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A study of the factors that influence consumer attitudes toward beef products using the conjoint market analysis tool[1]

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ABSTRACT: This study utilizes an analysis technique commonly used in marketing, the conjoint analysis method, to examine the relative utilities of a set of beef steak characteristics considered by a national sample of 1,432 US consumers, as well as additional localized samples representing undergraduate students at a business college and in an animal science department. The analyses indicate that among all respondents, region of origin is by far the most important characteristic; this is followed by animal breed, traceability, animal feed, and beef quality. Alternatively, the cost of cut, farm ownership, the use (or nonuse) of growth promoters, and whether the product is guaranteed tender were the least important factors. Results for animal science undergraduates are similar to the aggregate results, except that these students emphasized beef quality at the expense of traceability and the nonuse of growth promoters. Business students also emphasized region of origin but then emphasized traceability and cost. The ideal steak for the national sample is from a locally produced, choice Angus fed a mixture of grain and grass that is traceable to the farm of origin. If the product was not produced locally, respondents indicated that their preferred production states are, in order from most to least preferred, Iowa, Texas, Nebraska, and Kansas.

Key words: conjoint market analysis, consumer preferences, country of origin, steak quality, traceability, transaction cost

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INTRODUCTION

The imminent arrival of a national animal identification system, advances in traceability, and increased consumer affluence will likely speed the transition of the US beef system from a price-based commodity system to one based on characteristics such as quality, method of production, and region of origin. As this new production chain develops and the potential to brand beef products becomes a realistic possibility, consumers will be in a position to demand greater variety in product offerings, they will likely be more discriminating in their choices, and they will offer greater price premiums to producers generating beef products with those characteristics they most value (Grunert, 1997; Umberger, 2004, 2006; Farm Foundation, 2006). In other words, as consumers are exposed to beef products with a greater variety of features and attributes that are preferred, they will be willing to pay more for those characteristics they value.

Of course, branding and product differentiation will only be rewarded if the consumer of the product is willing to pay for the information or characteristics associated with the information that is provided by a brand. This suggests that more needs to be done to examine whether and how information about these and other factors influence consumer attitudes, preferences, and price sensitivity to beef products.

To examine these issues and address the questions raised above, we employed a widely used marketing methodology, the conjoint analysis technique, which has been shown to be quite useful as a market research and analysis tool for a variety of consumer goods. For example, whereas it is most widely used in marketing analysis and product development applications for consumer goods such as athletic apparel, automobiles, and

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consumer electronics, conjoint analysis has begun to be used for a variety of agricultural products. The features of products as diverse as ostrich meat, crawfish, honey, and cheese have been examined using conjoint analysis and, in some cases, the products have been customized or adapted to better meet the demands of consumer tastes and preferences (Gillespie et al., 1998; Murphy et al., 2000; Harrison et al., 2002; Tendero and Bernabéu, 2005).

The outcomes of our market analysis provide useful information about the importance of traceability in general. The research also provided additional information about the relative importance (i.e., utility) of information about various product characteristics such as region of origin, producer information, animal feed, genetics, hormone use, and similar factors that might be associated with a particular beef product.

MATERIALS AND METHODS

Animal Care and Use Committee approval was not obtained for this study because the data were obtained from a market analysis and did not involve the use of any animals.

An Overview of Conjoint Analysis

Conjoint analysis is a multivariate statistical analysis technique that has been used in the field of marketing for almost 3 decades to quantify consumer preferences for new products and services (Huber, 1987). Steak is a product, and like all products it consists of several attributes that can be varied in different potential configurations to appeal to different consumers. For example, a steak might be produced to sell at a certain price, with a given level of marbling, or with characteristics that are associated with the way the animal was treated or nurtured. Some features, such as the feed given to the animal or the living conditions of the animal, may be important to some people but less important to others. Conjoint analysis can help to quantify the utility that a potential steak buyer has for one or more of the attributes of a steak. By allowing producers to quantify the utility of the steak features, an optimum bundle of these features can be identified and used to design the preferred steak.

Conjoint analysis is a statistical technique that assumes that consumers will evaluate the value of a product by combining the utility of each of the product's attributes in a combinatorial evaluative process. A significant amount of research has been published that has examined the application of conjoint analysis for quantifying the market potential for new and improved products that are in the design or development stage (Cattin and Wittink, 1982; Wittink et al., 1994). Conjoint analysis has commonly been used in the development process for new products, where features might be dropped or added and combined or altered to identify the optimal mix of features (Hauser and Simmie, 1981; Page and Rosenbaum, 1987; Wind et al., 1989; Urban et al., 1990, 1996; Green and Krieger, 1991; Mahajan and Wind, 1992; Wittink et al., 1994; Moore et al., 1999). Conjoint analysis has been used in this way to measure the relative utility of product features, to identify tradeoffs that should be made in product features, and to conduct competitive benchmarking (Weinberg, 1990).

Product pricing and market segmentation analyses are other common applications of conjoint analysis (Hauser and Simmie, 1981; Green and Krieger, 1989, 1991). Significant research has been conducted on different methodologies and techniques for conducting and analyzing conjoint analysis projects (Akaah and Korgaonkar, 1983; Agarwal, 1988; Akaah, 1991; Agarwal and Green, 1991; Green et al., 1991; Johnson, 1991; Tumbush, 1991; Orme, 1999). Most important for this project is the research that has examined the different approaches used to collect data on consumer preferences. Research has shown that, compared with non-computer-based approaches, computer-supported conjoint analysis tools allow researchers to examine a larger number of product attributes. This means that much more complex products can be evaluated. Two types of computer-based survey techniques were used in this research: Adaptive conjoint analysis (**ACA**) was used for the first round of data collection and choice-based conjoint (**CBC**) was used for the last 2 rounds of data collection. The results from ACA and CBC analyses are comparable; however, there are differences between these techniques that should be considered when interpreting the results. Most notable, ACA is less sensitive to the importance of price and often produces results that understate the importance of price when this technique is compared with other techniques or to actual consumer behavior (see Pinnell, 1994, for a discussion of ACA price sensitivity).

Adaptive Conjoint Analysis Methodology

Adaptive conjoint analysis is designed to adapt the survey questions for each respondent by learning about the preference structure that each respondent has for product attributes (Sawtooth Software, 2002). The ACA procedure uses a self-explicated model where the subject provides a rating of the preference he or she has for each level of each attribute and also provides a rating of the overall importance of each attribute (Hair et al., 2006). These ratings are used to generate the stimulus profiles with subsequent questions adapted to focus on factors that are of greater importance to the respondent. This approach reduces the number of questions; therefore, ACA allows the researcher to examine product combinations that have many more attributes than would be possible using manual approaches (Johnson, 1987).

Adaptive conjoint analysis has been shown to be reliable and to offer superior results to other approaches for the types of analyses being performed in this project (Agarwal and Green, 1991). The ACA survey includes

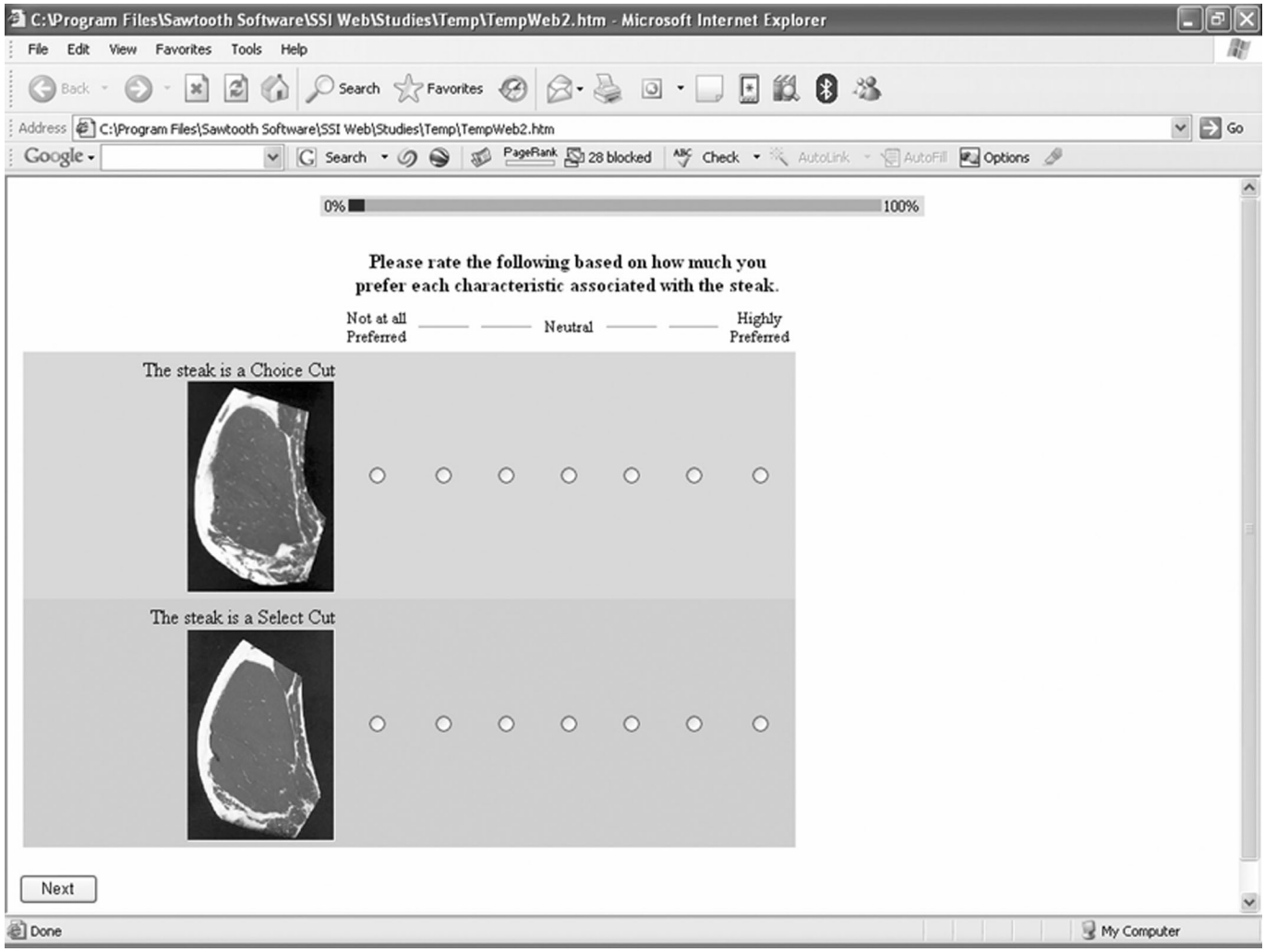


Figure 1. An example of a survey question asking the respondent to rate his or her preference for a product factor.

4 major sections. In the first section, the participant rates their preference levels by assigning a rating score on a 7-point scale. In the second section, the survey poses a question that asks the respondent to evaluate the importance of an attribute in terms of the relative difference in the levels for each attribute. The third section consists of a set of trade-off questions where the participant is asked to choose between a pair of products. This section is the core of the conjoint analysis process and is designed to force the respondent to make tradeoffs between pairs of grouped attributes. The respondent is asked to rate which grouping is preferred by entering a rating score indicating the degree to which he or she prefers each hypothetical product. Every time the respondent completes a paired-comparison question, the overall estimate of the respondent's preference for each attribute is automatically updated. In the fourth section, the survey instrument will adapt to pick the attributes that are determined to be most important based on earlier responses from the subject. The survey asks the respondent to estimate the likelihood of buying each combination of attributes by entering a numeric value that represents the probability that he or she would buy the product. Note that because the adaptive method focuses on the choice between 2 products, it is not particularity well suited to examine the impact of small price changes. Examples of the types of questions posed during each section of the survey are shown in Figures 1 through 4.

Choice-Based Conjoint Analysis Methodology

Choice-based conjoint is designed to create choice scenarios that mimic the actual purchasing process (Sawtooth Software, 2005). The procedure asks the respondent to indicate preferences by having the respondent choose from sets of concepts. Because of this, the CBC evaluation process is closest to the processes buyers engage in when making actual purchase decisions (Hair et al., 2006). Choice-based conjoint is most frequently used to examine relationships between price and product demand and is most useful when the relationship between price and demand differs from brand to brand. Unlike ACA, which adapts the questions on the survey

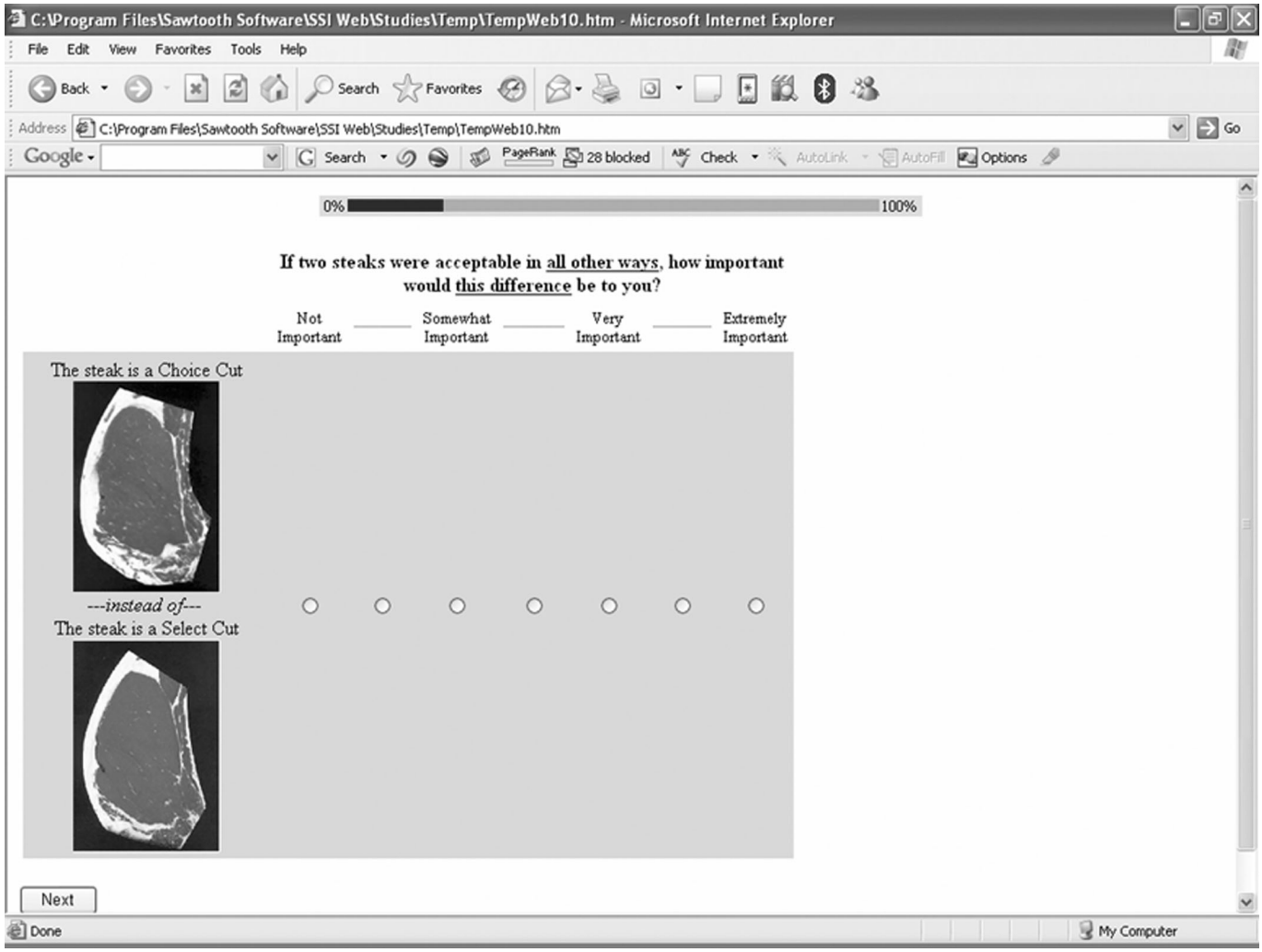


Figure 2. An example of a survey question asking the respondent to rate the importance of a product factor.

for each individual, CBC analysis presents the same survey questions to all participants. The trade-off with this technique is that whereas it presents a more realistic full-choice set of comparisons, the larger number of factors being evaluated in the full-profile model can make the decision-making process more difficult for subjects. Nevertheless, the greater realism associated with making evaluations using the full-profile CBC model was deemed to be more important in providing an accurate assessment of consumer preferences for steak attributes.

When the survey is delivered the respondent is presented with a screen that includes all of the factors/attributes that are examined in the study. In this case, we presented 3 alternative profiles on each screen and asked subjects to select which of these profiles he or she preferred (see Figure 5). It is this forced-choice approach that is at the heart of the CBC technique, in that the respondent is required to indicate which of the combined characteristics (i.e., the product profile) he or she prefers. This approach presents a more realistic representation of real buying decisions.

For this research, we used an extension to traditional CBC analysis that makes use of the hierarchical Bayesian method for estimating individual-level part worth values (see http://www.sawtoothsoftware.com/cbc.shtml#cbchb; last accessed June 19, 2007). Unlike ACA, which adapts the questions on the survey for each individual respondent based on that individual's prior responses, CBC presents the same survey questions to all participants. However, when estimating part worth utility values for each individual respondent, CBC-hierarchical Bayesian utilizes the choice information from all respondents to estimate the final utilities for each individual respondent. With this procedure, the results of the analysis are more robust relative to the non-Bayesian CBC model or to other statistical procedures such as ordinary least squares regression (Sawtooth Software, 2005). Unlike other statistical techniques, the Baysian CBC model does not produce results that offer a statistical level of significance. In other words, the result of this analysis is a utility score that is the product of a simulation based on the observed data, and although it is an accurate assessment of the subject's

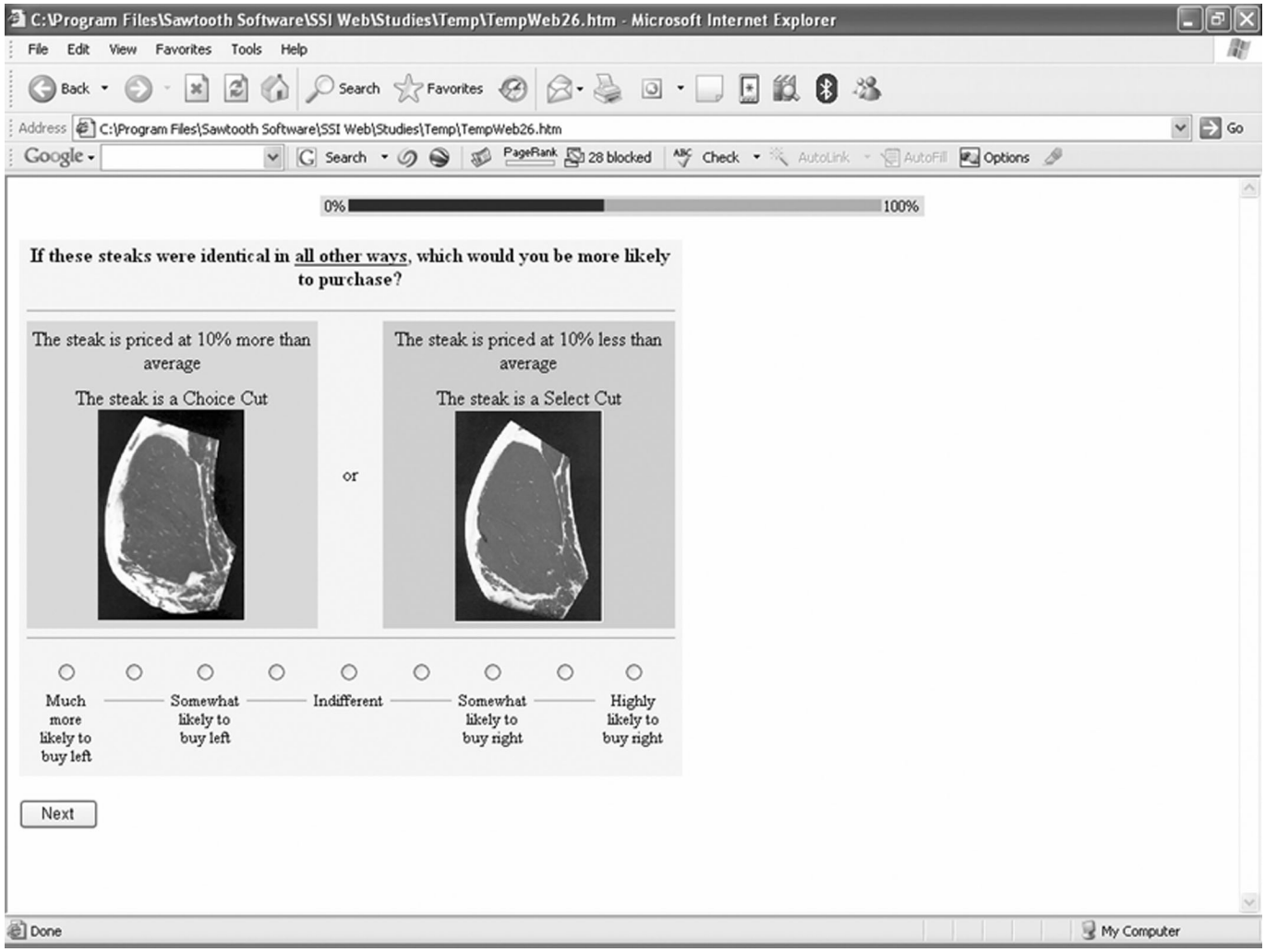


Figure 3. An example of a survey question asking the respondent to make a paired-comparison trade-off.

utilities, it is not amenable to statistical tests for rejecting a null hypothesis that is of the type that many researchers are accustomed to.

Data Collection Procedures

The initial survey was developed after conducting a focus group consisting of animal science researchers, who identified and refined the list of attributes (i.e., steak features) that were determined to be most relevant to consumers. Once the attributes and levels were identified, they were evaluated and refined through interviews with a panel of student subjects. The focus of this refinement process involved examining the wording of the questions and the subjects' understanding of attribute levels.

Before the presentation of the conjoint analysis surveys, subjects were presented with instruction screens that explained the purpose of the study and explained the factors that were being examined in the research; see Figure 6.

Three major rounds of data collection were used to develop the results of the study. The first round of data collection was an ACA-based survey that focused on refining the factors to be analyzed in this study and identifying the relative importance of respondent knowledge about steak. To accomplish this, we asked students from 2 academic programs in the College of Business and in the College of Agriculture (i.e., animal science students) to complete the survey. Students from business were expected to be relatively naïve about steak, whereas students from animal science were expected to be more knowledgeable about the relative importance of steak features. A statistical analysis of a manipulation check indicated that students had significantly different levels of knowledge about steak. In this context, the term manipulation check is used to describe the fact that the subjects' scores demonstrated that we achieved the desired manipulation involving this segmentation. In other words, we used these data to verify that the subjects in these groups were, as segregated (i.e., business students vs. animal science students), significantly different in their understanding of meat characteristics. Subjects were not segmented into knowledgeable or naïve categories based on their scores on the manipulation check. Although the ap-

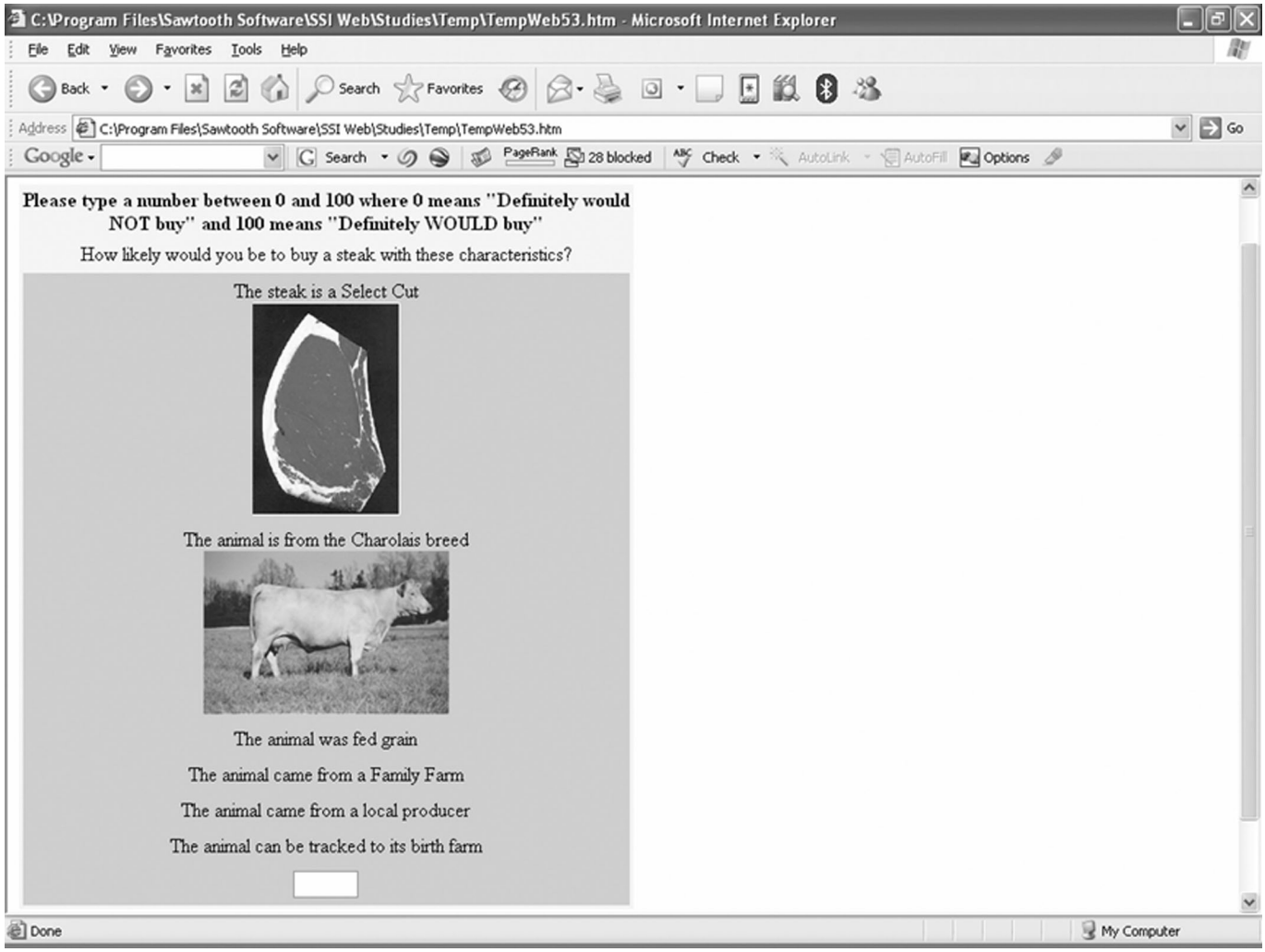


Figure 4. An example of a survey question designed to calibrate factors based on respondent ratings.

proach we used left some students in the naïve category who scored high on the manipulation test (i.e., they were equivalent in their knowledge about the 3 questions in the manipulation check), we think it is appropriate to leave the subjects in the respective segments. In this case, students who took the animal science class were likely quite different in their higher-level knowledge about the features of meat products and how these features influence taste, texture, and other variables. Business students would be more likely to be representative of the broader population of consumers in terms of the variance in their knowledge about meat products. This approach, as a more conservative method of segmentation, would offer a more realistic assessment of the difference between trained and untrained consumers.

After this ACA survey, a second round of data collection was conducted using a CBC survey that was configured similar to the survey used in round 1. The CBC was selected for use in this segment of the study because it most closely mimics the real decision-making process by presenting the subject's with all of the factors being examined in the study. Furthermore, CBC offers a richer set of data that can be used for more in-depth analysis of subject responses (Hair et al., 2006). The second data collection represented the primary focus of the study, which was an examination of a national sample of steak consumers. A total of 1,171 participants completed the CBC survey and provided useable data for the study. Participants were solicited with the assistance of a marketing firm, Return Path Inc. (http://www.returnpath.com; last accessed June 19, 2007), which was paid $5.00 for each valid respondent. Return Path Inc. screened all participants to make certain that they were potential consumers of steak (e.g., they were not vegetarians) and that they were at least 18 yr old. The use of sampling firms such as Return Path is typical in marketing research.

Because the results of the primary data collection effort produced results that were somewhat unexpected in terms of the similarity of rankings across different segments and the extreme importance reported for locally produced products, we initiated a third round of data collection to validate the results from the national

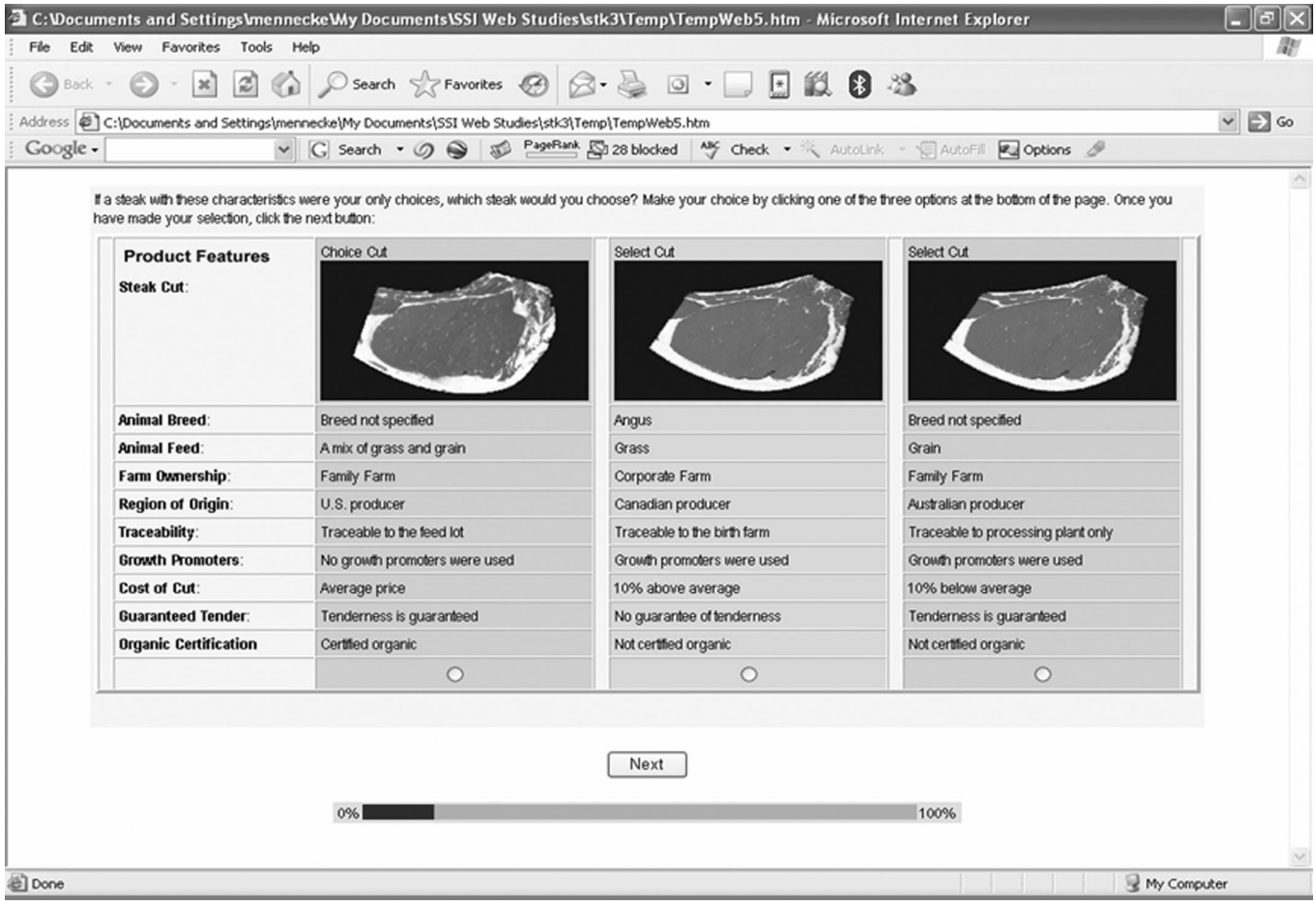


Figure 5. Choice-based conjoint product profile.

sample. The third data collection effort involved 211 students from the College of Business who completed the same CBC survey completed by the national sample. Students were offered class credit for participation in the research as an alternative to other class requirements.

The results from these 3 data collection activities are summarized in the next section.

RESULTS

In total, 1,468 individuals responded to the 3 surveys conducted in this research. Data for the study were collected in 3 rounds, with a distribution of participants as shown in Table 1.

The average age of the nonstudent respondents was 45.5 yr, and the average age of the student respondents was 22.1 yr. The number of females was 717 (50.1%), and the number of males was 713 (49.9%). All subjects were asked questions about their knowledge pertaining to steak using 3 questions about steak characteristics:

Which cut of steak is higher quality? (Top Round or Top Sirloin)

Which grade contains more marbling? (Select or Choice)

What is marbling? (The amount of fat within the muscle, the amount of connective tissue present in the steak, or the amount of fat on the outside of the steak)

The response for each of these questions was scored as 1 for correct or 0 for incorrect. The mean score for the subjects in each data collection segment is shown in Table 2.

Understanding the Results

The conjoint analysis results comparing business and animal science students were analyzed by first examining the respondents' preference structure in aggregate. The conjoint analysis survey produces results that show the relative preferences (or utility) for specific attributes and the level (or importance) of this preference. For example, the utilities for animal feed are as follows (attribute level: utility value):

The animal was fed a mix of grass and grain: 16.23.

The animal was fed grain: 12.71.

The animal was fed on grass: –28.94.

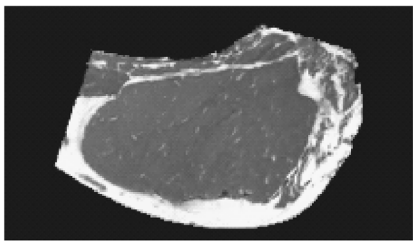
These values show the relative, not absolute, utility of each factor. For this data set, all that can be inferred

The following are the categories that you will be asked questions about during the survey. Please look over these categories and familiarize yourself with them before beginning the survey.

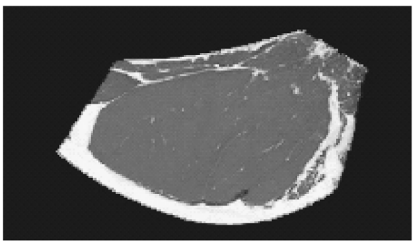
The information about each steak product will be presented in columns on the following pages. We recommend that you evaluate each product by reading the contents of that product's column. Once you have evaluated each product, then make your selection by comparing the products in each column.

Steak Cut: The cut of steak is...

Choice Cut



Select Cut



Animal Breed: The animal breed is...

- **Angus**: The Angus breed is black in color, has a smooth hair coat, and has no horns. Angus cattle qualify under USDA requirements for select and choice cuts of meat.
- **Breed not specified**: A variety of cattle breeds that qualify under USDA requirements for both select and choice cuts of meat.

Animal Feed: The animal was fed one of the following during finishing...

- **Grain**: Corn and other grains constitute the primary feed during finishing.
- **A mix of grass and grain**: a mix of grass and grain is used during finishing.
- **Grass**: Grass and other forage constitute the primary feed during finishing.

Farm Ownership: The animal came from either a...

- **Family Farm**: As defined by USDA regulations, a farm that produces agricultural commodities for sale in such quantities so as to be recognized in the community as a farm and not a rural residence; produces enough income (including off-farm employment) to pay family and farm operating expenses, pay debts, and maintain the property; is managed by the operator; and has a substantial amount of labor provided by the operator and the operator's family.
- **Corporate Farm**: A corporate farm is a business producing food or fiber products that is organized as a corporate entity for tax purposes. It is owned by stockholders and run by a board of directors. The principle stockholders do not necessarily have family relationships with the operators of the farm.

Region of Origin: The meat came from either a...

- **Local producer**: cattle growers with a demonstrated regional affiliation with the market in which the steak is sold; i.e., the producer is identified with the region in which the steak is purchased.
- **Producer from a Quality Region**: cattle grower from a region in the U.S. with a history of and reputation for high quality beef production
- **U.S. producer**: cattle growers located in the United States
- **Mexican producer**: cattle growers located in Mexico
- **Australian producer**: cattle growers located in Australia
- **Canadian producer**: cattle growers located in Canada

Figure 6a. Steak factor descriptions presented to subjects.

Traceability: The ability to retrieve the history, treatment, and location of the animal that a cut of meat comes from, through a recordkeeping and audit system or registered identification program. Traceability usually refers to the ability to track meat to the animal from which it was produced.

- **Traceable to the birth farm**: Meat that you purchase can be traced back to a specific animal on the farm on which it was born.
- **Traceable to the feed lot:** Meat that you purchase can be traced to the feed lot on which a group of animals were finished before processing and slaughter. Feed lot operators can combine animals from a variety of sources and may have lots that are all locally produced, lots that are a mix of local and non-local cattle, or lots that are entirely a single breed.
- **Traceable to processing plant only:** Processors frequently take animals from one or more feed lots and combine them into a process lot that are slaughtered together. Animals may be from the same farm, region, or country of origin, depending on how the processor constructs the lot. The information about the region of origin, farm ownership, etc. can be maintained with the meat in some, but not all, cases (e.g., if a processor runs a lot only with animals from a single region, or only from organic farms, then the lot can be regionally certified or organically certified). Regardless of the "type" of meat you purchase, it can only be identifiably traced to a processing plant and a specific slaughter lot.

Growth Promoters: Hormonal growth promoters are naturally occurring or synthetic products that are approved in the U.S. for use in beef cattle. The effect of hormonal growth promoters is to increase lean tissue growth.

- **Growth promoters were used**:
- **No Growth promoters were used**

Cost of Cut: The steak is priced at...

- **10% more than average**
- **An average price**
- **10% less than average**

Guaranteed Tender: The steak is guaranteed by the processor to be tender. Tenderness is measured though a variety of techniques depending upon the processor, but all are designed to assess the ease with which the steak can be chewed.

- **Tenderness is guaranteed:** The steak is labeled with a guarantee that the meat is tender
- **No guarantee of tenderness:** The label says nothing about the tenderness of the meat

Certified Organic: To be certified organic, a beef product must meet a number of criteria specified in USDA's national standards for production, handling and processing of organically produced agricultural products. In order for beef products to be labeled organic, the livestock must have been fed only organic feed (grass or grain) and received no antibiotics or growth promotants. Vaccines are permitted to keep the livestock healthy.

- **Certified organic:** The steak is labeled with a certification that the meat is organic
- **Not Certified organic**: The steak is not certified to be organic (i.e., the label says nothing about the organic certification of the steak)

Figure 6b. Steak factor descriptions presented to subjects.

is that the first level (the animal was fed a mix of grass and grain) is preferred to the second level (the animal was fed grain) and that the second level is preferred to the third level (the animal fed on grass).

To determine an attribute's importance, scores are scaled to a 100-point scale with each value representing the importance of each factor in relation to the total for all attributes. Each importance score represents a percentage of the total importance that each attribute has.

The utilities and importance scores for the responses to the conjoint analysis surveys are included in Appen-

Table 1. Distribution of participants for the 3 rounds of data collection in the study

Item	Total No. of participants	No. of male participants	No. of female participants	Animal science	Business
Round 1: Business vs. animal science students	76	43	33	41	34
Round 2: National consumer sample[1]	1,171	544	594		
Round 3: Student confirmatory sample[2]	221	126	90		

[1]33 respondents from this sample did not provide information about their biological sex.
[2]5 respondents from this sample did not provide information about their biological sex.

dix A. The results in the following section include a summary of these data for the aggregate of all respondents as well as within selected segments.

Adaptive Conjoint Analysis: Business vs. Animal Science Students

The sorted preferences based on importance are summarized in Table 3. The results of the aggregate analysis for both groups of students is shown in Table 4 and shows that region of origin, animal breed, traceability, the animal feed used, and beef quality are the 5 most important steak features. Alternatively, the cost of cut, farm ownership, the use of growth promoters, and whether the product is guaranteed tender were the 5 least important factors. Based on the utilities and the most important attributes, an ideal steak product would include the 5 attributes displayed in Table 5. The results of the analysis contrasting business and animal science students are summarized in Table 6. The results of the segmented analysis show that for business students, the region of origin, traceability, the cost of cut, and the use of growth promoters were the 5 most important steak features. Alternatively, for animal science students, the region of origin, animal breed, the beef quality, and the animal feed were the 5 most important factors. Based on the utilities and the most important attributes, an ideal steak product for each group would include the 5 attributes displayed in Table 6.

These results demonstrate that the knowledge that a consumer possesses about meat, animal characteristics, and similar features related to steak products will influence attitudes about the features of steak products that are considered important. Students in the animal science classes approached the decision scenario presented to them in the conjoint analysis survey with significantly more knowledge about the impact that various steak characteristics have on the quality of the steak. Factors such as the animal breed, the quality of the beef cut, and the feed given to the animal all have objectively demonstrable impacts on the quality of the steak that is produced from the animal. The animal science students had this knowledge, and this was shown in the attitudes demonstrated in the conjoint analysis results. Alternatively, most business students would not be as likely to have this knowledge about the relationship between these features. Therefore, the preference structure of business students demonstrates a ranking that is based on more superficial characteristics, such as traceability to the birth farm, the cost of the steak, and whether growth promoters were used.

Choice-Based Conjoint Analysis: National Consumer Sample

The sorted preferences based on importance for the national sample are summarized in Table 7. The results of this aggregate analysis show that region of origin, the use of growth promoters, the cost of cut, whether the steak is guaranteed tender, and traceability are the most important steak features. Alternatively, farm ownership, the animal feed used, the steak cut, the animal breed, and whether the product is certified organic were the least important.

Table 8 shows the importance levels when participants are categorized by their knowledge about steak.

Table 2. Results for knowledge manipulation check

Item	Cut of steak	Marbling grade	Marbling definition
	(Number correct/incorrect) % correct		
Round 1: Business students	(26/8) 76.47	(25/9) 73.53	(17/17) 50.00
Round 1: Animal science students	(39/3) 92.86	(40/2) 95.24	(41/1) 97.62
Round 2: National sample	(957/178) 84.32	(755/380) 66.52	(710/435) 62.56
Round 3: Business students	(181/40) 85.78	(133/88) 63.03	(139/82) 65.88

Table 3. Importance: business vs. animal science students

Business students	Total	Animal science students	Total
Region of origin	19.34	Region of origin	19.73
Traceability	12.65	Animal breed	16.55
Cost of cut	11.37	Beef quality	12.64
Growth promoters	11.07	Animal feed	11.69
Animal breed	11.03	Traceability	10.89
Animal feed	10.22	Cost of cut	8.76
Farm ownership	8.84	Farm ownership	8.51
Guaranteed tender	8.81	Guaranteed tender	6.48
Beef quality	6.68	Growth promoters	4.74

Table 4. Importance: aggregate response for business and animal science students

Item	Total
Region of origin	19.61
Animal breed	14.06
Traceability	11.59
Animal feed	11.17
Beef quality	10.06
Cost of cut	9.88
Farm ownership	8.55
Growth promoters	7.56
Guaranteed tender	7.52

Rankings are similar across groups with a couple of exceptions. Those who are more knowledgeable appear to have a stronger preference for nonhormone-treated beef. Those who are less knowledgeable attach more importance to organic beef. Based on the utilities and the most important attributes, an ideal steak product for the national sample would include the attributes displayed in Table 9.

The national sample also asked respondents an open-ended question: Which state produces the best steaks? Results from the 1,135 valid responses are shown in Figure 7 and indicate that beef produced in Iowa is viewed as having the highest quality. Texas, Nebraska, and Kansas are also highly ranked.

The data obtained from the national sample were segmented based on biological sex; the results of the analysis contrasting male and female respondents are summarized in Table 10. The results indicate that for men, region of origin, the cost of cut, the use of growth promoters, whether the steak is guaranteed tender, and traceability were the most important steak features. Similarly, for women the region of origin, the use of growth promoters, whether the steak is guaranteed tender, the cost of cut, and traceability were the most important factors. Based on the utilities and the most important attributes, an ideal steak product for each group would include the attributes displayed in Table 11. These results indicate that although there is some variation in the ranking of these attributes, the general pattern of the responses are similar. For example, although the cost of the cut appears to be more important to men than to women, all of the top 5 factors are the same for all respondents (albeit in different order). Similarly, although there are slight variations in the rank order of the least important factors, the same 4 factors are considered least important by men and women.

Table 5. Ideal steak product for business and animal science students

- The steak came from a local US producer.
- The animal breed is Angus.
- The steak can be traced to the farm on which the animal was born.
- The animal was fed a mix of grain and grass.
- The steak is a choice cut.

Choice-Based Conjoint Analysis: Student Confirmatory Sample

In order to confirm the results of the national sample, we opted to run a controlled sampling of student subjects using the same instrument deployed for the national sample. Our concern was that participants in the national sample might have filled the response out carelessly so as to minimize the amount of time required to complete the survey. Therefore, a third round of data was collected from students at Iowa State University and compared with the results from the national sample.

The aggregate importance ratings for the student respondents are summarized in Table 12. The results of the analysis indicate that the region of origin, organic certification, the cost of cut, whether the steak is guaranteed tender, and animal feed were the most important steak features. These results, although including a few variations relative to the national sample, are largely similar to the results from the national sample. For example, as is the case for the national sample, students preferred a select cut of meat compared with a choice cut. Also, although animal feed was rated as more important by students, this factor was in a similar relative position to its rank for the national sample. In summary, the results from the confirmatory sample support the general pattern of results seen for the national sample.

DISCUSSION

Prior Research Examining Consumer Attitudes about Beef Products

Considerable research has been conducted to understand the role that meat characteristics have in forming consumer attitudes toward beef and other meat products. This research has focused on identifying the role that intrinsic and extrinsic characteristics have in perceptions of quality, food safety, and the likelihood of buying the product. In most of the previous research examining beef products, econometric demand system estimates, surveys, experimental markets, or interviews were used to capture data (Grunert, 1997; Dickinson and Bailey, 2002; Loureiro and Umberger, 2003, 2005; Roosen et al., 2003; Thilmany et al., 2003; Campiche et al., 2004; Nayaga et al., 2004, 2005; Wirthgen, 2005; Ziehl et al., 2005). Although this previous work has added to our understanding of the consumer forces driving the consumer decision-making process (and especially the demographic variables that cause differing responses among consumers), the methodology has typically involved the extraction of consumer preferences from price and sales data or the elicitation of consumer preferences using surveys or experiments.

Table 6. Ideal steak product for business vs. animal science students

Business students	Animal science students
• The steak came from a local US producer.	• The steak came from a local US producer.
• The steak can be traced to the farm on which the animal was born.	• The animal breed is Angus.
• The steak costs 10% less than the average price of other steaks.	• The steak is a choice cut.
• No growth promoters were fed to the animal.	• The animal was fed a mix of grain and grass.

A number of studies have used the conjoint analysis methodology or related choice methodologies to examine consumer preferences for agricultural products (e.g., Baidu-Forson et al., 1997; Grunert, 1997; Gillespie et al., 1998; Quagrainie et al., 1998; Unterschultz et al., 1998; Walley et al., 1999; Murphy et al., 2000; Gellynck and Viaene, 2002; Harrison et al., 2002; Orth and Firbasová, 2003; Grunert and Bech-Larsen, 2004; Mesias et al., 2005; Tendero and Bernabéu, 2005; Valeeva et al., 2005); however, only a handful of these studies used conjoint analysis to examine consumer preference for beef products (Grunert, 1997; Unterschultz et al., 1997, 1998; Quagrainie et al., 1998; Lusk et al., 2003; Mesias et al., 2005). A variety of variables about consumer preferences for beef have been examined using conjoint analysis. These include factors such as growth hormones and genetically modified food (Lusk et al., 2003), traceability and animal welfare (Hobbs, 1996), the production system and product labeling (Mesias et al., 2005), and product grade (Unterschultz et al., 1997). In addition, region of origin has been examined in many of the prior studies that have used conjoint analysis (e.g., Grunert, 1997; Unterschultz et al., 1997, 1998; Quagrainie et al., 1998; Mesias et al., 2005). With a few exceptions (Grunert, 1997), the results indicate that region of origin is an important factor influencing consumer attitudes about meat products. In all of the studies where region of origin was found to be important, the results show that consumers or meat buyers prefer steak or beef products that come from local producers or from the country or region in which the consumer resides (Unterschultz et al., 1997; Quagrainie et al., 1998; Mesias et al., 2005).

The study by Grunert (1997) represents one of the closest studies to our research in terms of the types of variables examined. Using the total food quality model (Grunert et al., 1996), Grunert examined the attitudes of consumers in 4 different European countries: France, Germany, Spain, and the UK. Factors that were examined in this study include the meat cut (i.e., steak, roast, cubed, and minced), color (i.e., light red, medium red, etc.), fat lumps (i.e., major, minor), fat rim (i.e., yes, not), marbling (i.e., high or low), fat content (i.e., high or low), price (i.e., low, medium, high), origin (i.e., no information, Denmark, Ireland, Scotland), information about animal production (i.e., no information or information about the animal welfare and hormone use), and the purchase locale (i.e., a local butcher or supermarkets). Alternative profiles were presented to subjects on cards and included not only descriptors of the meat characteristics but also pictures of the cut of meat. Results indicate that fat content and the place of purchase were the 2 most important factors influencing perceptions of meat quality for the consumers in these 4 European countries. Meat purchased from a butcher was perceived to be higher in quality. Interestingly, meat that was lower in fat content was viewed more favorably in terms of perceptions of quality (see also Bredahl, 2003). In other words, consumers misunderstood the relationship between meat quality and the features of the meat that influence quality features like tenderness, taste, and juiciness. Also of interest in Grunert's study and in dramatic opposition to the results found here and in other conjoint analysis studies of beef, country of origin, breeding, and farming/production practices were not found to be significantly related to quality perceptions. In fact, studies using a variety of methodologies have found that information about the origin of meat products is important. For example, Jekanowski et al. (2000) surveyed consumers in Indi-

Table 7. Importance: aggregate response for national sample

Item	Total
Region of origin	23.12
Growth promoters	14.47
Cost of cut	12.51
Guaranteed tender	11.04
Traceability	8.96
Organic certification	7.96
Animal breed	5.80
Steak cut	5.64
Animal feed	5.36

Table 8. Importance: Segmented by knowledge about steak features

Item	Low knowledge	Average knowledge	High knowledge
Steak cut	5.43	5.37	6.07
Animal breed	6.07	5.87	5.57
Animal feed	5.51	5.33	5.32
Farm ownership	5.40	5.34	4.75
Region of Origin	23.95	23.53	22.17
Traceability	8.76	9.36	8.63
Growth promoters	12.91	14.22	15.63
Cost of Cut	12.20	12.06	13.21
Guaranteed tender	11.64	10.90	10.87
Organic certification	8.14	8.02	7.78

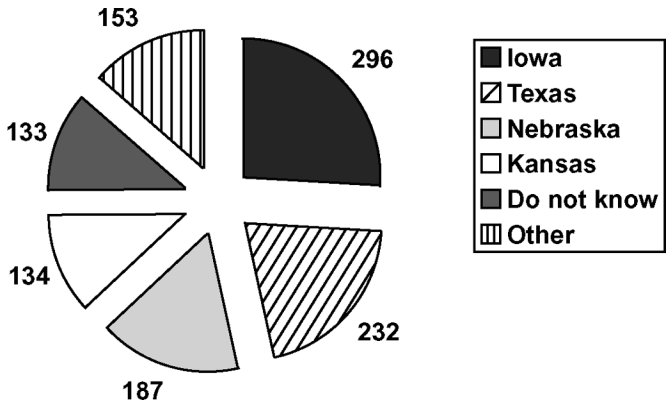


Figure 7. National sample, open-ended responses to the question, "Which state produces the best steak?"

ana and concluded that consumers (especially female consumers) were willing to pay a premium for locally produced meats. This is consistent with similar results obtained for consumers from California (McGarry-Wolf and Thulin, 2000), Colorado (Thilmany et al., 2003), and the United States (Umberger et al., 2003).

Quality cues in the context of the total food quality model (Grunert et al., 1996) have been studied in other contexts as well. For example, Bredahl (2003) interviewed 310 shoppers in Danish supermarkets to identify the role of intrinsic and extrinsic cues on the perception of quality of meat products. Shoppers in the supermarket were solicited after selecting a meat product, interviewed briefly in the store, and then asked to complete a survey about the meat product after they had prepared and consumed the meat. Intrinsic cues were presented as descriptive questionnaire items and included percentage fat content, the degree of marbling, the meat color, and the amount of meat juice present in the packaging. Extrinsic descriptive cues included brand name, the price of the product, the product label, the nature of the package sleeve, the presence of an information leaflet, and inclusion of recipes. Other measures included the expected quality, the experienced quality, the method used to prepare the meat, anticipation of future purchases, their familiarity with the product, and their purchase history. The results showed that consumers used extrinsic cues to evaluate the health quality of the product, whereas expected eating quality was based on a mix of intrinsic and extrinsic cues. There was a relationship between the familiarity that consumers had with the meat product and the use of brand as a cue. Consumers who had less familiarity with the product tended to use brand as the primary cue, whereas consumers with greater familiarity relied more on intrinsic cues. Interestingly, price was not found to be a significant factor influencing quality perceptions. Finally, as in previous studies (e.g., Savell et al., 1989; Grunert, 1997; Bredahl et al., 1998), fat content was found to be negatively related to perceptions of quality. The author refers to this fat paradox as a contradiction and an important influence on the expected and experienced quality of the steak. Specifically, consumers who buy steaks that are lean expect them to be higher quality (i.e., to have greater tenderness and better taste) but are disappointed with the quality when the product is actually consumed.

The role of biological sex in determining attitudes toward food and meat consumption has been a focus of research for a considerable time (e.g., Dreifus, 1977; Rappoport et al., 1993; Wilkinson and Kitzinger, 1994; Digby and Stewart, 1996; Pollard and Hyatt, 1999). For example, Rappoport et al. studied the attitudes of men and women about health, pleasure from food, and convenience. Although the study did not focus on meat consumption per se, the results suggest that women and men have quite different attitudes along these 3 dimensions. For example, in a study in which subjects evaluated specific meals along these dimensions, women were found to give higher healthy, pleasurable, and convenience ratings to meals that were in fact healthier (Rappoport et al., 1993). In a survey of consumers, Beardsworth et al. (2002) found that women were more likely than men to regulate food intake, with health concerns as a primary determinant. Women were also more likely to view food consumption from an ethical perspective, with greater concern expressed by women for the source of the animal used to produce food and the ecological factors that influence that production. Women were also shown to be more reflective about food and health issues, and as a result, they were more likely to try novel food offerings. Men, on the other hand, were more conservative in their evaluation of food and considered traditional food offerings as more healthy. This line of research suggests that, when compared with men, women are more likely to express con-

Table 9. Ideal steak product for national sample

- The steak came from a local US producer.
- No growth promoters were fed to the animal.
- The steak costs 10% less than the average price of other steaks.
- The steak is guaranteed tender.
- The steak can be traced to the farm on which the animal was born.
- If the steak comes from out-of-state, it should come from Iowa.

Table 10. Importance: male vs. female respondents

Male respondents	Total	Female respondents	Total
Region of origin	22.48	Region of origin	23.70
Cost of cut	14.05	Growth promoters	15.40
Growth promoters	13.44	Guaranteed tender	11.41
Guaranteed tender	10.65	Cost of cut	11.14
Traceability	8.59	Traceability	9.28
Organic certification	7.68	Organic certification	8.18
Steak cut	6.50	Animal breed	5.64
Animal breed	6.01	Animal feed	5.40
Animal feed	5.33	Farm ownership	5.03
Farm ownership	5.27	Steak cut	4.83

Table 11. Ideal steak product for male vs. female respondents (in order of importance)

Male respondents	Female respondents
• The steak comes from a local US producer.	• The steak came from a local US producer.
• The steak costs 10% less than the average price of other steaks.	• No growth promoters were fed to the animal.
• No growth promoters were fed to the animal.	• The steak is guaranteed to be tender.
• The steak is guaranteed to be tender.	• The steak costs 10% less than the average price of other steaks.
• The steak can be traced to the farm on which the animal was born.	• The steak can be traced to the farm on which the animal was born.

cerns about the origin of food, the impact that food production has on the environment, and the role that food choices have on health.

Finally, in terms of thinking about other ways to classify subjects, the work by Verbeke and Vackier (2004) offers insights about how consumers' attitudes and characteristics influence their perceptions of beef. The authors examined the relationship between consumer involvement in meat products and various characteristics of fresh meat products. They classified meat consumers into 1 of 4 categories. First, the straightforward meat lover makes consumption decisions primarily based on the goal of finding pleasure in meat without significant concern for other features such as food safety. In general, men are more likely than women to fit into this category; for example, men were found to be more likely to make decisions based on taste than on health concerns (Institute of European Food Studies, 1996). A second type of meat consumer is classified as the indifferent meat consumer. These consumers are not focused solely on obtaining pleasure from eating meat and express low levels of concern about risks related to meat quality or safety. In general, consumers in this category are concerned primarily with price and are unlikely to be influenced by information sources about the health and safety effects associated with meat products. A third type of consumer is classified as the cautious meat lover. These consumers seek meat for pleasure and taste but also show a high level of interest in and concern about information related to meat quality and safety. These consumers are typified by women with families who buy meat with a concern for the effects the meat will have on the well-being of family members. A fourth type of consumer is classified as the concerned meat consumer. These consumers express significant levels of concern about meat safety and would likely engage in extra effort to seek higher-quality meat from trusted sources (e.g., a local butcher).

Table 12. Importance: aggregate response for confirmatory sample

Item	Total
Region of origin	27.06
Organic certification	11.95
Cost of cut	10.42
Guaranteed tender	10.38
Animal feed	7.76
Traceability	7.19
Growth promoters	7.18
Steak cut	6.35
Farm ownership	6.26
Animal breed	5.43

This review highlights the fact that this study is unique on a number of dimensions. For example, earlier conjoint analysis research primarily focused on smaller, regional samples, they tended to examine the visible, physical attributes of the beef without simultaneously considering extraphysical characteristics (e.g., origin), they were designed to study nonbeef products, or they focused on a narrowly defined set of product characteristics or attributes (e.g., the use of growth hormones, irradiation). This study represents the first comprehensive use of the conjoint analysis methodology to study a national sample of US consumers and their preferences for beef using a substantial number of product characteristics. In addition, this study examined several important characteristics of the consumer such as biological sex and knowledge of beef product characteristics. The conjoint analysis that we report here improves on earlier research both in term of its ability to extract and rank various characteristics and in terms of the numbers of participants that were included.

Marketing Implications

The data indicate that region of origin is the most important decision characteristic among all groups of consumers; no segmentation of the subjects moved this characteristic from its dominant position. For US-based farmers, this is certainly welcome information because it adds a preference premium to US-produced beef. The results are also particularly welcome for beef producers in Iowa, Texas, Nebraska, and Kansas who plan to create brands based on the location of their production; respondents consistently indicated a positive value for beef produced in these regions. The surprising importance attached to location of production is of particular relevance given the ongoing debate about country of origin labeling and the implementation of a national animal identity program.

For grass-fed producers, the data indicate relatively little value contributed to the consumers' buying decision based upon the feed type of the animal. Feed type becomes more important among more knowledgeable

beef buyers (it ranked higher among our business student population, who scored higher than our national sample, and higher still among our animal science student population, who ranked highest with regard to the standard beef knowledge questions). Grass feeding does add value, however, because the feed type that was preferred by more knowledgeable consumers was for a grass- and grain-fed animal. Although these data indicate that a grass regimen adds little attraction for consumers, they also indicate that knowledgeable consumers care more about feed and do prefer grass within the feed mix. Because many grass-fed beef producers are also employing a growth-promotant-free production system, it would seem that their product is an attractive one, albeit not made so by the grass-fed characteristic alone.

An obvious conclusion that should be drawn from these results is that product characteristics that relate to origin and production are consistently of high priority to consumers. This is the case regardless of biological sex, product knowledge, or other segmentation variables. It is therefore implied that maintenance of identity and the flow of information throughout the production value chain is mandatory for producers and processors to preserve the value that is associated with those traits. Development of technologies to efficiently maintain identity of beef products throughout the production chain should therefore be a high priority for beef producers and processors.

In addition, whereas the preservation of product information throughout the production chain is important, it is of equal importance that the information be maximally utilized to add value to the final steak product. Our results clearly indicate that information about the region of origin, the use or nonuse of growth promoters, guaranteed tenderness, and traceability could all be critical elements of consumer decision making. To benefit from this information, producers (in concert with final retail sellers) must establish the most propitious method of presenting value-adding information to consumers. Further, by developing consumer-education programs that teach consumers about the value of different beef-characteristics, other value-adding factors such as feed type, animal breed, subregions (i.e., Iowa, Texas, Kansas, and Nebraska), and beef quality (select vs. choice) become important choice-making characteristics as well.

This last point leads to a logical question, Does educating the consumer about product information have the potential to influence purchasing decisions? The comparison of animal science students to business students demonstrates that diversity in knowledge and experiences generates different priorities for product preferences. The animal science students demonstrated that they were more knowledgeable about the intrinsic cues for quality (cut, quality, and marbling definitions). In turn they were apparently more likely than their business student counterparts to use their understanding of these and other features to make informed decisions about the cut. An extension of this observation is that education of consumers could change attitudes and product priorities. Nevertheless, past experiences may have an overriding effect and diminish the efficacy of consumer education. The issue of the type, amount, and nature of consumer education on purchasing behavior and decision making for steak and similar products is an open question. Future research should examine whether consumer attitudes can be influenced by in-store product information, media promotions and campaigns, and similar educational materials.

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Appendix A

Detailed Conjoint Analysis Results

Round 1: Business vs. animal science students

Table A-1. Importance: Aggregate response

	Total
Region of origin	19.61
Animal breed	14.06
Traceability	11.59
Animal feed	11.17
Beef quality	10.06
Cost of cut	9.88
Farm ownership	8.55
Growth promoters	7.56
Guaranteed tender	7.52

Table A-2. Utilities: Aggregate response

Average utility values

Rescaling method:	Zero-centered diffs Total
The steak is a Choice Cut	32.42
The steak is a Select Cut	–32.42
The animal is from the Angus breed	50.92
The animal is from the Holstein breed	–26.17
The animal is from the Brahman breed	–27.32
The animal is from the Charolais breed	2.57
The animal was fed grain	12.71
The animal was fed a mix of grass and grain	16.23
The animal fed on grass	–28.94
The animal came from a family farm	33.36
The animal came from a corporate farm	–33.36
The animal came from a local producer	63.04
The animal came from a U.S. producer	65.87
The animal came from a Mexican producer	–76.20
The animal came from an Australian producer	–26.77
The animal came from a Canadian producer	–25.95
The animal can be tracked to its birth farm	35.29
The animal can be tracked to the feed lot	19.97
There is no information about the origin of the animal	–55.26
Growth promoters were used on the animal	–22.49
No growth promoters were used on the animal	22.49
The steak is priced at 10% more than average	–44.67
The steak is priced at an average price	6.70
The steak is priced at 10% less than average	37.97
The label states that the steak is guaranteed to be tender	31.26
The label makes no claims about the tenderness of the steak	–31.26

Round 1: Business vs. animal science students

Table A-3. Importance: Segmented by who buys steak[1]

	Me (respondent)	Someone else
Beef quality	11.82	8.85
Animal breed	15.48	13.08
Animal feed	11.88	10.69
Farm ownership	8.15	8.82
Region of origin	21.20	18.52
Traceability	11.13	11.90
Growth promoters	6.34	8.39
Cost of cut	8.15	11.07
Guaranteed tender	5.84	8.68

[1]Segmentation based on the following question: "When you eat steak at home, who is most likely to buy the steak?"

Table A-4. Utilities: Segmented by who buys steak

Average utility values by BuysSteak

Rescaling method:	Zero-centered diffs Total	Me	Someone else
The steak is a Choice Cut	32.42	43.49	24.80
The steak is a Select Cut	–32.42	–43.49	–24.80
The animal is from the Angus breed	50.92	49.68	51.78
The animal is from the Holstein breed	–26.17	–34.91	–20.15
The animal is from the Brahman breed	–27.32	–29.09	–26.11
The animal is from the Charolais breed	2.57	14.32	–5.52
The animal was fed grain	12.71	16.46	10.14
The animal was fed a mix of grass and grain	16.23	16.23	16.22
The animal fed on grass	–28.94	–32.69	–26.36
The animal came from a family farm	33.36	30.97	35.00
The animal came from a corporate farm	–33.36	–30.97	–35.00
The animal came from a local producer	63.04	78.51	52.38
The animal came from a U.S. producer	65.87	67.49	64.76
The animal came from a Mexican producer	–76.20	–81.29	–72.68
The animal came from an Australian producer	–26.77	–34.04	–21.76
The animal came from a Canadian producer	–25.95	–30.66	–22.70
The animal can be tracked to its birth farm	35.29	33.75	36.35
The animal can be tracked to the feed lot	19.97	19.52	20.29
There is no information about the origin of the animal	–55.26	–53.27	–56.64
Growth promoters were used on the animal	–22.49	–16.09	–26.91

No growth promoters were used on the animal	22.49	16.09	26.91
The steak is priced at 10% more than average	–44.67	–35.48	–51.00
The steak is priced at an average price	6.70	5.71	7.39
The steak is priced at 10% less than average	37.97	29.76	43.62
The label states that the steak is guaranteed to be tender	31.26	22.91	37.00
The label makes no claims about the tenderness of the steak	–31.26	–22.91	–37.00

Round 1: Business vs. animal science students

Table A-5. Importance: Segmented by knowledge about steak features

	Low	Moderate	High
Beef quality	9.87	10.55	5.24
Animal breed	16.80	13.51	14.38
Animal feed	9.67	11.54	15.04
Farm ownership	7.76	8.33	8.21
Region of origin	17.84	20.38	15.87
Traceability	13.52	11.55	6.94
Growth promoters	9.89	5.94	17.08
Cost of cut	6.54	10.73	11.61
Guaranteed tender	8.10	7.47	5.62

Table A-6. Utilities: Segmented by knowledge about steak features

Average utility values by correct

	Zero-centered diffs			
Rescaling method:	Total	Low	Moderate	High
The steak is a Choice Cut	32.42	19.41	39.36	11.96
The steak is a Select Cut	–32.42	–19.41	–39.36	–11.96
The animal is from the Angus breed	50.92	70.93	45.36	55.00
The animal is from the Holstein breed	–26.17	–13.85	–32.83	–11.50
The animal is from the Brahman breed	–27.32	–29.74	–26.03	–24.16
The animal is from the Charolais breed	2.57	–27.35	13.49	–19.34
The animal was fed grain	12.71	1.09	16.27	6.01
The animal was fed a mix of grass and grain	16.23	15.53	18.35	8.38
The animal fed on grass	–28.94	–16.62	–34.62	–14.39
The animal came from a family farm	33.36	26.13	33.44	28.78
The animal came from a corporate farm	–33.36	–26.13	–33.44	–28.78
The animal came from a local producer	63.04	51.82	65.90	63.37
The animal came from a U.S. producer	65.87	53.89	69.64	61.77
The animal came from a Mexican producer	–76.20	–58.74	–82.51	–64.57
The animal came from an Australian producer	–26.77	–14.48	–29.65	–33.41
The animal came from a Canadian producer	–25.95	–32.48	–23.37	–27.17
The animal can be tracked to its birth farm	35.29	42.86	34.59	24.19
The animal can be tracked to the feed lot	19.97	21.16	21.04	10.85
There is no information about the origin of the animal	–55.26	–64.02	–55.63	–35.05
Growth promoters were used on the animal	–22.49	–24.75	–17.30	–61.91
No growth promoters were used on the animal	22.49	24.75	17.30	61.91
The steak is priced at 10% more than average	–44.67	–27.80	–49.54	–50.31
The steak is priced at an average price	6.70	5.25	8.50	2.28
The steak is priced at 10% less than average	37.97	22.55	41.04	48.03
The label states that the steak is guaranteed to be tender	31.26	36.00	30.09	24.84
The label makes no claims about the tenderness of the steak	–31.26	–36.00	–30.09	–24.84

Round 1: Business vs. animal science students

Table A-7. Importance: Segmented by biological sex

	Female	Male
Beef quality	7.92	11.71
Animal breed	12.94	14.91
Animal feed	11.03	11.29
Farm ownership	9.47	7.84
Region of origin	17.94	20.89
Traceability	13.99	9.74
Growth promoters	7.66	7.48
Cost of cut	11.29	8.80
Guaranteed tender	7.74	7.35

Table A-8. Utilities: Segmented by biological sex

Average utility values by biological sex

	Zero-centered diffs		
Rescaling method:	Total	Female	Male
The steak is a Choice Cut	32.42	27.02	36.56
The steak is a Select Cut	–32.42	–27.02	–36.56
The animal is from the Angus breed	50.92	42.89	57.08
The animal is from the Holstein breed	–26.17	–37.96	–17.12
The animal is from the Brahman breed	–27.32	–17.61	–34.78
The animal is from the Charolais breed	2.57	12.68	–5.18
The animal was fed grain	12.71	0.09	22.41
The animal was fed a mix of grass and grain	16.23	19.89	13.42
The animal fed on grass	–28.94	–19.97	–35.83
The animal came from a family farm	33.36	37.75	29.98
The animal came from a corporate farm	–33.36	–37.75	–29.98
The animal came from a local producer	63.04	57.82	67.04
The animal came from a U.S. producer	65.87	58.13	71.81
The animal came from a Mexican producer	–76.20	–68.56	–82.05
The animal came from an Australian producer	–26.77	–22.32	–30.18
The animal came from a Canadian producer	–25.95	–25.07	–26.62

The animal can be tracked to its birth farm	35.29	47.92	25.59
The animal can be tracked to the feed lot	19.97	20.45	19.61
There is no information about the origin of the animal	–55.26	–68.38	–45.20
Growth promoters were used on the animal	–22.49	–20.67	–23.90
No growth promoters were used on the animal	22.49	20.67	23.90
The steak is priced at 10% more than average	–44.67	–54.38	–37.21
The steak is priced at an average price	6.70	10.66	3.67
The steak is priced at 10% less than average	37.97	43.72	33.55
The label states that the steak is guaranteed to be tender	31.26	31.71	30.90
The label makes no claims about the tenderness of the steak	–31.26	–31.71	–30.90

Round 2: National sample

Table A-9. Importance: Aggregate response

	Total
Steak cut	5.64
Animal breed	5.80
Animal feed	5.36
Farm ownership	5.14
Region of origin	23.12
Traceability	8.96
Growth promoters	14.47
Cost of cut	12.51
Guaranteed tender	11.04
Organic certification	7.96

Table A-10. Utilities: Aggregate response

Total respondents	Total
Total respondents	1,135
Average utility values	
	Zero-centered diffs
Rescaling method:	Total
Choice cut	–4.57
Select cut	4.57
Angus	22.41
Breed not specified	–22.41
Grain	3.17
A mix of grass and grain	3.31
Grass	–6.48
Family farm	20.54
Corporate farm	–20.54
Local producer	68.23
Producer from a quality region	36.18
U.S. producer	76.38
Mexican producer	–110.44
Australian producer	–42.67
Canadian producer	–27.68
Traceable to the birth farm	34.78
Traceable to the feed lot	–0.37
Traceable to processing plant only	–34.41
Growth promoters were used	–61.57
No growth promoters were used	61.57
10% above average	–46.11
Average price	15.61
10% below average	30.50
Tenderness is guaranteed	49.50
No guarantee of tenderness	–49.50
Certified organic	27.06
Not certified organic	–27.06

Round 2: National sample

Table A-11. Importance: Segmented by who buys steak

	Me	Someone else	Both me and someone else
Steak cut	5.81	5.30	5.41
Animal breed	5.64	6.05	6.09
Animal feed	5.42	4.83	5.49
Farm ownership	5.33	4.88	4.81
Region of origin	23.07	21.36	24.05
Traceability	8.88	9.13	9.12
Growth promoters	14.61	13.83	14.33
Cost of cut	12.60	13.28	11.93
Guaranteed tender	10.85	12.78	10.75
Organic certification	7.80	8.55	8.03

Table A-12. Utilities: Segmented by who buys steak

Total Respondents by who buys steak				
	Total	Me	Someone else	Both me and someone else
Total respondents	1,135	702	139	291
Average Utilities by who buys steak				
	Zero-centered diffs			
Rescaling method:	Total	Me	Someone else	Both me and someone else
Choice cut	–4.57	–2.10	–7.44	–9.25
Select cut	4.57	2.10	7.44	9.25
Angus	22.41	21.79	25.23	22.80
Breed not specified	–22.41	–21.79	–25.23	–22.80
Grain	3.17	3.41	1.93	3.18
A mix of grass and grain	3.31	3.43	2.19	3.49
Grass	–6.48	–6.83	–4.12	–6.67
Family farm	20.54	21.80	17.41	19.05
Corporate farm	–20.54	–21.80	–17.41	–19.05
Local producer	68.23	66.63	61.34	74.98
Producer from a quality region	36.18	36.82	32.47	36.36
U.S. producer	76.38	75.79	70.04	80.58
Mexican producer	–110.44	–111.10	–94.74	–116.01
Australian producer	–42.67	–42.13	–36.54	–46.57
Canadian producer	–27.68	–26.01	–32.56	–29.33

Traceable to the birth farm	34.78	35.20	32.61	34.95
Traceable to the feed lot	–0.37	–0.76	1.83	–0.52
Traceable to processing plant only	–34.41	–34.44	–34.44	–34.43
Growth promoters were used	–61.57	–61.56	–58.06	–62.64
No growth promoters were used	61.57	61.56	58.06	62.64
10% above average	–46.11	–46.35	–50.08	–43.50
Average price	15.61	15.52	17.60	14.98
10% below average	30.50	30.83	32.48	28.53
Tenderness is guaranteed	49.50	48.04	59.80	48.60
No guarantee of tenderness	–49.50	–48.04	–59.80	–48.60
Certified organic	27.06	26.78	28.84	26.69
Not certified organic	–27.06	–26.78	–28.84	–26.69

Round 2: National sample

Table A-13. Utilities: Segmented by knowledge about steak features

Total Respondents by Knowledge About Steak Features	Total	Low knowledge	Average knowledge	Highly knowledgeable
Total respondents	1,135	239	476	420
Average utilities by knowledge about steak features				
	Zero-centered diffs			
Rescaling method:	Total	Poor knowledge	Average knowledge	Highly knowledgeable
Choice cut	–4.57	–5.21	–4.48	–4.31
Select cut	4.57	5.21	4.48	4.31
Angus	22.41	22.02	22.94	22.04
Breed not specified	–22.41	–22.02	–22.94	–22.04
Grain	3.17	1.48	1.49	6.04
A mix of grass and grain	3.31	2.63	5.77	0.90
Grass	–6.48	–4.10	–7.27	–6.94
Family farm	20.54	22.45	20.80	19.17
Corporate farm	–20.54	–22.45	–20.80	–19.17
Local producer	68.23	72.11	70.80	63.10
Producer from a quality region	36.18	35.81	37.79	34.56
U.S. producer	76.38	79.33	78.47	72.34
Mexican producer	–110.44	–111.59	–111.16	–108.95
Australian producer	–42.67	–45.80	–45.02	–38.23
Canadian producer	–27.68	–29.87	–30.86	–22.82
Traceable to the birth farm	34.78	30.63	36.99	34.63
Traceable to the feed lot	–0.37	0.07	–1.22	0.34
Traceable to processing plant only	–34.41	–30.71	–35.77	–34.97
Growth promoters were used	–61.57	–51.35	–60.68	–68.41
No growth promoters were used	61.57	51.35	60.68	68.41
10% above average	–46.11	–39.00	–44.96	–51.46
Average price	15.61	14.90	14.29	17.51
10% below average	30.50	24.10	30.67	33.95
Tenderness is guaranteed	49.50	50.14	48.35	50.44
No guarantee of tenderness	–49.50	–50.14	–48.35	–50.44
Certified organic	27.06	25.96	28.03	26.58
Not certified organic	–27.06	–25.96	–28.03	–26.58

Round 2: National sample

Table A-14. Importance: Segmented by biological sex

	Male	Female
Steak cut	6.50	4.83
Animal breed	6.01	5.64
Animal feed	5.33	5.40
Farm ownership	5.27	5.03
Region of origin	22.48	23.70
Traceability	8.59	9.28
Growth promoters	13.44	15.40
Cost of cut	14.05	11.14
Guaranteed tender	10.65	11.41
Organic certification	7.68	8.18

Table A-15. Utilities: Segmented by biological sex

Total respondents by biological sex	Total	Male	Female
Total respondents	1,135	539	588
Average utility values by biological sex			
	Zero-centered diffs		
Rescaling method:	Total	Male	Female
Choice cut	–4.57	–6.08	–3.60
Select cut	4.57	6.08	3.60
Angus	22.41	23.77	21.31
Breed not specified	–22.41	–23.77	–21.31
Grain	3.17	3.91	2.59
A mix of grass and grain	3.31	3.05	3.63
Grass	–6.48	–6.96	–6.22
Family farm	20.54	20.68	20.45
Corporate farm	–20.54	–20.68	–20.45
Local producer	68.23	64.26	71.92
Producer from a quality region	36.18	34.25	38.17
U.S. producer	76.38	73.12	79.09
Mexican producer	–110.44	–107.46	–113.07
Australian producer	–42.67	–40.80	–44.32
Canadian producer	–27.68	–23.37	–31.78
Traceable to the birth farm	34.78	31.36	37.67
Traceable to the feed lot	–0.37	0.21	–0.89
Traceable to processing plant only	–34.41	–31.56	–36.77
Growth promoters were used	–61.57	–55.19	–67.45
No growth promoters were used	61.57	55.19	67.45
10% above average	–46.11	–53.60	–39.23
Average price	15.61	16.79	14.58
10% below average	30.50	36.81	24.66
Tenderness is guaranteed	49.50	46.97	51.98
No guarantee of tenderness	–49.50	–46.97	–51.98
Certified organic	27.06	24.24	29.33
Not certified organic	–27.06	–24.24	–29.33

Round 3: Confirmatory student sample

Table A-16. Importance: Aggregate response for confirmatory sample

	Total
Steak cut	6.35
Animal breed	5.43
Animal feed	7.76
Farm ownership	6.26
Region of origin	27.06
Traceability	7.19
Growth promoters	7.18
Cost of cut	10.42
Guaranteed tender	10.38
Organic certification	11.95

Table A-17. Utilities: Aggregate response for confirmatory sample

Total respondents	
	Total
Total respondents	221
Average utility values	
	Zero-centered diffs
Rescaling method:	Total
Choice cut	–2.67
Select cut	2.67
Angus	18.91
Breed not specified	–18.91
Grain	9.05
A mix of grass and grain	6.53
Grass	–15.57
Family farm	22.53
Corporate farm	–22.53
Local producer	72.83
Producer from a Quality Region	49.79
U.S. producer	77.95
Mexican producer	–120.71
Australian producer	–47.82
Canadian producer	–32.04
Traceable to the birth farm	18.24
Traceable to the feed lot	1.31
Traceable to processing plant only	–19.55
Growth promoters were used	–7.68
No growth promoters were used	7.68
10% above average	–25.43
Average price	9.23
10% below average	16.20
Tenderness is guaranteed	45.07
No guarantee of tenderness	–45.07
Certified organic	47.86