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Introduction

Location of product origin is an often-used marketing device by retailers. This approach is based on the assumption that location of origin indicates something to consumers about the underlying quality of the product. This can be an effective strategy if the signal matches the consumer valuation of the product after consumption. In the same vein, health advertising is used to increase demand for a product that exhibits "healthy" dietary attributes. While there have been various studies examining the potential impacts of these attributes on demand, there have been relatively few that examine the consistency of consumer valuations of location of origin before and after they have actually consumed the product or before and after health advertising. This study attempts to bridge that gap between impacts of specific attributes on demand and consistency of consumer valuation under different information sets including consumption.

The sweetpotato is a product that combines both credence and experience attributes. Experience attributes are those where individual assessments or valuations cannot be resolved until after consumption — the taste of a particular cut of meat, for example. Credence attributes, by contrast, are those where assessment or measurement cannot take place even after consumption and are, therefore, based solely on the "belief" that the attribute exists. The credence characteristics in the sweetpotato are its location of origin and its nutritional content. The experience characteristic is the element of taste where the consumer's uncertainty can only be resolved through consumption of the product. Some attributes related to sweetpotatoes may be valued differently than others. There is no information, however, on how consumers value these attributes in sweetpotatoes.

The sweetpotato industry in the United States has four primary growing regions: Louisiana, Mississippi, North Carolina, and California. In the southeast, the Beauregard variety developed at Louisiana State University in 1987 is the predominant variety produced. Midwest produce buyers, who represent a potentially important target for Mississippi growers, prefer to purchase potatoes from North Carolina (Graves). Sweetpotato farmers pack their potatoes in 40-pound crates and then ship them to brokers. These brokers then sell them to buyers throughout the United States. While the Midwest buyers' preference for the North Carolina potato is likely based in part on developed relationships with North Carolina growers, their purchase decisions are made, at least in part, on perceptions of consumer preferences.

Because the genetic composition of the Beauregard potato is constant in each state, there is little genetic variation in product quality. However, soil quality may make some difference. Growers, for example, suggest that the soil quality in Mississippi produces a "sweeter" potato than North Carolina (Graves). To the extent that consumers value this attribute, they should express a positive value. If true, the use of the "location" of North Carolina would be a poor signal of the underlying quality. Thus, consistency of valuation of potatoes with and without knowledge of location of production is critical for (1) understanding the relationship between the credence attribute and consumer valuation, and (2) developing marketing strategies based on those valuations.

The second credence attribute in sweetpotatoes relates to health effects. Compared with white (Irish) potatoes, sweetpotatoes are higher in beta-carotene and lower in starches and sugars (North Carolina Sweet Potato Commission). If consumers significantly value these health effects, use of health advertising may be an effective strategy. In general, health advertising has been effective for many products, there is no evidence of its effectiveness for sweetpotatoes.

Finally, the taste of the sweetpotato is an experience attribute. Sweetpotatoes are purchased on sight evaluation in the store. Consistent valuation after consumption with preconsumption (sight) valuation would indicate two important conclusions. First, sight valuation is an effective prediction of postconsumption valuation. Second, because the valuation of the potato after consumption is consistent with expectations (based on what consumers concluded based on sight alone), consumers are more likely to be satisfied with their decision and, therefore, purchase the product again. More specifically (and related to the location attribute), it is important to investigate the sight/consumption valuation consistency for potatoes from different regions. Knowledge of this relationship across regions will allow producers in different regions to develop more effective marketing strategies and allow produce buyers to formulate more consumer-driven buying decisions.

The general objective of this research was to examine consumer willingness to pay for sweetpotatoes based on location of origin and health advertising. Specifically, the purpose was to examine these effects in a controlled environment to control for before and after effects, focusing on the impact of location of origin, taste, and health information on consumer valuation of sweetpotatoes.

Sweetpotato Industry

The United States is the 10th largest producer of sweetpotatoes in the world, with the People's Republic of China accounting for 85% alone. However, only 3% of American consumption is imported, with the majority of that coming from the Dominican Republic exporting exclusively to Puerto Rico (USDA 2002). The U.S. sweetpotato industry has four major growing regions (Figure 1), with North Carolina (37%), Louisiana (24%), California (18%), and Mississippi (13%) as the primary producers. Until 1988, sweetpotato demand had been declining since 1932, when sweetpotato acreage was at its peak. U.S. sweetpotato production in 2001 was the third highest of all time as Mississippi tripled its production from 2000 (ERS 2002).

Once the potato is produced and harvested, the farmer typically sells the product to a packer and is paid on the basis of crop quality. The packer prepares the potatoes for shipping and sells the product to a broker. Because the broker pays the transportation costs from the packer to the buyer, the location of the farmer or packer plays an important role when doing business. Of the 16 largest sweetpotato brokers in the Southern growing region, eight (50%) are located in North Carolina, four (25%) are located in Louisiana, and two (12.5%) are located in both Mississippi and Alabama (Graves). The larger brokers characteristically have offices in each state but tend to first sell the supply of their home state. Given high transportation costs, North Carolina's proximity to large Northeast markets (Figure 2) gives that state a competitive advantage in those markets. Louisiana uses the majority of its crop for prepossessing and canning. However, Louisiana has shifted their focus to the fresh market in the past 8-10

American Sweetpotato Producers

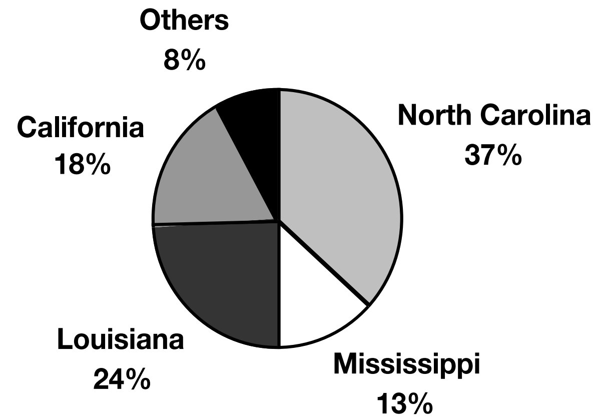

Figure 1. American sweetpotato production by the largest producing states (National Agricultural Statistic Service, USDA 2001).

Regional Consumption of Sweetpotatoes

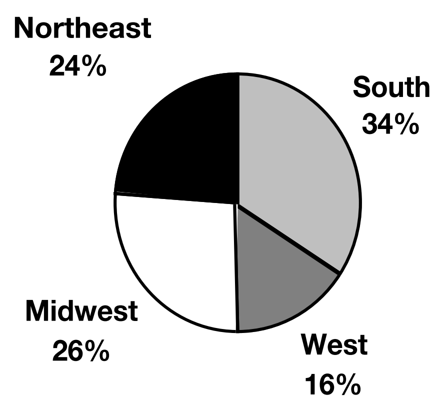

Figure 2. Total American consumption of sweetpotatoes by geographical region (National Agricultural Statistic Service, USDA 2001).

years and now has large market shares in Chicago and Detroit (ERS, 2002). Graves argues that Louisiana and North Carolina, with their superior transportation infrastructure, battle for the Midwest and its 26% share of the total sweetpotato market. He suggests that because the transportation costs are typically lower (due to proximity) in North Carolina and transportation infrastructure is typically better in Louisiana, brokers turn to these states first before looking at Mississippi. Thus, transportation costs play an important role in product choice. However, consumer demand for alternative products may override cost considerations.

Value Elicitation

The primary objective of this analysis is to elicit values for different types of sweetpotatoes. There are a number of elicitation techniques available, each with different advantages and disadvantages. The following subsections outline the different elicitation methods with some discussion of their relative merits (for a more complete discussion of these techniques, see Nalley or Lusk). We separate elicitation methods into two categories: (1) hypothetical and (2) nonhypothetical.

Hypothetical Value Elicitation — Various hypothetical valuation techniques are used today with contingent valuation (CV) and conjoint analysis (CA) being the most widely used. In contingent valuation, a new product or new attribute is described and participants are asked, hypothetically, how much they would be willing to pay (WTP) for the good or whether they would purchase the good at a certain price level. In conjoint analysis (CA), participants are shown various product scenarios, where the attributes of the product are varied across the scenarios (i.e., color, packaging, size, brand, and price). Participants then rank the scenarios and/or are asked to choose which scenario is most appealing to them. Though hypothetical value elicitation methods have been shown to have benefits (e.g., relatively inexpensive, easy to explain to participants, and realistic choice selection), it has been shown that consumers may not behave economically rational. List and Gallet found that, on average, participants overstate their preferences by a factor of about 3 in hypothetical settings. List and Gallet also found that this is influenced by the distinction between WTP and willingness to accept (WTA), public vs. private goods, and the type of elicitation method. To curtail this problem of inflated bids, participants can be put in a scenario where they have to spend money (their own) to purchase the good, which is discussed below.

Nonhypothetical Value Elicitation — Using experimental demand-revealing auctions has a distinct advantage over the study of purchase decisions with field data because it allows an individual's limit price to be measured directly (Noussair, Robin, and Ruffieux). When you observe only an individual's purchasing habits, you merely establish if his or her price limit exceeds the stated market price. According to Hayes et al., it is advantageous to use a nonhypothetical auction as opposed to a hypothetical focus group because you now deal with real goods and market discipline will be established.

The English auction, as well as the Vickery, the Becker Degroot Marschak (BDM), and the Random *n*th price auction, are all nonhypothetical value elicitation methods. They can be described as "incentive compatible," meaning that it is to the bidder's advantage to express his or her true WTP. For example, if you bid higher than your true reservation value and win the auction, but the market price is less than your true value, you benefit, because you won the auction at a price lower than your true value. However, if you win the auction and the market price is more than your true value, you end up paying more than you are willing to pay to obtain the good. If you bid less than your true reservation value in an incentive-compatible auction, the inverse is true. If you lose the auction and the market price is more than you are willing to pay, you are indifferent because you would not have won the auction even bidding your true value. However, if you lose the auction and the market price is less than or equal to your true reservation value, you have lost the opportunity to purchase the good at a value at which you were willing to pay. The underlying theme is that you can never benefit, but you can lose, by not expressing your true reservation value in an incentive-compatible auction. Knowing these facts, participants of an auction will express their true WTP and generate accurate data desired by the auctioneer.

While it can been demonstrated that some types of experimental auctions offer an active market environment with subjects encouraged to act economically rational, it has also been shown that each plays a situational role. That is, each has advantages and disadvantages (Table 1); therefore, the type of information that needs to be elicited will dictate which auction to use.

Willingness-to-Pay

Willingness-to-pay (WTP) is the maximum price that a consumer is willing to pay to acquire a good, service, or attribute. While market price and WTP are not the same, WTP does form the upper bound on a market price an individual will pay for a good. The WTP concept is important to benefit-cost analysis, welfare economics, and efficiency criteria. There are different attributes that can affect consumer WTP for certain goods, such as visual appearance (Melton et al.), taste (Chern et al.), and food safety (Latvala and Kola). In the case of credence and experience attributes, consumers may find that their true WTP cannot be derived until after consumption unless adequate information is provided.

Several studies have previously identified inconsistencies in WTP values depending on the information provided on the underlying attributes. Melton et al. found in fresh pork chops that correlations of consumer rankings based on visual evaluations across presentation formats were low, and overall evaluations of appearance and "eatability" were even less closely related. Chern et al. found that consumers who valued the sight of a credence attribute (pulsed electric field [PEF] orange juice) at a premium actually decreased their WTP by 17% once they had consumed it. Credence attributes such as location of origin may signal quality as in the case of Hawaiian produce (Suryanata).

These studies suggest that WTP may vary according to the information about underlying attributes. More precisely, one would expect that increasing information would alter WTP (if the new information leads to a change in valuation). In the case of sweetpotatoes, WTP can be expressed by equation 1:

$$\text{WTP}_i = V_i(\delta;I_j) \quad (1)$$

Table 1. Pros and cons of hypothetical and nonhypothetical valuation methods.

Method	Pros	Cons
Contingent Valuation Method	Flexible tool to be used to analyze specific polices and to measure WTP for an attribute or quality change	Overestimation: due to general lack of considering budget constraints, stated WTP higher than actual paying and the large divergence between consumers' statement and actual behavior
	Collects data directly from consumers, not relying on secondary data	Variation in WTP responses, conditional upon the familiarity with the good being valued
	Less Expensive and easier than experiments	Vulnerable to sample and question format bias
Experimental Auction Method	More accurate WTP measures than CV method, using money to remind subjects of their budget constraints, and based on behavior rather than intentions	Higher costs per respondent than CV
	Honest revelation of values and preferences by real incentive mechanism	Geographical or regional restrictions on samples and high probability of nonresponsive samples
	Control for external distractions and external strategic behavior	Bias in the revealed WTP caused by financial compensation or participation payments
	The absence of nonresponse bias	Difference between lab and real life, due to artificial settings of experiments
Conjoint Analysis Method	Lower costs (less expensive) and less variance (more precise), due to the repeated measures design	Not focusing on the value of specific attributes, but evaluating a product with several attributes as a whole
		Limited number of production profiles, because of respondents' difficulties in rating more than about nine profiles, change in attribute level also being restricted

Equation 1 states that consumer *i*'s valuation (V_i) of a sweetpotato is a function of a variety of intangible and/or unmeasured characteristics (δ) and the information set to which the consumer is privy (I_j), which may consist of factors such as sight valuation, smell, taste, and other signals of quality. The information set can be from either prior knowledge or information given to them prior to valuation. As shown in equation 2, in this analysis it is assumed that information is a function of sight or visual assessment (S), taste (T), and health information dealing with sweetpotatoes (H):

$$I_j=f(S,T,H) \tag{2}$$

Assume that I_1 represents an information set containing sight information only. The consumer's WTP after considering sight information is given by equation 3:

$$WTP_s = V_i(\delta;I_1) \tag{3}$$

Once consumers have consumed a good with an experience attribute such as taste, they may change their WTP based on their approving or objecting to the taste attribute. If sight and taste are perfectly correlated (that is, visual appearance is a perfect representation of taste), WTP should remain constant from their initial valuation. However, it is most likely the case that visual evaluation is not perfectly correlated with taste (Melton et al.), so there may be some variation between the consumer's initial WTP based exclusively on sight and their new valuation based on visual appeal and taste. By adding the experience attribute of taste along with the knowledge of sight (I_2), changes in consumers willingness-to-pay can be measured in equation 4:

$$\Delta WTP_t = V_i(\delta;I_1) - V_i(\delta;I_2) \tag{4}$$

where the WTP based on sight and taste is subtracted from the WTP with sight only. If sight is a perfect indicator for taste, the change in WTP is equal to zero; if not, the WTP bid either increases or decreases based on the perception of taste. It should be noted that tasting the product might impact sight evaluation. The sequence is presented as sight first, then taste because it is more consistent with real-world purchasing decisions.

Adding health information to the information set of the consumer may further change WTP. Health attributes are a true credence good in that the level of these attributes cannot be discerned even after consumption. If consumers place no value on the health benefits of a product, their WTP should be exactly equal to their WTP when they evaluated the product on its other attributes. However, if consumers do place some value on the health aspects of a good, their WTP should change. It is hypothesized that health information will increase consumer WTP because it is unlikely that a consumer will place a negative value on positive health attributes. So, a change in WTP for a product when a credence attribute such the health benefit is given to the consumer as new information can be measured as such in equation 5 where (I_3) is the combination of health, sight, and taste information that the consumer now possesses. Assuming health effects have a positive impact on WTP, the change on WTP is as follows:

$$\Delta WTP_h = V_i(\delta;I_2) - V_i(\delta;I_3) \leq 0 \tag{5}$$

Location of origin can also affect consumers WTP in both a positive and negative manner (Loureiro and Hine). Location of origin may indicate a signal of quality (Suryanata), where the consumer evaluates the origin of the product before evaluating the attributes of the product. With sweetpotatoes, it may be the case that consumers place an initial value on a potato based on its location of origin and then value the potato's attributes, saying that location of origin is a signal of quality in the eyes of the consumer. This scenario is expressed in equation 6:

$$I_4 = f(S,T,H|O) \tag{6}$$

where (O) is the knowledge of the location of origin, sight (S), taste (T), and health benefits (H). If consumers place a significant value on the location of origin, then the WTP when location of origin is known ($V_{i,LK}$) should be different than when the location of origin is unknown ($V_{i,LU}$) as described in equation 7:

$$\Delta WTP_O = V_{LK}(\delta;I_3) - V_{LU}(\delta;I_3) \tag{7}$$

Endowment heterogeneity and origin may also alter participants' behavior. Friedman's permanent income hypothesis concluded that behavior varies over wealth from different sources. Some studies found no evidence that origin of assets influence participants behavior (e.g., Clark; Rustrom and Williams; Ball et al.). Conversely, others have found that asset origin does alter a participant's marginal propensity to consume with windfall (i.e., unearned) endowments (Keeler et al.; Arkes et al.; and Thaler and Johnson). Given Thaler and Johnson's findings that prior outcomes influence real monetary decisions, and Cherry et al.'s (2003) finding that heterogeneity of endowments are relevant to participants behavior, it seems logical that heterogeneity may be a relevant consideration in bidding behavior. To the extent that heterogeneity in the initial endowment affects bidder behavior, we would expect to see a statistically significant impact on individual bids. In the empirical models, endowment heterogeneity is examined.

Methods and Procedures

Sample

Forty participants were recruited from various undergraduate classes at Mississippi State University. The potential limitation of using student subjects as participants is recognized: specifically, the lack of representiveness of the general population. However, the goal of this research was to test specific theoretical propositions that should hold for any subsample of the population. To the extent that the factors under consideration discussed in the previous section are important, one should find such an effect with a student sample. Further, research has shown that undergraduate students are consistent with CEOs in answering economic questions (MacCrimmon and Wehrung). Behavior in decision-making has not typically differed between a student sample and participants recruited from naturally occurring markets (Smith, Suchanek, and Williams).

Individuals who agreed to participate were assigned a time and a date to attend. Subjects participated in one of two experimental auction treatments: (1) location of origin unknown and (2) location of origin known. Upon arriving at the assigned session, each participant was given a $10 show-up fee. To allow for random variability in the initial endowments and attempt to eliminate the windfall effect, the participants were given a packet that contained a series of 10 randomly chosen Graduate Management Admissions Test (GMAT) questions and asked to complete them in less than 15 minutes (GMAT questions used in experiment are available from the authors upon request). The participants were informed that for every question they answered correctly, they would receive $1, with the possibility of earning $10 in addition to their initial show-up fee. By allowing participants to earn money, Cherry et al. (2002) have shown that participants will act more rationally. The subjects were told that there would be no penalty for wrong answers. Once the subjects had completed their questions, a proctor collected and graded the responses, placed $1 for each correct answer in an envelope (to preserve anonymity), and returned the envelope to the corresponding subject.

Each subject was then provided a packet with a survey to fill out (experimental survey is available from the authors upon request). The purpose of the survey was twofold. First, completion of the survey was intended to make the participant feel as if he had "earned" the initial endowment (Cherry et al., 2002). Second, the survey was used to collect socio-demographic data for use in the analysis.

Experiment

The subjects were told that they were taking part in an experimental auction dealing with sweetpotatoes. A uniform fourth-price, sealed-bid auction was used to elicit WTP values. The advantage of the sealed-bid approach is its demand-revealing and incentive compatibility features. However, the traditional second-price auction (Vickery) often fails to engage off-margin bidders (Shogren et al., 2001). Shogren et al. (2001) suggest the random n^{th}-price auction as an alternative. The market price in an n^{th}-price auction is endogenously determined by randomly selecting the number of winning bidders. Thus, it is possible for all bidders to win, ensuring that all bidders are engaged in the auction.

The n^{th}-price auction is cumbersome for a number of reasons. First, it is difficult for participants to understand and is logistically more difficult for proctors to administer. Second, in this experiment, product supply became an issue. With 40 respondents bidding on a 5-pound bag of potatoes, a total 200 pounds of potatoes was needed, but there was no prior knowledge of how many pounds would actually be sold. A fourth-price auction would still result in 20% of the sample winning the auction, thus increasing bidder engagement, while avoiding the logistical problems associated with the n^{th}-price auction.

To better clarify the specific details of a fourth-price auction, subjects were taken through an example using candy bars. The participants were shown three varieties of candy bars (Butterfinger, Baby Ruth, and Snickers) and were given a bid sheet with each of the respective candy bar names on them. Each participant was asked to bid for all three candy bars simultaneously. The subjects were told that this auction would be hypothetical (no money would change hands). The proctor then collected the bids and announced the winner's identification number and the winning (fifth highest bid price) for each candy bar. It was explained that if a participant won more than one candy bar, they were given the option of which candy bar they would choose. The candy bar auction was designed to enhance the level of the participants' understanding of a somewhat complicated auction mechanism. The participants were then asked if they had any questions regarding how the auction was conducted. The participants were told that they would be taking part in an identical auction dealing with sweetpotatoes that would be nonhypothetical (money would be changing hands). Before the auction began, it was explained to the participants that there would be three rounds in this auction with only one of them being binding (that is, the round that would be used to determine winners and market prices). They were told that the binding round was to be chosen at random by the proctor at the end of the third round. After the binding round was announced, the subsequent winners would pay the prices for the products they had won. The procedures at this point were identical for both treatments: (1) location of origin unknown and (2) location of origin known.

Treatment 1 — Location of Origin Unknown

After the participants were told how the auction would be conducted and all questions were answered, the sweetpotato auction began. The participants were shown three potatoes labeled A, B, and C. Each of these potatoes was chosen at random. Potatoes A, B, and C each came in a 40-pound box from Louisiana, Mississippi, and North Carolina, respectively. Each box was purchased directly from a packer from their supply bound for grocery stores. The potatoes from each box were then numbered. Since some boxes had more than others, the numbers that were higher than the highest number in the smallest box were disqualified. A number was then randomly chosen out of a hat to see which potato would represent potato A, B, and C in the auction.

Participants were then asked to approach the table where the potatoes were located and inspect each of the potatoes. After all of the subjects had completed their visual inspection, they were asked to give their maximum WTP (bids) for 5-pound bags of each of the potatoes simultaneously on their bid sheet (one bid for a 5-pound bag of each type of potato). After the proctors had collected the subsequent bid sheets, the participants were told that the second round was to begin. Participants had no written record of their bids for each round.

Melton et al. point out the unreliability of WTP measures based on visual inspection only. To examine the consistency of visual and taste valuations, subjects in round 2 of this study tasted cooked potatoes. With the potato that they bid on in round 1 still visible on the table, a tray with samples was put behind each of the respective whole potatoes. The same method was used to randomly choose which potato would be cooked as was used in round 1. The only difference was that only the ripe potatoes were numbered. So, the box with the fewest ripe potatoes set the upper bound for numbering. The potatoes were all cooked in the same microwave for the same amount of time and were prepared only as cooked potatoes with no condiments. The cooked potatoes were placed on the table along with bottled water and crackers. The participants were asked to come to the table and first eat a cracker to cleanse their palates, then sample potato A. Between each potato sample, subjects were instructed to eat a cracker and drink some water so as to not to confuse the taste of the one potato with the next. After all three potatoes had been sampled, the participants then returned to their seats where they were instructed to simultaneously bid their maximum WTP for a 5-pound bag of each potato based on its visual and taste attributes. Proctors then collected the bid sheets from round 2 and informed the participants that round 3 would now begin.

In round 3, the participants were given an information sheet about the nutritional content of a sweetpotato (nutritional handouts are available from the authors upon request). They were also given a comparison between the nutritional values of a sweetpotato and an Irish potato (white potato). The proctor then put the sweetpotato nutritional information on an overhead and read it to the participants. The subjects were given two minutes to compare the nutritional values of the sweetpotato to the Irish potato. They were then asked to write their maximum WTP for a 5-pound bag of each potato based on their visual, taste, and health attributes. Proctors collected the bid sheets from round 3 and informed the participants that the binding round would be chosen.

Numbers one through three were placed in a hat, and a randomly selected participant was asked to select a number from the hat. The number chosen was deemed the binding round. The proctors took the binding round, established the winners and the amount they were to pay for each respective bag of potatoes, and wrote them on the board. The participants were told if they did not see their bidder number on the board, they were free to go. Auction winners were then told that they needed to pay the market price (fifth highest price) for each of the respective bags of potatoes. After the winning participants paid the market price for each of the bags of potatoes, they were instructed they could leave and the auction was complete.

Treatment 2 — Location of Origin Known

Treatment 2 was conducted in an identical manner as treatment 1 with the exception of the labeling method of each potato. In treatment 1, the potatoes were labeled A, B, and C. In treatment 2, the same potatoes were labeled Louisiana, Mississippi, and North Carolina. The same potatoes were used in treatment 1 as treatment 2. Treatment 1's potato A was labeled Louisiana in treatment 2; potato B, Mississippi; and potato C, North Carolina. In round 1 of treatment 2, the participants were not bidding solely on the visual attribute of potato A as in round 1; rather, they were bidding on the visual attributes of the Louisiana potato. Besides the additional information of location of origin given to the participants in treatment 2, both treatments were identical. As mentioned previously, the subjects in treatment 2 did not participate in treatment 1.

Data Analysis

The experimental auctions resulted in three observations (bids) for each individual per round, or nine bids per respondent. These data allow for a number of different comparisons. If one assumes that the data are normally distributed, standard parametric methods such as the t-test or analysis of variance (ANOVA) can be used. However, if normality is in question, nonparametric methods may be more appropriate (Conover). The test procedures for the nonparametric tests are discussed below.

Location Effects

The Mann-Whitney test is a nonparametric test that can test if two independent samples have different means as shown by Lusk and Hudson (in press) in determining mean bids between two samples in an ultimatum game. Using the Mann-Whitney test, it is possible to test if the mean for each round is constant between the location of origin unknown (LU) treatment and the location of origin known (LK) treatment. This is valuable because if there is a difference, the bidders put a premium or a discount on the location in which the potato was grown. If the bids are constant between treatments, bidders displayed no utility from knowing the location of origin.

The test statistic for the Mann-Whitney is

$$T_1 = \frac{T - N\dfrac{N+1}{2}}{\sqrt{\dfrac{nm}{N(N-1)}\displaystyle\sum_{i=1}^{N} R_i^2 - \dfrac{nm(N+1)^2}{4(N-1)}}} \quad (8)$$

where $\sum R_i^2$ refers to the sum of the squares of all N of the ranks or average ranks actually used in both samples, n is equal to the random sample size from population 1, and m is the population size from random sample size from population 2, and where T is defined by equation 9:

$$T = \sum_{i=1}^{n} R(X_i) \quad (9)$$

Observations are represented by X and range through the i^{th} observation (X_i).

To rank the observations, first the samples m and n are combined into one sample. The ranks are assigned 1 to $m + n$ with 1 being the lowest value and $m + n$ being the largest. If several observations are equal to each other (tied) the average of the ranks is assigned to them. The hypothesis for LU round 1 vs. LK round 1 using the Mann-Whitney test is as follows:

$$H_o: E(X) = E(Y) \quad (10)$$
$$H_A: E(X) \neq E(Y)$$

where E(X) is the expected value of LU round 1, and E(Y) is the expected value of LK round 1. The null hypothesis can be rejected at the level of significance α if T is less than the $\alpha/2$ quantile $w_{\alpha/2}$ or if T is greater than the 1- $\alpha/2$ quantile $w_{1-\alpha/2}$ using the quantiles of the Mann-Whitney test statistic table (Conover), where $w_{1-\alpha/2}$ is the significance level for the two-tailed test. Comparisons are made between treatments for each potato and each round, resulting in nine total tests. The corresponding parametric tests, the two sample t-tests, were also conducted for each comparison.

Information Effects

The Wilcoxon signed rank test is a nonparametric test designed to test whether a particular sample came from a population with a specified median. It may also be used in situations where observations are paired, such as a "before" and "after" observations on each of several subjects to see if the second random variable in the pair has the same median as the first (Conover). The Wilcoxon signed rank test can be used to compare the median bids for each respective potato between rounds within a particular treatment. Morgan used a similar application of the Wilcoxon signed rank test to test for equality of median revenues between auctions.

The first step in the Wilcoxon signed rank test is to subtract the n^{th} observation from sample A from the n^{th} observation from sample B and take the absolute value, as shown in equation 12:

$$|D_i| = |Y_i - X_i| \quad i = 1, 2, 3, \ldots, n \quad (12)$$

All pairs with a difference of zero are omitted, and the remaining pairs are ranked according to the size of the absolute difference. The rank of 1 is given to the pair (X_i, Y_i) with the smallest absolute difference. The pair with the largest absolute difference is assigned rank *n*. If several ranks are the same, the average of the ranks across the tied observations is assigned.

There is no *a priori* expectation that taste (round 2) should either increase or decrease the median bid from sight valuation (round 1), resulting in the following null and alternative hypotheses for this comparison:

$$Ho: E(X) = E(Y) \quad (13)$$
$$H_A: E(X) \neq E(Y)$$

The null hypothesis in the two-tailed test is that the medians between rounds one (X) and two (Y) are identical, and the alternative is that the medians are not identical.

By contrast, the median bid accounting for health information (round 3) should be higher than the one from round 2 if health effects are important to consumers. That assumption is made because very few people are expected to place a negative value on a commodity possessing a healthy attribute. In comparing the second and third rounds, a one-tailed test is more appropriate employing the hypotheses:

$$Ho: E(X) = E(Y) \quad (14)$$
$$H_A: E(X) < E(Y)$$

The test statistic for the Wilcoxon signed ranks test is as follows:

$$T = \frac{\sum_{i=1}^{n} R_i}{\sqrt{\sum_{i=1}^{n} R_i^2}} \quad (15)$$

where R_i is the assigned rank to each pair. For the one-tailed test that was conducted, a large value of T indicates that the null hypothesis can be rejected at the level of significance α if T exceeds $w_{1-\alpha}$ using the normal distribution table. The Wilcoxon test shows how participants reacted to new information (taste and health). If there was no statistical difference in the Wilcoxon test between the rounds, it could be said that sight alone is a good measure of utility; however, if there is a statistically significant variation in bids detected by the Wilcoxon, it could be said that sight alone is not an accurate measure for consumer utility. The paired t-test was also used for comparison.

Relative Values Across Potatoes

The Quade test was used to test mean bids between the three potatoes in each round. The Quade test is a nonparametric method that depends only on the ranks of the observations within each block (round) and the ranks of the block-to-block sample ranges. Therefore, it is comparable to the parametric two-way analysis of variance (Conover).

The first step in the Quade test is to let $R(X_{ij})$ be the rank, for j =1 to *k*, assigned to X_{ij} within a block (round) *i*. That is, for block *i* the random variables X_{i1}, X_{i2},…,X_{ik}, are compared to each other, and the rank of 1 is given to the smallest value, the rank 2 to the second smallest, and the rank *k* to the largest. In this case, 3 was the largest rank, representing the three varieties of potatoes. In case of a tie, the average is assigned. Then, ranks are assigned to the blocks themselves according to the size of the sample range within the block. The sample range within block *i* is the difference between the largest and smallest observation (bid) within that block. There are *b* sample ranges (in this application b=20), one for each block. The rank of 1 is assigned to the block with the smallest range, rank 2 to the block with the second smallest range, and *b* to the block with the highest, using the average of the ranks in case of a tie. Let Q_1, Q_2,..,Q_b be the ranks assigned to 1, 2,…, *b* respectively.

Lastly, the block rank Q_i is multiplied by the difference between the rank within block *i*, $R(X_{ij})$ and the average ranks within blocks, (k+1)/2 to get the product S_{ij}, as shown in equation 16:

$$S_{ij} = Q_i \left[R(X_{ij}) - \frac{k+1}{2} \right] \quad (16)$$

Equation 16 is a statistic that represents the relative size of each observation within the block, adjusted so that it reflects the relative significance of the block in which it appears (Conover). Equation 17 represents the sum for each treatment:

$$S_j = \sum_{i=1}^{b} S_{ij} \quad (17)$$

The hypotheses for the Quade Test are as follows:

Ho: Each ranking of the random variables within a block is equally likely (There is no preference difference between potatoes)

H_A: At least one of the treatments tends to yield a larger observed value than at least one other treatment.

The test statistic for the Quade test is

$$A_1 = \sum_{i=1}^{b} \sum_{j=1}^{k} S_{ij}^{\ 2} \tag{18}$$

Next calculate the B_1 term,

$$B_1 = \frac{1}{b} \sum_{j=1}^{k} S_j^{\ 2} \tag{19}$$

where S_j is calculated by equation 17. This is called the treatment sum of squares (Conover). The test statistic is

$$T_1 = \frac{(b-1)B_1}{A_1 - B_1} \tag{20}$$

The decision rule for the Quade test is to reject the null hypothesis at significance level α if T_1 exceeds the 1- α quantile of the F distribution table with k_1= k-1 and k_2 = (*b*-1)(*k*-1) degrees of freedom. If and only if you are able to reject the null hypothesis, treatments *i* and *j* are considered different if the inequality,

$$\left|S_i - S_j\right| > t_{1-\alpha/2} \left[\frac{2b(A_1 - B_1)}{(b-1)(k-1)}\right]^{\frac{1}{2}} \tag{21}$$

in equation 21 holds true, where S_j is calculated by equation 16, A_1 is calculated by equation 18 and B_1 is calculated by equation 19, and $t_{1-\alpha/2}$ is the percentile level for the two tailed t-test. All possible pair-wise comparisons are used using equation 21 (similar to Tukey's pair-wise comparison for analysis of variance), using the same α that was used in the Quade test. To analyze the implications of the endowment effect on participant behavior the tobit model was implemented.

To test the hypothesis that heterogeneity in endowments is irrelevant in bidding behavior, a tobit model necessary. The tobit model was used because bids cannot fall below zero, meaning that the bid distribution is bounded below by zero. If a participant bids zero, there is no way to tell if the true WTP is actually zero or if it is really a negative value. The tobit model takes into account each bid being at the threshold (0). A number of factors may influence individual bids. For example, whether the respondent had past experience with sweetpotatoes may influence the level of bids. In these auctions, whether the respondent was in the first or second treatment (unknown or known location of origin) may make a difference in bids as well. Finally, the level of their initial endowment is a variable of interest. Equation 22 shows the variables hypothesized to influence individual bids:

Bid = f(End, Pur, Treat, Age) (22)

where "End" is the initial endowment received by the participant (show-up fee plus additional money earned from GMAT questions), "Pur" is a dummy variable designating whether the individual had purchased sweetpotatoes before, "Treat" is the treatment that the participant took part in (LU or LK), and "Age" is the participant's age. The Treat variable is a dummy variable with LK being 1 and 0 otherwise. Pur is also a dummy variable with having purchased sweetpotatoes being 1 and 0 otherwise.

Results

Sample Characteristics and Survey Results

The sample was composed of more males than females in both treatments 1 and 2 with males being 80% and 60%, respectively (Table 2). The majority of the participants in both treatments were Caucasian, and the average age was 23 for treatment 1 and 25 for treatment 2 (which is indicative of a college sample). Table 3 shows that 70% and 60% of the participants in treatments 1 and 2, respectively, had purchased sweetpotatoes prior to this experiment, suggesting that most consumers in the experiment had some prior experience with sweetpotatoes. Not surprisingly, results show that participants associated sweetpotatoes with holidays (i.e., Christmas or Thanksgiving). Much of this analysis deals with the concept of location of origin. Only 25% of the participants in treatment 1 and 5% of the participants in treatment 2 had knowledge of where the potatoes they had purchased in the past were grown (either country or state). When participants were asked if location of origin was an important attribute in their buying decision (with 1 being very important and 5 being very unimportant), the average response was 4.1 in treatment 1 and 3.95 in treatment 2, suggesting that location of origin was not an important factor in prior purchase decisions.

Impacts of Location and Information

When the average bids by round were examined for treatment 1 (location unknown), North Carolina had the highest average bid with the exception of the first round (Louisiana). The preference ordering after the third round was (1) North Carolina, (2) Louisiana, and (3) Mississippi (results from all rounds of the experimental auctions are available from the author upon request). When the location of origin was known (treatment 2), there was an overall increase in bids. This result seems counter to the reported importance of location of origin above because participants in treatment 2 rated location of origin an average of 3.95 out of 5 in importance. Figure 3 shows how the preference ordering changed after participants were provided information on the location of origin. When the location of origin was known, the final preference ordering was the opposite of when location was not known (Figure 4): (1) Mississippi, (2) Louisiana, and (3) North Carolina. It is reasonable to assume that people would value their home product more (Mississippi), but it appears as if they also put a premium on

Table 2. Demographic characteristics of auction participants.

Variable	Description	Treatment	
		Origin unknown	Origin known
Gender	Male	80%	60%
	Female	20%	40%
Ethnicity	1= Caucasian	95%	75%
	2= African American	0%	5%
	3= Hispanic	5%	5%
	4= Asian	0%	10%
	5= Other	0%	5%
Age	Age of participants in years	23.100	25.050
		(4.063)	(6.210)
		[18,37]	[18,40]
Home town	1= farm	25%	15%
	2= small town (0-1,000)	10%	0%
	3= town (1,000-10,000)	25%	15%
	4= large town (10,000-100,000)	45%	50%
	5= city (100,000+)	0%	20%
Income	1= ($0-$25,000)	55%	30%
	2= ($25,000-$50,000)	15%	30%
	3= ($50,000-$75,000)	0%	10%
	4= ($75,000-$100,000)	25%	10%
	5= ($100,000+)	5%	20%

Note: Mean is reported with the standard deviation in parentheses and range in brackets.

Table 3. Responses from sweetpotato survey.

Variable	Description	Treatment	
		Origin unknown	Origin known
Purchased sweet-potatoes before	1= yes, 0 =no	.700 (.470)	.600 (.502)
Associate sweet-potatoes with holidays (i.e., Christmas, Thanksgiving)	1= yes, 0 =no	.650 (.4893)	.700 (.470)
Location of origin known prior to purchase	1= yes, 0 =no	.250 (.444)	.050 (.223)
Price	1= very important 5 = very unimportant	3.050 (1.394)	2.800 (1.361)
Visual appeal	1= very important 5 = very unimportant	2.200 (1.436)	2.200 (1.507)
Location of origin	1= very important 5 = very unimportant	4.100 (1.071)	3.950 (1.190)
Taste	1= very important 5 = very unimportant	1.600 (1.231)	1.850 (1.460)
Health	1= very important 5 = very unimportant	3.100 (1.140)	2.850 (1.268)

Note: Mean is reported with the standard deviation in parentheses.

the Louisiana location or discounted the North Carolina location. The distribution of bids was tested for normality using Shapiro-Wilk test and the Kolmogrov-Smirnov test and, in general, normality was rejected (results from the Shapiro-Wilk and the Kolmogrov-Smirnov test for normality are available from the authors upon request). Thus, the nonparametric test results will be highlighted from this point forward.

Relative Potato Values

The nonparametric Quade test and the parametric two-way ANOVA were used to examine differences in bids across potatoes. Results show that 75%, 50%, and 100%, respectively, of the time, the mean bids for each individual round between all of the potatoes were significantly different (Table 4). When the location of origin was unknown, participants' bids were not statistically different in round 1 (sight only) based on the Quade test (all references to not statistically different or statistically significant is at P> 0.10 level). This result indicates that the participants were indifferent across potatoes; that is, based on sight alone, participants had no real preference for a potato. When the participants knew the location of origin, there was also no statistical difference in bids based on sight alone in the Quade test. Even though the auction was held in Mississippi, there was no statistically significant difference for the Mississippi potato. If "hometown bias" was prevalent and persistent, the Mississippi potato should have exhibited a statistical difference in mean bids.

The introduction of the information of taste (round 2) yielded a divergence in mean bids. In treatment 1, a statistical difference (P=0.05) in bids was identified, and a pair-wise comparison revealed that the North Carolina potato (C) was preferred to both the Louisiana (A) and the Mississippi (B) potatoes as shown in Figure 5. The Quade test results shown in Table 4 indicate that the bid function for the North Carolina potato is above and to the right of the Louisiana and Mississippi potatoes. In treatment 2, where location is known, there is also a statistical difference (P= 0.05) in mean bids after the participants had tasted the potatoes. However, in treatment 2, the Mississippi potato was preferred to the North Carolina potato as illustrated in Figure 6.

When the participants were exposed to the health information (round 3), there were statistical differences (P= 0.05) in treatment 1 only. The North Carolina potato (C) was preferred to both the Louisiana (A) and the Mississippi (B) potatoes. Therefore, the health attribute did not change the preference of the North Carolina potato over the Mississippi and Louisiana potatoes. However, in treatment 2, where location was known, there was no statistical difference in the mean bids using

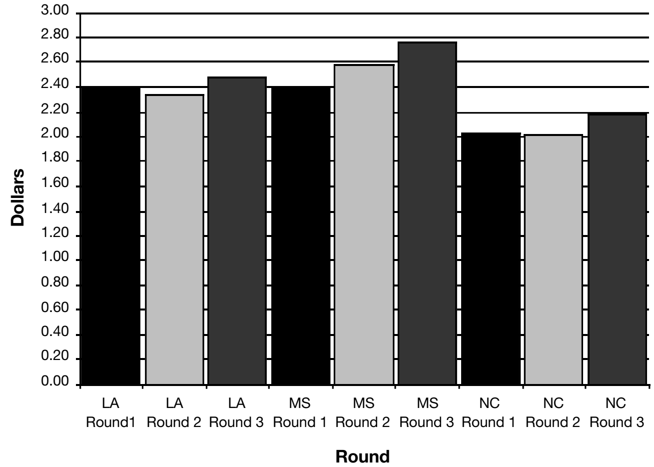

Figure 3. Average bids for each potato in treatment 2 (location known).

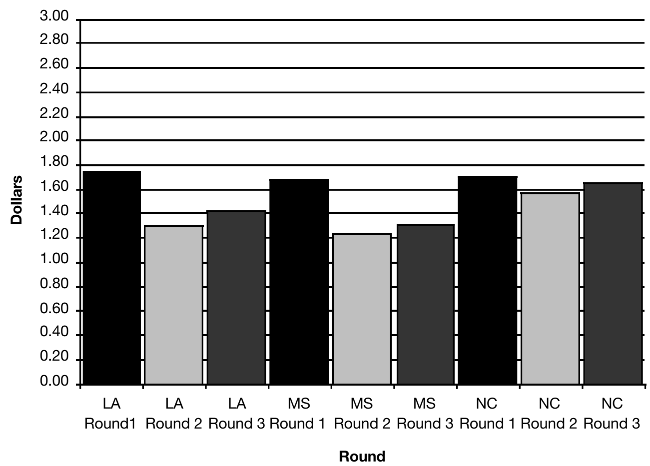

Figure 4. Average bids for each potato in treatment 1 (location unknown).

Table 4. Comparison of mean bids across rounds using the Quade test and two-way Analysis of Variance.

Round	Quade[1]	Two-way ANOVA[2]
Location of origin unknown		
1-Sight only	0.1369	0.017
2-Taste	5.2102[3,4]	3.341[5]
3-Health	3.9031[3,4]	3.735[5]
Location of origin known		
1-Sight only	0.8492	2.066
2-Taste	2.9842[3,6]	3.577[5]
3-Health	0.8324	3.904[5]

[1]Is the T value as calculated from the Quade Test using equation (3-20).
[2]Is the F value across potatoes sum of squares from Two-Way Anova.
[3]Statistically significant at the 5% level.
[4]Indicates that potato C (North Carolina) was preferred to both potatoes A and B (Louisiana and Mississippi).
[5]Statistically significant at the 10% level.
[6]Indicates that the Mississippi potato was preferred to the North Carolina potato.

the nonparametric Quade test. Treatment 2 results are interesting because they imply that relative valuation changed in the face of information that should be value-neutral or consistent across potatoes. That is, because all three potatoes possess the same nutritional characteristics, each participant's relative premium or discount across potatoes should remain constant. As discussed at the beginning of this chapter, the mean bids after all the information was made available (round 3) in treatment 2 showed that the Mississippi potato was preferred. But the Quade test indicates that the actual difference is not statistically significant. This lack of a clear preference order reinforces the supposition that the sample did not exhibit hometown bias.

The Quade test shows that there is no significant difference in mean bids based only on sight (round 1) in either treatment. This result implies that consumers are indifferent when evaluating the potato based solely on sight. On the contrary, once the participants were allowed to sample the potatoes, a distinct preference ordering was revealed. Essentially, once the participant was exposed to the experience attribute of taste, preference ordering was re-evaluated, which is likely a better gauge of "true" valuation of each potato relative to the others. Although the preference ordering is different from treatment 1 to treatment 2 after tasting, the important result is that the experience attribute of taste led to statistical differences (P=0.05) in valuation in both cases. Interestingly, the attribute of health, which should not alter preference ordering as explained above, acted as theory would predict in treatment 1. However, in treatment 2, the added knowledge of the health attribute caused the preference to switch from preferring Mississippi to no statistically significant difference in bids. Thus, in treatment 2 after the participants were given the full information set (sight, taste, and health), there was no distinguishable preference for any of the potatoes.

Location of Origin

The parametric two-sample t-test and the nonparametric Mann-Whitney test were implemented to test whether the mean bid for each round was constant between the location of origin unknown (LU) treatment and the location of origin known (LK) treatment. It was hypothesized that they would not be constant; that is, knowledge of location would affect mean bids. According to the Mann-Whitney test, in 66% (6 out of 9) of the rounds, the added information of location of origin statistically impacted the mean bid (at the P=.10 or less level). This result suggests that the participants did place a value on the added information of location of origin. With the exception of Mississippi round 1, and North Carolina rounds 1 and 2, the mean bids were statistically different (at the P=.10 or less level) (Table 5). For potato A (Louisiana) the mean bid was statistically different (at the P=.10 or less level) for all three rounds between treatments. This result indicates that the participants placed a statistically significant value (premium) on the fact that a potato was grown in Louisiana. For potato B (Mississippi), difference in round 1 (sight) was not statistically significant, which means that based on sight alone, the added information of that potato being grown in Mississippi had no impact on the mean bid. Conversely, in round 2 when the participants had the opportunity to taste the Mississippi potato, there was a statistically significant difference (P=0.05) (Figure 7). The North Carolina potato was the exception in round 2 because there was no significant difference in the mean bids in round 2 between treatments (Figure 8). In essence, the added information that the potato was

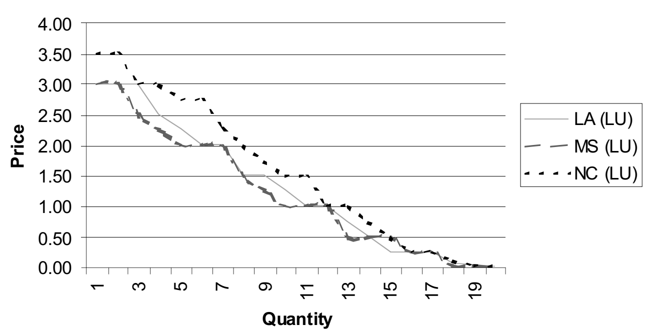

Figure 5. Demand function from treatment 1 (location unknown), round 2 bids.

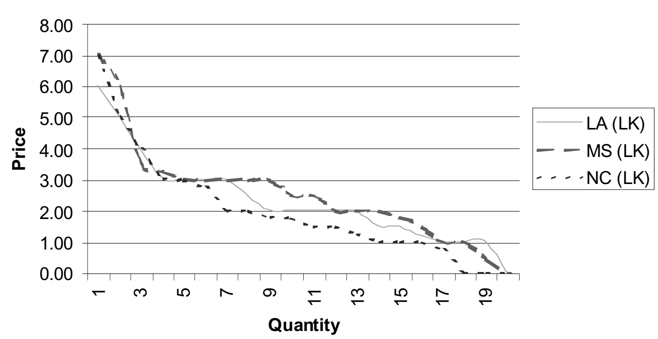

Figure 6. Demand function from treatment 2 (Location Known), round 2 bids.

Figure 5 and similar graphs presented were constructed by arranging the bids in descending order and then plotting them against the number of respondents expressing a bid of greater than or equal to that amount. Essentially, the line(s) in the figure represents a "demand function" for the stated round(s) and treatment(s).

grown in North Carolina did not affect bidding behavior in rounds 1 and 2.

In all of the cases in which the means were statistically different, the mean bid was higher in treatment 2 (an average of $0.84 per bid). Intuitively, this result suggests that the participants were placing a premium on the location of origin of $0.84 per 5-pound bag. Thus, under Lancaster's utility model, the credence attribute of location of origin must be taken into consideration when accurately measuring utility, even when the value is zero. By placing this "premium" on the location of origin attribute, the consumer is likely displaying that location of origin is a signal of quality in their minds. More specifically, location had a larger impact on Mississippi and Louisiana than North Carolina. The Mann-Whitney test has illustrated that knowledge of the location of origin of sweetpotatoes does have an impact on consumer valuation.

Information Effects

The nonparametric Wilcoxon signed rank test and the parametric paired t-test were used to compare the median/mean bids for each respective potato between rounds within a particular treatment. The Wilcoxon test is designed to examine whether added information had a statistically significant impact on the participant's valuation for a specific potato. Table 6 shows the results from the Wilcoxon and paired t-tests. If there was a significant difference, the added information (round) altered the participants' valuation for that potato (either increasing it or decreasing it).

Results show that when location of origin was unknown, bids between rounds for the North Carolina potato were not significantly different (Figure 9). This result indicates that sight alone is an accurate measurement of valuation for the North Carolina potato when the location of origin is not known. From an economic perspective, this result indicates that changes in information sets have no significant impact on valuation. From a marketing perspective, this result suggests that consumers who place a high value on the North Carolina potato are likely to maintain that value with changes in information, leading to more repeat purchases. However, when location of origin is known, bids significantly decreased (at the P=.10 or less level) after tasting. This difference in results may suggest that when location of origin is known, consumers become more critical/discerning of taste.

Both the sight vs. taste and the taste vs. health tests showed significant differences in mean bids for Mississippi when location of origin was unknown (treatment 1), which is illustrated in Figure 10. After the participants were exposed to the experience attribute of

Table 5. Comparison of mean bids for each potato between unknown- and known- location-of-origin treatments using the Mann-Whitney test and the two-sample t-test.

Round	Mann-Whitney [1]	Two-sample t-test [2]
Louisiana		
1-Sight	-1.6157 [3]	-1.5471
2-Taste	-2.3114 [4]	-2.5879 [4]
3-Health	-2.2649 [4]	-2.4916 [4]
Mississippi		
1-Sight	-1.2721	-3.5469 [4]
2-Taste	-2.9026 [4]	-3.1624 [4]
3-Health	-2.9778 [4]	-3.3899 [4]
North Carolina		
1-Sight	-0.9852	-0.7069
2-Taste	-0.5152	-0.9332
3-Health	-1.3357 [3]	-1.2635

[1]Is the T value calculated from the Mann-Whitney test.
[2]Is the t value calculated from the two-sample t-test.
[3]Denotes statistical significance at the 10% level.
[4]Denotes statistical significance at the 5% level.

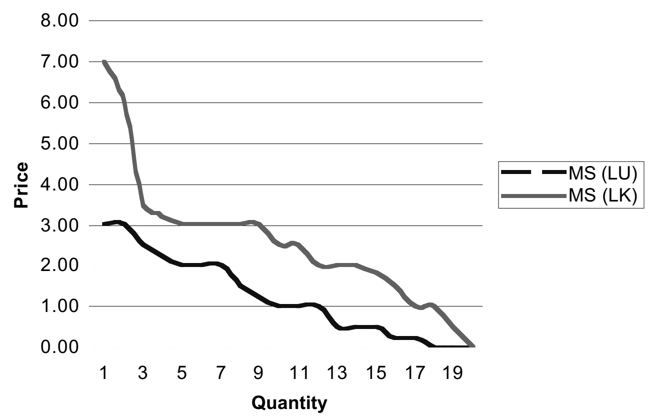

Figure 7. Demand function from bids in round 2 for potato B (location unknown) vs. Mississippi potato (location known).

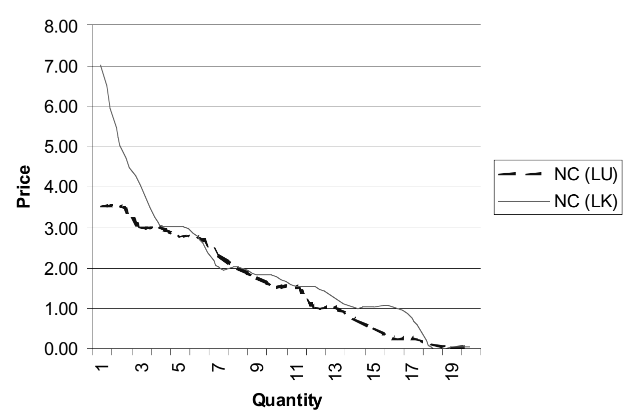

Figure 8. Demand function from bids in round 2 for potato C (location unknown) vs. North Carolina (location known).

taste, bids dropped by an average of $0.44. Thus, the added information of taste decreased their valuation of the Mississippi potato, implying that valuation after tasting was not perfectly correlated with the valuation in round 1 (sight). Participant valuation was altered again with potato B when the credence attribute of health was added. Participants' bids increased by an average of $0.13 between rounds 2 and 3 when they were provided the information on the nutritional content of sweetpotatoes. Although the average bid went up between rounds 2 and 3, bids did not increase to the original average bid based on sight alone. In the case of potato B, the attribute of taste lowered participant valuation, and the health attribute increased it relative to taste, but did not raise it enough to reach the initial valuation. These results suggest that information did affect average bids. Furthermore, the results suggest that the apparent lack of correspondence between initial bids and postconsumption bids may complicate repeat purchase behavior for Mississippi potatoes. However, when location of origin was known, decreases in bids were not observed (in fact, bids increased). This result may indicate that the significant increase in bids for Mississippi for location of origin observed in the Mann-Whitney test mitigates the negative impact of taste for Mississippi. More generally, these results suggest that knowledge of location of origin has some effect on the marginal impact of added information.

Wilcoxon signed rank test showed that in 55% (10 out of 18) of the cases when new information was added, participant valuation demonstrated a statistically significant (at the P= .10 or less level) change. With the exception of potato C (North Carolina) when the location of origin was not known, participant valuation of each respective potato changed at least once in each treatment. Thus, the notion that consumers can formulate accurate estimates of value for sweetpotatoes based solely on sight is questionable.

Table 6 Comparison of mean bids for each potato between rounds for unknown- and known- location-of-origin treatments using the Wilcoxon signed ranks test and the paired t-test.

Round	Wilcoxon test [1]	Paired t-test [2]
Location of origin unknown		
Louisiana		
Sight vs. Taste	-1.9904 [3]	-2.1156 [3]
Taste vs. Health	1.5109 [4]	1.3648 [4]
Initial vs. Final [5]	-1.7464 [3]	-1.6577 [4]
Mississippi		
Sight vs. Taste	-2.1052 [3]	-2.3528 [3]
Taste vs. Health	1.6977 [4]	1.3589 [4]
Initial vs. Final	-1.6970 [4]	-1.9086 [4]
North Carolina		
Sight vs. Taste	-0.6650	-0.5556
Taste vs. Health	0.2996	0.8404
Initial vs. Final	-0.3800	-0.2268
Location of origin known		
Louisiana		
Sight vs. Taste	-0.2213	-0.3225
Taste vs. Health	1.4966 [4]	1.4653 [4]
Initial vs. Final	0.3158	0.3158
Mississippi		
Sight vs. Taste	0.9979	0.8788
Taste vs. Health	1.4106	1.5975 [4]
Initial vs. Final	1.7376 [4]	1.7645 [4]
North Carolina		
Sight vs. Taste	-1.4067 [4]	-0.0438
Taste vs. Health	1.1779	0.6429
Initial vs. Final	0.5976	.8164

[1]Is the T value calculated from the Wilcoxon signed ranks test.
[2]Is the t value calculated from the paired t-test.
[3]Denotes statistical significance at the 5% level.
[4]Denotes statistical significance at the 10% level.
[5]Comparison of round 3 to round 1.

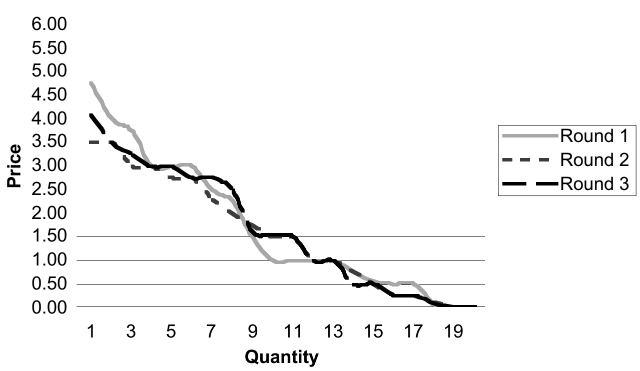

Figure 9. Demand function from bids for all three rounds for the North Carolina potato in treatment 1 (location unknown).

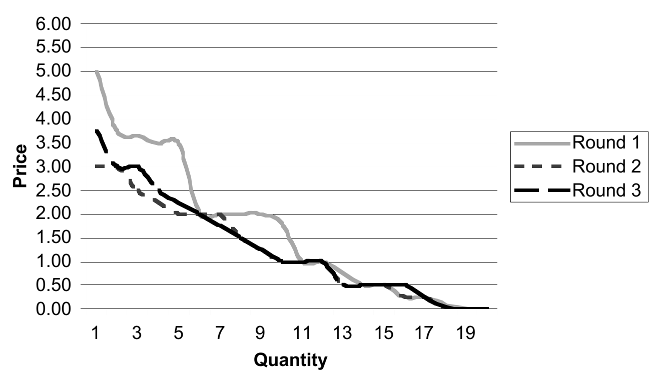

Figure 10. Demand function from bids for all three rounds for the Mississippi potato in treatment 1 (location unknown).

Summary and Conclusions

Although participants in both rounds said that location of origin played a small role (4.1 and 3.95 out of 5 in treatments 1 and 2, respectively) in their valuation of potatoes, the Mann-Whitney test showed that the added information of location of origin had a significant impact on bidder behavior 66% of the time. The Mann-Whitney test illustrated that knowledge of location of origin of sweetpotatoes does have an impact on consumer valuation.

The nonparametric Wilcoxon signed rank test and the parametric paired t-test were used to compare the median bids for each respective potato between rounds within a particular treatment and found that additional information did impact participant valuation 55% of the time. When analyzing the added information of taste (from the original valuation of sight), participant valuation changed 50% of the time (3 out of 6). The valuation remained consistent when the experience attribute of taste was added to North Carolina treatment 1 and treatment 2 Mississippi and Louisiana. When the credence attribute of the health benefits was presented to the participants, valuation changed 66% (4 out of 6) times when compared to round 2. Finally, when a comparison was made from participants' initial valuations (round 1) to their final valuation (round 3), valuations changed 50% of the time. Taken together, it can be seen that both the information from the taste attribute and the health attribute played a role in valuation.

When the results of the nonparametric Quade test were analyzed, it showed that the mean bids for each round between potatoes were significantly different (at the P=.10 or less level) 50% of the time. That is, in the Quade test, half of the time participants had no real preference between potatoes in a certain round. In treatment 1, participants displayed a significant preference ordering 66% of the time (rounds 2 and 3). In treatment 2, where location is known, only 33% (1 out of 3) of the time participants displayed a preference ordering according to the nonparametric test. The Mann-Whitney test suggested a statistical difference in bids when participants knew the location of origin, but the Quade test shows that there is only evidence of preference ordering in one round of treatment 2 (round 2). This may mean that the participants placed a value on all three locations of origin; therefore, a strong preference ordering was not prevalent. In both treatments when participants had to value the potatoes on sight alone, there was no preference ordering. Thus, even with the added information of location of origin, participants were indifferent across potatoes. It was not until the experience attribute of taste was introduced that the participants displayed a significant preference ordering. The added information about location of origin was not the factor that caused the preference ordering; rather the experience attribute of taste was the determining factor.

Marketing Implications

These results address three important areas: (1) the differences in relative values across potatoes, (2) the lack of consistency in consumer valuation, and (3) the added information of health effects and its increase in the demand for sweetpotatoes. The difference in relative values in each potato was evident by the introduction of the location of origin. Specifically, introduction of information about location changed preference ordering and the relative lack of consistency for each potato with the advent of new information sets. The results showed that there was a lack of consistency between the sight and taste valuations, which tended to be negative; however, when made aware of certain health benefits, valuations tended to increase. This decrease in valuation after tasting should not be viewed as a dislike for the taste of sweetpotatoes, rather simply a decrease from the initial valuation under imperfect information. The apparent lack of valuation consistency throughout the various information sets may suggest that consumers would be less likely to be repeat buyers of a specific potato. That is, when a consumer values an item based solely on appearance and then discounts that value after consumption, they are less likely to become a repeat buyer because of the differences in preconsumption and postconsumption perceptions.

It must also be noted that the manner in which the potatoes were prepared (no butter or salt) may not be the typical preparation method used by consumers. Thus, they may have discounted the taste due to a preconceived notion of how a sweetpotato is "supposed" to taste. Note that roughly 65% of the sample had previously purchased sweetpotatoes. While there is no evidence that prior tasting experience influenced the results, these effects should still be considered. In the case where valuation was constant throughout, the consumer would be more apt to be a repeat buyer because their initial valuation based solely on sight was identical to their valuation after all the information was presented; more importantly, the valuation did not decrease. Repeat purchasing is a product of consumer satisfaction with both the sight and taste attributes. These results mirror the Melton et al. findings in that, while appearance is likely to matter, especially to first-time buyers, repeat purchases seem likely to be more affected by taste. These results also reinforce the results found by Melton et al., where it can be concluded that predicting consumers' demand for sweetpotatoes based on sight when each potato has a different appearance is essentially unproductive.

The results show that the added information of health benefits when advertising a product can increase the demand for that product. Conversely, in many cases, it cannot offset the "bad taste" of the product. In this study, it was found that in half of the potatoes analyzed, the final valuation with perfect information was significantly lower compared with the initial bid on sight alone. That is, although the added information of health did cause a statistically significant increase in valuation, that amount was not enough to offset the amount the consumer discounted the potato from its initial bid after it was consumed. In other words, the decrease in valuation that the taste attribute produced was larger than the increase in valuation with the health benefits added. It seems that advertising on the basis of health would be advantageous because it would increase consumer demand, but it must be noted that this study cannot conclude whether the increase in demand would offset the cost of the advertising campaign.

Limitations and Suggestions for Future Research

It was shown that location of origin did have a significant impact on consumer valuations for sweetpotatoes; however, the auction was only conducted in one location (Mississippi). The extent of the value of location of origin between Louisiana, Mississippi, and North Carolina may vary across locations. It was shown that location of origin did matter to consumers in Mississippi; however, consumers in different areas of the country may alter their preference ordering based on location of origin differently than was exhibited by Mississippi consumers. It may be found that marketing on the basis of location of origin might only have an impact in certain regions of the country.

It is also important to realize that the information sets given to consumers were presented in a fashion that mimicked "real-world" shopping conditions; that is, they were presented the search attribute (sight), then the experience attribute (taste), and finally the credence attribute (health). Nevertheless, it is important to note that if the consumer knew the health attributes of the sweetpotato prior to purchasing, the initial valuation might change. Ideally, this auction would have been preformed several times, with each treatment presenting the information sets in a different chronological order.

Further, when analyzing the endowment effects, heterogeneity in the endowment amount existed in both treatments. It would have been advantageous to have one treatment where the endowment amount was held constant in a base round. This would allow researchers to analyze more specifically if endowment heterogeneity is an issue in experimental auctions. In addition, it would be valuable to have a treatment where the researcher created endowment heterogeneity randomly without trying to mitigate the house money and windfall income effect and compare results between the two treatments. This would allow the researcher to measure the impact (if any) of the house money and windfall income effect. However, due to budget and time constraints this was not a feasible option.

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