U.S. Consumer Preference for Domestic Corn-fed versus International Grass-fed Beef

Wendy J. Umberger, Dillon M. Feuz, Chris R. Calkins and Karen M. Killinger[1]

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[1]The authors are respectively: Ph.D. Candidate and Associate Professor, Department of Agricultural Economics and Professor and M.S. student, Department of Animal Science, University of Nebraska-Lincoln. For questions or correspondence regarding this paper, please e-mail: wumberg1@bigred.unl.edu. The authors gratefully acknowledge the National Cattlemen's Beef Association for partial funding of this project.

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Background

The world is becoming more of a global market place. Trade agreements between nations are reducing barriers to trade. The North America Free Trade Agreement is an example of one of these agreements. Trade in beef products is increasing as well. Imports of beef and veal into the U.S. have increased from 1.5 to 2.1 billion pounds of product and exports have increased from 1.3 to 1.8 billion pounds of product from 1995 to 1999. U.S. exports in 1999 were 8.7 percent of domestic production and imports of beef and veal into the U.S. were 10.7 percent of domestic production. Major beef export markets for the U.S. are Japan, Mexico, Korea and Canada. Imports of beef into the U.S. are from Canada, Australia, New Zealand, Brazil and Argentina. Most of the imports from Canada, Australia and New Zealand are boneless beef that is either fresh or frozen. However, most of the imports from Brazil and Argentina are processed beef (LMIC).

One of the benefits to trade is that consumers are offered a greater variety of products to choose from in the market place. Cattle genetics and feeding and management practices differ across countries and as a result beef from different countries has unique flavor attributes. In the U.S. most cattle are placed in a feedlot for 100 to 200 days prior to slaughter and fed a high energy, corn-based diet. This feeding program increases the intramuscular fat or marbling in the meat; giving the U.S. beef a distinct corn-fed flavor. In contrast, most cattle finished in Australia, New Zealand and South American countries are not fed high energy diets for an extended period. The cattle are more typically grass-fed for most of their lives. This grass-fed beef also has a distinct flavor.

Currently, the U.S. beef industry is trying to regain market share and increase beef demand by improving the quality and consistency of beef products. In order to do this, the beef industry must strive to create a product that meets consumers' expectations for palatability. Consumers' preferences for different palatability characteristics must be identified.

Meat science research has shown that palatability of beef and consumer taste preferences are based on three components: tenderness, flavor, and juiciness. Most of the recent research regarding consumers' palatability preferences has focused on consumers' perceptions and willingness-to-pay for tenderness (Savell et al., 1989; Boleman, et al., 1997; and Lusk et al., 1999). However, a recent study has shown that beef flavor is of equal or of greater importance to consumers. Neely et al. (1998) reported that both flavor and tenderness were highly correlated with consumer overall like ratings for beef steaks.

Several factors, such as marbling level, length and type of aging, feeding practices, and the genetics of the cattle contribute to the flavor of beef. Marbling level clearly affects the type of flavor imparted to fresh beef products and is an obvious factor to use in order to begin studying consumer perception of beef flavor. Savell et al. (1989) found that consumers in both San Francisco and Philadelphia liked the flavor of USDA Choice beef over the taste of USDA Select beef. Neely et al. (1998) found that consumers in Chicago and Philadelphia rated steaks in the upper two-thirds of the USDA Choice quality grade significantly higher in overall like ratings than steaks of lower USDA quality grades.

While the studies discussed above provide information on the role of USDA quality grades in consumer evaluation of flavor, no effort was made to hold tenderness constant between different quality grades. By using steaks with similar tenderness values, one can focus on the

importance of flavor alone, without confounding the issue with tenderness. Determining consumer perceptions of beef flavor when tenderness is held constant could give the beef industry a better indication of the importance of beef flavor to the consumer. In addition, identification of the price premium that consumers are willing-to-pay to purchase beef having the flavor that they prefer would also be a valuable marketing tool for the beef industry.

Objectives

The overall objective of this research is to identify if consumers can perceive flavor differences in beef steaks and to determine if consumers are willing to pay a premium for their preferred flavor. Consumers will taste paired steak samples where tenderness is held constant but where marbling levels differ or where feeding practices and country of origin have differed.

The specific objectives of this paper are: 1) to analyze consumer preferences for flavor in beef steaks by comparing: a) highly marbled USDA upper 2/3 Choice versus low marbled USDA Select steaks and b) Argentine grass-fed beef versus U.S. corn-fed beef both grading USDA Select; 2) to establish the price premium that consumers are willing-to-pay for their flavor preference; 3) to identify demographic variables that affect consumers' taste preferences and willingness-to-pay for beef flavor.

Methodology

Three basic methods are used to elicit consumers' economic value or willingness-to-pay for preferences: personal interviews, written surveys, and experimental auctions. In this study, an experimental auction market procedure was used to elicit consumer willingness-to-pay for steaks with varying flavor. Experimental auction methods are cited as having the "potential to provide more reliable measures of willingness-to-pay than a hypothetical survey method (Lusk et. al.,

1999)." Fox et. al. (1995) stated four main advantages of using experimental valuation methods where winning participants are required to purchase the product: 1) auction bidding is designed to reveal true preferences, 2) the use of real money, real food, and repeated participation ensures reliability of the data, 3) the use of the requirement-to-eat factor reinforces the non-hypothetical aspect of the research and 4) the data is less biased by non-responses.

A commonly used experimental auction design is the Vickrey sealed-bid, second-price auction where each participant submits a written bid on a particular product (Friedman and Sunder, 1994). The highest bidder is determined to be the "winner" of the auction and must purchase the product at the second highest bid. Second-price auctions have been used to determine the price premium consumers were willing-to-pay for vacuum packaged steaks versus overwrapped steaks (Menkhaus et al., 1992), to determine the value of genetically modified pork (Buhr et al., 1993), to elicit consumer willingness-to-pay for food safety (Hayes et al., 1995) and to place a value on consumer preferences for various quality attributes of fresh pork chops (Melton et al., 1996).

Based on the second-price Vickrey auction methodology, an experimental valuation process using a fourth-price Vickrey auction was developed to elicit consumers' true willingness-to-pay for their preferred steaks. In the case of this research, the fourth-highest bid determined the market price with the top three bidders required to purchase steaks at the fourth-highest (market) price.

A multinomial logit model was used to analyze individual panelist's preferences and bids. The demographic and other data collected during the experimental valuation process were used to determine the effect of income, household size, meat consumption habits, etc. on flavor

preferences for domestic corn-fed beef versus international grass-fed beef and for USDA upper 2/3 Choice versus USDA Select beef.

Procedures

Consumers from Chicago, Illinois and San Francisco, California[2] were selected and screened on a broad range of questions regarding demographics and meat eating practices. Individuals meeting the trial specifications were invited to participate in a research experiment where they would sample various New York Strip steaks. They were told that they would receive $25 (Chicago) or $35 (San Francisco) for their participation and that they would have the option to purchase steaks similar in quality to those they had sampled. Twenty-four taste panels consisting of twelve consumers each were scheduled for a total of 144 participants in Chicago and 144 participants in San Francisco.

Once at the research facility, consumers were first paid the amount specified over the phone and were then asked to complete surveys describing their meat purchasing behavior, eating preferences, knowledge of beef and demographic characteristics. The Vickrey auction process was then explained to the consumers. Participants were encouraged to bid exactly what they believed the product to be worth to them. They were informed that if they submitted a successful bid, they were obligated to purchase the steak that they bid on at the auction market price. Three practice (non-purchase) auctions were performed in order to familiarize the consumers with the auction process. Consumers were then brought into taste panel booths where they were given a warm-up sample of steak to taste and evaluate.

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[2] The Chicago market is typically characterized as a Choice beef market while the San Francisco market is characterized as a Select or no-roll beef market. Both the domestic product and the Argentine product had sufficient marbling for the USDA Select grade.

Prior to the tasting and rating the U.S. corn-fed beef and the Argentine grass-fed beef steaks, consumer panelists had tasted, rated, and bid on two pairs of high-marbled versus low-marbled steaks (USDA upper two-thirds Choice versus USDA Select). Each pair of U.S. corn-fed beef and Argentine grass-fed beef steaks had similar Warner-Bratzler shear force values; therefore, tenderness was held constant within the paired comparisons.[3] The steaks were all cooked to the same degree of doneness (70°C, a medium degree of doneness).

After consumers tasted each steak sample, they rated the sample on sensory traits (juiciness, tenderness, flavor and overall acceptability). Consumers were given a set of "bid sheets" where they wrote down their bid price for each steak after they had completed sensory evaluations on both steak samples in a pair. Each bid was for one pound of frozen, packaged New York Strip steaks from the same loin as the steak that they had tasted. After all of the bids were turned in for the pair, the fourth-highest bid for each steak was announced as the market price and the top three bidders all purchased steaks at the market price.

Participant Demographics

In total, 248 consumers actually participated in the study, 124 in Chicago and 124 in San Francisco. Demographic summary statistics are provided in Table 1. Approximately 81% of the consumers participating in the study were female with slightly more male consumers participating in San Francisco. The dominant ethnic background of the consumers was White/Caucasian and the average age of the consumers was 45 years. On average, most participants had some college experience with mean annual household income levels around

[3] Warner-Bratzler shear force measures the amount of force required to penetrate a cut of meat and allows a numerical value to be assigned indicating its tenderness level. It is the most accurate measurement of the variation in steak tenderness (Shackelford et. al., 1996).

$60,000 to $69,000, were married and lived in households with three to four family members.

Table 2 provides the results from the purchasing behavior and consumption preferences survey questions. Fifty-eight percent of the respondents prepared and ate meat three to six times a week with Chicago consumers eating meat more times per week than San Francisco participants. When consuming meat at home, participants most commonly consumed beef (65%) with chicken being the second most consumed meat (32%). The majority of the participants preferred to consume steak (76%) or roast beef (16%).

When surveyed about their satisfaction with the flavor, tenderness and juiciness of the beef products that they consumed, 93% of the consumers were satisfied. On average, quality was marked most commonly as being the "driver" of shopping decisions, however, both price and quality appeared to be important to Chicago consumers. Forty-eight percent of the participants indicated that they typically bought USDA Choice grade steaks, 15% usually purchased USDA Select steaks and 33% did not know what quality grade they purchased. Forty-six percent of the consumers indicated that they had stopped purchasing a beef product because they were unsatisfied with the product's flavor, tenderness or juiciness.

Results

Figure 1 shows the results of the sensory evaluations from the domestic versus imported pair of steaks. Consumers strongly preferred the domestic product on all sensory traits (flavor desirability, juiciness, tenderness, and overall acceptability) over the imported product. Of particular interest is the magnitude of the flavor desirability ratings. A mean difference of one full taste panel rating is seldom observed in beef sensory panel research. It is clear from these

results that consumers in both Chicago and San Francisco felt strongly about flavor and, as a result, about overall satisfaction.

After completing the sensory evaluations, participants bid on the steaks. A few participants only wanted to participate in the research trial for the cash and chose not to bid on any steaks. Participants who bid zero on all auctions were eliminated from the data set leaving 226 usable participants. The results from the auction on the domestic versus imported pair of steaks showed that on average, consumers bid more for the domestic steak sample (Table 3). The differences in sensory ratings translated into significant bid differentials of $.82 and $.55 per pound in Chicago and San Francisco, respectively.

The results discussed above are simply average taste panel rankings and bid prices. One objective of this research was to investigate if consumers exist who prefer and are willing-to-pay more for the domestic corn-fed beef versus the Argentine grass-fed beef (and vice versa). Based on overall acceptability rankings and bid differentials between pairs of steaks, consumers were identified who preferred and were willing-to-pay more for a particular flavor. After tasting and evaluating both of the steaks in the domestic versus Argentine steak pair, 141 consumers were willing-to-pay an average of $1.61 more per pound for the domestic sample, 51 consumers were willing-to-pay an average of $1.36 more per pound for the Argentine sample and 34 consumers were indifferent between the domestic and Argentine steak (Figure 2).

As mentioned in the procedures, prior to sampling the domestic corn-fed versus international grass-fed beef, panelists sampled upper 2/3 Choice versus Select beef. Figure 3 shows the results of their sensory evaluations. On average, panelists ranked the flavor

desirability, juiciness and overall acceptability of the Choice steak significantly higher than the Select steak.

In addition to the higher taste panel ratings for the Choice steak (on average), consumers were also willing-to-pay a slightly higher price for the Choice steak on average. In Chicago, these differences were valued at an additional $.25 per pound (Table 4). Although consumers in San Francisco also found the higher marbled steaks to have a more desirable flavor, greater juiciness and higher overall acceptability, they were only willing-to-pay $.03 more per pound. Sixty-five consumers were consistently willing-to-pay significantly more (an average of $1.30 per pound more) for the USDA Choice beef, 31 consumers were consistently willing-to-pay significantly more for USDA Select beef (an average of $1.63 per pound more) and 130 participants were indifferent between USDA Choice and Select (Figure 4).

It is clear that there are consumers who prefer the domestic corn-fed beef to the grass-fed beef and vice-a-versa. Some consumers also prefer higher marbled steaks to lower marbled steaks and vice-a-versa. Each group is willing-to-pay a premium for their preference and consumers with a stronger preference generally had a larger bid differential. There was no statistically significant relationship between consumers who preferred corn-fed versus grass-fed beef and those who preferred Choice versus Select beef.

A multinomial logit model was used to identify consumers by their demographic traits and to predict which flavor they would prefer and the strength of their preference (measured by their willingness-to-pay). The multinomial logit model shown in Equation 1 was used to examine the probability that a consumer would prefer the corn-fed steak, the grass-fed steak or would be indifferent between the two, given their demographic and steak eating and preference

characteristics. Equation 2 was used to analyze the probability that a consumer would prefer the high-marbled (USDA Choice) steak , the low-marbled (USDA Select) steak or would be indifferent between the two steaks given the independent explanatory variables.

Equation 1. *COUNTRY PREFERENCE = f(location, age, gender, ethnic, income, education, family size, eat meat, eat beef, satisfy, driver, grade*).

Equation 2. *MARBLING PREFERENCE = f(location, age, gender, ethnic, income, education, family size, eat meat, eat beef, satisfy, driver, grade*).

COUNTRY PREFERENCE is a categorical variable used to represent consumers' taste preferences for corn-fed versus grass-fed steaks. *COUNTRY PREFERENCE* takes on the values of 0, 1, or 2 for consumers who were indifferent between the corn-fed and the grass-fed beef, consumers who preferred the corn-fed beef over the grass-fed beef, and for consumers who preferred the grass-fed beef over the corn-fed beef, respectively

MARBLING PREFERENCE is also a categorical variable used to represent consumers' steak preferences due to marbling. *MARBLING PREFERENCE* takes on the values of 0, 1, or 2 for consumers who were indifferent between the high-marbled and the low-marbled beef, consumers who preferred the high-marbled beef over the low-marbled beef, and consumers who preferred the low-marbled beef over the high-marbled beef, respectively.

Location is either Chicago or San Francisco, *age* is the participant's age category, *gender* is male or female, *ethnic* is ethnic background, *income* is the participant's income category, *education* is the participant's education level, *family size* is the family size category, *eat meat* is the number of times per week that meat is eaten in the home, *eat beef* is equal to one if beef is consumed most often and is equal to zero otherwise, *satisfy* is the consumer's satisfaction

with the flavor, tenderness and juiciness of beef products consumed, *drive* is the factor driving consumers' shopping decisions, *grade* is the USDA grade of beef typically purchased.

The marginal effects from the multinomial logit model estimated using Equation 1 are shown in Table 5. The model contained 226 observations. The coefficients in Table 5 are the predicted change in the probability that a consumer will be in that category as a result of a one unit increase in the value of a independent variable.

Few variables were significant in the model. The marginal probabilities for *gender, eat beef,* and *grade* were statistically significant in the "preferring corn-fed" category. The estimates indicate that females are 7.2% less likely than males to prefer the corn-fed steak, individuals who consume beef most often (versus other meats) will be 5.5% more likely to prefer the corn-fed beef and consumers eating beef with a USDA grade of Choice are 2.5% more likely to prefer the corn-fed beef. Among the consumers preferring the grass-fed beef, *location, ethnic, driver* and *grade* were significant variables. These marginal probabilities indicate that consumers in San Francisco are l6.3% less likely to prefer the grass-fed beef and non-Caucasian consumers are 7.9% more likely to prefer the grass-fed steak.

The marginal effects from the multinomial logit model estimated using Equation 2 are presented in Table 6. Age was a significant variable for both the "high-marbled beef preferring" and the "low-marbled beef preferring" categories, indicating that as age category increases by one unit, consumers are 4.9% more likely to prefer the high-marbled beef steak and 5.6% less likely to prefer the low-marbled beef steak. The marginal probabilities for education was also statistically significant in the "high-marbled beef preferring" and "indifferent" categories. A one unit increase in the consumers' level of education will increase the probability that they are

indifferent between the flavor of high-marbled versus low-marbled beef by 4.9% and decrease the probability by 4.3% that consumers prefer the flavor of the high-marbled steak. Grade was a significant variable for the "low-marbled beef preferring" category indicating that consumers who indicated that they typically purchase a steak that is graded USDA Choice are 9.6% more likely to prefer the low-marbled beef steak.

Implications

These results indicate that: 1) consumers can differentiate between the flavor of domestic, corn-fed USDA Select steaks and Argentine, grass-fed steaks (qualifying for USDA Select quality grade) and between upper 2/3 Choice and Select grade steaks when tenderness is held constant within the pair of steaks, and 2) consumers are willing-to-pay a significant premium for the steak that they prefer. Sixty-two percent of the participants preferred the domestic, corn-fed flavor to the Argentine, grass-fed flavor and were willing-to-pay an average of $1.61 per pound more for the domestic steak. However, 23% of the participants preferred the Argentine steak and were willing-to-pay and average of $1.36 per pound more for their preference.

The results of this study suggest that country-of-origin labeling may need to be considered in order to provide consumers with a consistent beef product that meets their palatability expectations. Currently, imported beef may meet the USDA inspection specifications for a safe and wholesome product, be graded with a USDA quality grade and sold in the retail meat case in the same manner as domestically produced beef. However, beef imported from countries that produce cattle under different management practices will likely produce a uniquely flavored product. If consumers are not aware of the origin of their beef, they may purchase a beef product that produces an unfavorable eating experience. Thus, it is

important that consumers are properly informed of the factors affecting the palatability of their steak.

This information should also be of interest to agribusiness firms interested in niche marketing or branding grass-fed beef products. While the results of predicting flavor preferences from the demographic data and meat eating preferences were not that revealing, there are groups of consumers who can distinguish a flavor difference between domestic, corn-fed beef and grass-fed beef and are willing-to-pay a significantly higher price for their preferred flavor. As more is learned about consumer preferences for beef and as those preferences are met with the appropriate product, it is likely that demand for beef in the U.S. can be increased.

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Table 1. Definitions of Demographic Variables and Summary Statistics

Definition	Chicago %	San Francisco %	Overall %
Gender of Respondent:			
1= Male	17.09	21.10	19.03
2 = Female	82.91	78.90	80.97
Age of respondent:			
1 = Under 25 years	1.71	3.67	2.65
2 = 25 – 34 years	5.13	7.34	6.19
3 = 35 – 44 years	47.86	29.36	38.94
4 = 45 – 54 years	31.62	36.70	34.07
5 = 55 – 64 years	13.68	22.94	18.14
6 = Over 64 years	0.00	0.00	0.00
Ethnic background:			
1 = White/Caucasian	94.87	74.31	84.96
2 = African American	2.56	6.42	4.42
3 = Hispanic	1.71	9.17	5.31
4 = Asian	0.85	0.92	0.88
5 = Native American	0.00	0.92	0.44
6 = Other	0.00	8.26	3.98
Education level of respondent:			
1 = Elementary school	0.00	0.00	0.00
2 = Some high school	0.85	0.92	0.88
3 = High school graduate	18.80	10.09	14.60
4 = Some college	33.33	47.71	40.27
5 = Completed junior college	11.11	16.51	13.72
6 = Completed 4-year university	24.79	17.43	21.24
7 = Completed graduate school	11.11	7.34	9.29
Household income level:			
1 = Less than $20,000	3.48	3.81	3.64
2 = $20,000 to $29,000	3.48	3.81	3.64
3 = $30,000 to $39,999	11.30	6.67	9.09
4 = $40,000 to $49,999	8.70	16.19	12.27
5 = $50,000 to $59,999	12.17	9.52	10.91
6 = $60,000 to $69,999	16.52	15.24	15.91
7 = $70,000 to $79,999	11.30	10.48	10.91
8 = $80,000 to $89,999	10.43	11.43	10.91
9 = $90,000 to $99,999	6.09	9.52	7.73
10 = Greater than $100,000	16.52	13.33	15.00

Table 1. Continued Definitions of Demographic Variables and Summary Statistics

	Chicago %	San Francisco %	Overall %
Number of family members living in household			
1 = 1	4.27	9.17	6.64
2 = 2	13.68	19.27	16.37
3 = 3	17.09	22.94	19.91
4 = 4	31.62	32.11	38.86
5 = 5	28.21	13.76	21.24
6 = more than 5	5.13	2.75	3.98
Marital Status:			
1 = Single	7.76	16.51	12.00
2 = Divorced	6.90	11.01	8.89
3 = Separated	0.86	0.92	0.89
4 = Married	83.62	67.89	76.00
5 = Widowed	0.86	2.75	1.78
6 = Domestic partnership	0.00	0.92	0.44
Employment:			
1 = Student	0.85	2.75	1.77
2 = Part-time	36.75	24.77	30.97
3 = Full-time	28.21	45.87	36.73
4 = Not employed	34.19	26.61	30.53

Table 2. Definitions of Meat and Beef Purchasing Behavior Variables and Summary Statistics

Definition	Chicago %	San Francisco %	Overall %
Number of times per week meat products are prepared and eaten in home.			
1 = 1-2 times	5.13	5.50	5.31
2 = 3-4 times	22.22	40.37	30.97
3 = 5-6 times	25.64	28.44	26.69
4 = 7-8 times	19.66	14.68	17.26
5 = 9-10 times	10.26	3.67	7.08
6 = more than 10	17.09	7.34	12.39
Preferred meat product for consumption:			
1 = Beef,	61.61	65.09	63.30
2 = Pork	7.14	0.00	3.67
3 = Chicken	25.00	28.30	26.61
4 = Lamb,	0.89	2.83	1.83
5 = Fish,	5.36	1.89	3.67
6 = Duck	0.00	1.88	0.92
Meat product consumed most often at home:			
1 = Beef	65.52	64.76	65.16
2 = Pork	0.00	0.95	0.45
3 = Chicken	32.76	30.48	31.67
4 = Lamb	0.00	0.00	0.00
5 = Fish	1.72	3.81	2.71
6 = Other	0.00	0.00	0.00
Preferred type of beef to consume:			
1 = Steak	73.50	79.44	76.34
2 = Ground Beef	7.69	5.61	6.70
3 = Roast	17.95	13.08	15.63
4 = Other	0.85	1.86	1.34
Preparation method for cooking beef steaks:			
1 = Broiling	23.68	27.36	25.45
2 = Grilling	65.79	56.60	61.36
3 = Pan Broiling	3.51	3.77	3.64
4 = Pan Frying	1.75	4.72	3.18
5 = Roasting	2.63	3.77	3.18
6 = Stir-Frying	0.88	1.89	1.36
7 = Braising	0.00	0.00	0.00
8 = Cooking in Liquid	1.75	1.89	1.82

Table 2. Continued Definitions of Meat and Beef Purchasing Behavior Variables and Summary Statistics

Definition	Chicago %	San Francisco %	Overall %
Satisfaction with the flavor, tenderness, juiciness of the beef products consumed:			
1 = Extremely satisfied	5.98	6.42	6.19
2 = Very satisfied	28.21	45.87	36.73
3 = Satisfied	58.12	42.20	50.44
4 = Unsatisfied	7.69	4.59	6.19
5 = Very unsatisfied	0.00	0.92	0.44
6 = Extremely unsatisfied	0.00	0.00	0.00
Grade of beef steaks typically purchased:			
1= USDA Choice	46.96	48.62	47.77
2= USDA Select	13.91	15.60	14.73
3 = Don't know	33.91	33.03	33.48
4 = USDA Prime	0.87	1.83	1.34
5 = Other (Branded Product)	4.35	0.92	2.68
Factor "driving" shopping decisions:			
1 = Price	31.25	15.00	23.58
2 = Quality	46.43	64.00	54.72
3= Budget	10.71	8.00	9.43
4 = Health	11.61	13.00	12.26
Where beef is typically bought:			
1 = Grocery store	86.96	75.76	81.78
2 = Butcher shop	9.57	15.15	12.15
3 = Other	3.48	9.09	6.07
Stopped purchasing beef due to dissatisfaction with product's tenderness, flavor, or juiciness:			
1 = Yes	50.86	39.81	45.54
2 = No	49.14	60.19	54.46

Table 3. Average Auction Bids ($/pound) for Domestic and Imported Beef Steaks (Standard Deviation in Parenthesis).

Treatment:	**Chicago** Mean (Std. Dev.)	**San Francisco** Mean (Std. Dev.)	**Overall** Mean (Std. Dev.)
Domestic Corn-Fed	$2.68 (1.38)	$2.66 (1.61)	$2.67 (1.49)
Argentine Grass-Fed	$1.84 (1.59)	$2.11 [a] (1.67)	$1.97 (1.63)
Difference (Corn-fed vs. Grass-Fed)	$0.82 [b]	$0.55 [b]	$0.70 [b]

N=226

[a] = Average bid is significantly different ($\alpha = .05$) between locations.

[b] = Average bid is significantly different ($\alpha = .05$) between treatments.

Table 4. Average Auction Bids ($/pound) for USDA Choice versus USDA Select Beef Steaks (Standard Deviation in Parenthesis).

Treatment:	**Chicago** Mean (Std. Dev.)	**San Francisco** Mean (Std. Dev.)	**Overall** Mean (Std. Dev.)
High-marbled (USDA Upper 2/3 Choice)	$2.40 (1.19)	$2.76 [a] (1.46)	$2.57 (1.34)
Low Marbled (USDA Select)	$2.15 (1.01)	$2.73 [a] (1.33)	$2.43 (1.21)
Difference (Choice vs. Select)	$0.25 [b]	$0.03	$0.14 [b]

N=226

[a] = Average bid is significantly different ($\alpha = .05$) between locations.

[b] = Average bid is significantly different ($\alpha = .05$) between treatments.

Table 5. Marginal Probabilities for the Corn-fed Beef versus the Grass-fed Beef Multinomial Logit Model

	Category		
Variable	**Prefers Corn-fed**	**Prefers Grass-fed**	**Indifferent**
Location	.0266 (.7600)	-.1634[a] (1.992)	.1368[b] (1.47)
Age	-.0167 (-.8620)	.0462 (1.159)	-.0296 (-.6740)
Gender	-.0717[b] (-1.612)	-.0706 (-.7010)	.1423[a] (1.931)
Ethnic	-.0138 (-.7950)	.0789[a] (2.386)	-.0651[b] (-1.631)
Income	-.0001 (-.4490)	.0010 (.579)	-.0009 (-.5850)
Education	.0011 (.1070)	-.0187 (-.6830)	.0176 (.6100)
Family Size	.0253 (1.064)	.0093 (.2850)	-.0345 (-.9670)
Eat Meat	-.0006 (-.0630)	-.0331 (-1.453)	.0337 (1.138)
Eat Beef	.0559[b] (1.645)	-.0395 (-.4990)	-.0163 (-.1820)
Satisfy	.0242 (.8590)	.0373 (.7160)	-.0615 (-1.132)
Driver	.0001 (.5570)	-.0002[b] (-1.559)	.0002 (1.005)
Grade	.0249[a] (2.560)	-.0075[b] (-1.720)	-.0174 (-2.063)

[a] = coefficient is statistically significant at the 5% level
[b] = coefficient is statistically significant at the 10% level
n = 226

Table 6. Marginal Probabilities for the High Marbled (USDA Choice) versus the Low Marbled (USDA Select) Beef Steak Multinomial Logit Model

	Category		
Variable	**Prefers High-Marbled**	**Prefers Low-Marbled**	**Indifferent**
Location	.8035 (1.261)	-.0506 (-.9240)	-.0297 (-.5100)
Age	.0487[b] (1.384)	-.0562[a] (-1.854)	.0074 (.2320)
Gender	-.1127 (-.1360)	.3864 (.5250)	-.0273 (-.3640)
Ethnic	.3326 (.3470)	.0715 (.8190)	-.1048 (-1.620)
Income	.2149 (.0900)	.0001 (.7020)	-.0017 (-.9110)
Education	-.0431[a] (-1.654)	-.0066 (-.3010)	.0497[a] (2.158)
Family Size	-.2019 (-.0730)	.0091 (.3870)	-.0071 (-.2830
Eat Meat	.9302 (.3770)	-.1097 (-.5250)	.0017 (.0750)
Eat Beef	.0478 (.6450)	-.3931 (-.6360)	-.0084 (-1250)
Satisfy	.0061 (.1310)	.2556 (.6430)	-.0316 (-.7490)
Driver	.2121 (1.345)	-.0002 (-1.429)	-.0001 (-.3600)
Grade	-.0494 (-.7230)	.0964 [a] (1.756)	-.0470 (-.7530)

[a] = coefficient is statistically significant at the 5% level
[b] = coefficient is statistically significant at the 10% level
n = 226

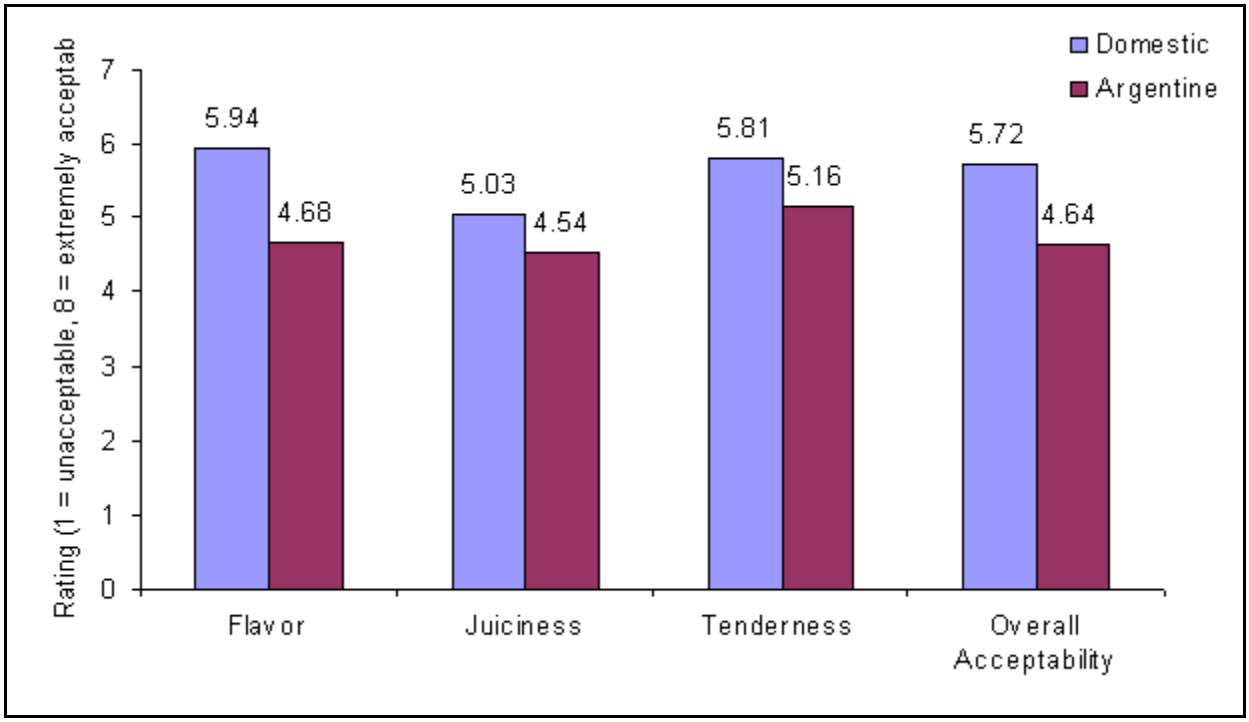

Figure 1 Taste Panel Rating for Domestic Corn-fed versus Argentine Grass-fed Beef Steaks

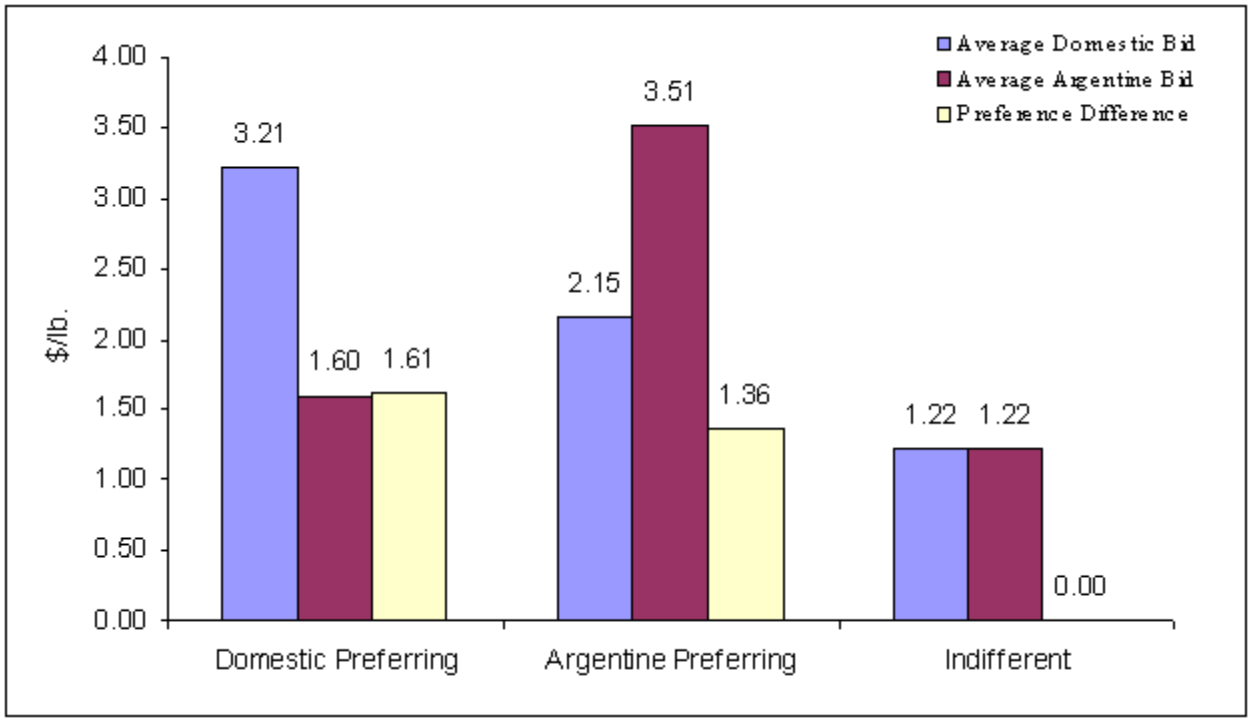

Figure 2 Average Bid Difference for Preferred Beef Flavor (Domestic versus Argentine Beef)

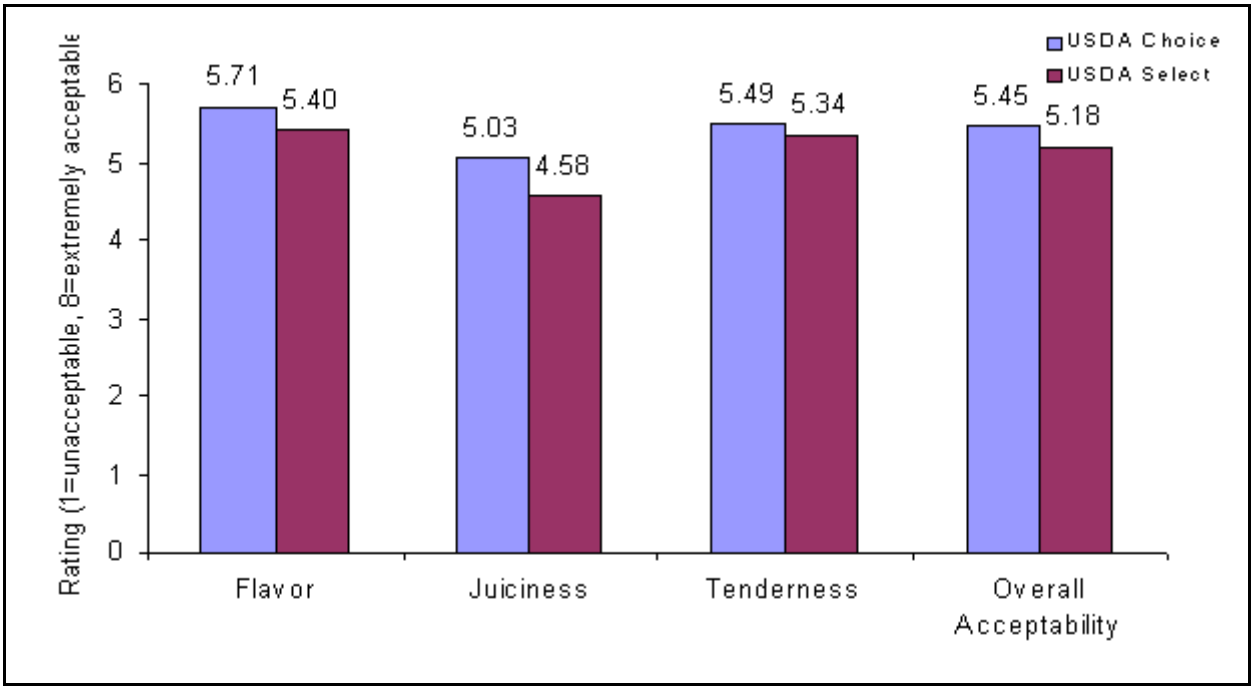

Figure 4 Taste Panel Ratings for USDA Upper 2/3 Choice and Select Beef Steaks

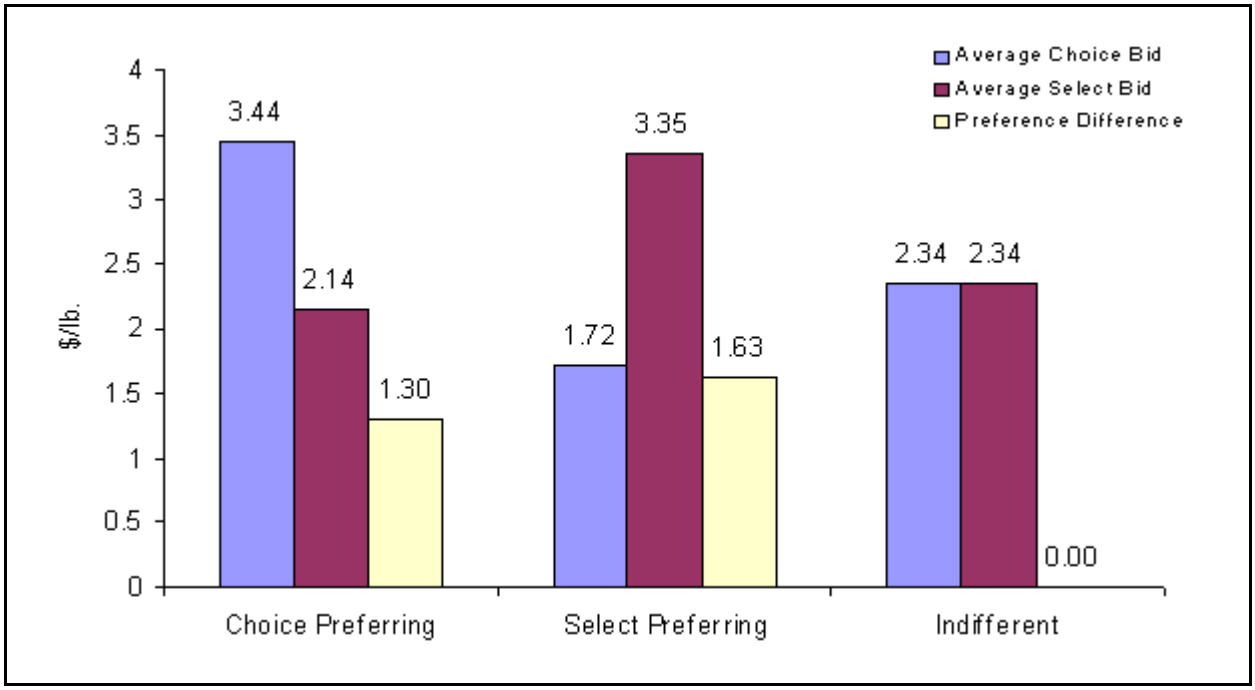

Figure 3 Average Bids for Preferred Beef Flavor (USDA Upper 2/3 Choice versus USDA Select Beef Steaks)