0.282)
Product of US and Mexico (β_6)	-1.534**	-2.569**	-2.364**	0.078	-1.045*
	(0.153)	(0.363)	(0.391)	(0.242)	(0.447)
Product of US, Canada and Mexico(β_7)	-1.064**	-1.311**	-2.670**	0.188	-0.167
	(0.128)	(0.210)	(0.459)	(0.238)	(0.336)
Price * Endowment	-0.030	0.024	-	-	-
	(0.022)	(0.029)	-	-	-
Product of US * Ethnocentrism	0.344**	0.388**	0.378**	0.308**	0.456**
	(0.043)	(0.077)	(0.099)	(0.074)	(0.127)
Log-Likelihood	-2791	-837	-509	-1020	-277
# Observations	2232	765	432	774	261

** Denotes statistical significance of 1% level or lower.
* Denotes statistical significance of 5% level or lower.
[a] Combined model includes all participants in both Dallas and San Antonio trials
[b] Numbers in parentheses are standard Errors

Table 7. Value of Information Estimates from the Indirect Approach

	Dallas		San Antonio	
Combined[a]	Beef	Pork	Beef	Pork
2.257	2.999	2.572	1.876	2.253
(0.125)[b]	(0.380)	(0.369)	(0.177)	(0.283)
[2.037, 2.514][c]	[2.535, 4.018]	[1.990, 3.401]	[1.583, 2.261]	[1.776, 2.895]

[a] Combined includes all participants from Dallas and San Antonio
[b] Numbers in parentheses ( ) are standard errors obtained via the Krinsky-Robb method.
[c] Numbers in brackets [ ] are 95% confidence intervals