

Consistency of Consumer Valuation Under Different Information Sets: An Experimental Auction with Sweet Potatoes

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We used a controlled, uniform 5th-price auction to elicit values for sweet potatoes—both when location is known and unknown, and before and after tasting and providing health information. Significant differences were found between pre- and post-consumption valuations and also found that there were significant effects for location of origin and health information. Interestingly, we also find that location of origin not only affects the level of bids, but also the *marginal* differences in bids between different potatoes. Overall, however, these results suggest little consistency in bid values across information sets, suggesting that attempting to elicit values of attributes in isolation may lead to erroneous results.

Marketing products on the basis of attributes is a popular means of generating differentiation. Consistent with Lancaster's theory, this approach presumes that utility-maximizing consumers derive utility from attributes, not from the product itself. Attributes may be observational, such as color, size, or other characteristics of appearance. Other attributes may be proxies for underlying quality such as location of origin. There are also experience attributes, such as taste, whereby consumers have no information until after consumption. Finally, there may be credence attributes, such as nutritional characteristics, where consumption provides no information and the consumer is reliant on third-party or external information to identify the existence of the attribute in the product.

Proxy, credence, and experience attributes complicate consumer valuation of products because pre- and post-consumption values may not coincide. From a marketing perspective, lack of consistency between pre- and post-consumption valuations can significantly affect repeat purchase decisions. From an economic perspective, this lack of consistency complicates predictions of market demand and also may affect welfare measures arising from valuation exercises.

There is a considerable body of literature related to eliciting consumer values for products and services (see Lusk [2003] for a broad review). Most studies tend to elicit values for product attributes in

isolation (that is, examine the value of one attribute one at a time), examine valuations in hypothetical experiments, or do both. This study examines the impact of a proxy, a credence, and an experience attribute in a non-hypothetical setting allowing for pre- and post-consumption valuations. The product used in this study is the sweet potato. The sweet potato is a simple product that is grown in a number of distinct regions. The product is purchased based mainly on visual appearance, but has the experience attribute of taste. It also has an important credence attribute—nutritional characteristics relative to the common white potato—that may significantly alter valuation. The purpose of this study, however, is not to develop specific marketing implications for the sweet potato, but rather to examine the impacts of alternative information sets on valuation to examine consistency of valuation. Results of this study will help guide marketing studies seeking to utilize experimental auctions to derive consumer values.

We use a controlled, uniform 5th-price auction to elicit values for sweet potatoes—both when location is known and unknown, and before and after tasting and providing health information. We generally find significant differences between pre- and post-consumption valuations and also generally find significant effects for location of origin and health information. Interestingly, we also find that location of origin not only affects the level of bids but also the *marginal* differences in bids between different potatoes. Overall, however, these results suggest little consistency in bid values across information sets, suggesting that attempting to elicit values of attributes in isolation may lead to erroneous results.

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Background

Several studies have identified that subjects alter their willingness to pay (WTP) after additional attributes—experience, credence, or proxy—are revealed to the consumer. Taste attributes in previous studies have had positive, negative, and negligible effects on WTP measures. Melton, Huffman, and Wallace (1996) found significant differences between pre- and post-consumption WTP for pork chops when pictures were used for visual appraisals, but no significant differences when the actual product was used in visual inspection. Chern, Kaneko, and Tarakcioglu (2003) found that consumers decreased their WTP for pulsed-electric-field (PEF) orange juice by 17% after tasting the orange juice. Thus evidence exists that pre- and post-consumption WTP may differ, which suggests WTP based solely on visual appraisals could be misleading.

Credence attributes, such as health information, have also received much attention in the literature. Studies have looked at the influence of both positive and negative health and nutritional information on consumer behavior (Ippolito and Mathios 1990; Viscusi, Magat, and Huber 1987; Fox, Hayes, and Shogren 2002; Swartz and Strand 1981). Ippolito and Mathios find nutritional advertising influenced consumers' behavior in the cereal market. Fox, Hayes, and Shogren's study indicates people increase WTP measures when presented with positive information and decrease WTP measures when presented with negative information. Furthermore, when presented with both positive and negative information, people respond to the negative information. Proxy attributes such as location of origin may signal quality as in the case of Hawaiian produce (Suryanata 1999) or U.S. beef (Loureiro and Umberger 2003). However, there is also evidence that location of origin has a negative impact on WTP measures (Loureiro and Hine 2002).

An issue that has received relatively little attention in the literature is the joint effects of attributes. That is, valuing attributes in isolation implicitly assumes that utility functions are additive (separable); however, Dickinson and Bailey (2002) found evidence of complementary relationships between attributes in their study of meat traceability, resulting in a higher valuation when both attributes were presented relative to traceability alone. This finding is supported from a theoretical perspective by a discussion presented by Lusk (2003).

The problem of non-additivity in experimental auctions can be examined by viewing the consumer's utility function. Following Lancaster (1966), we assume that a consumer chooses a good with a set of quality attributes that maximizes utility. Using a formulation by Louviere, Hensher, and Swait (2000) and Lusk (2003), we suppose that the deterministic portion of a random utility function is specified as

$$(1) V = \beta_0 + \beta_1 P + \beta_2 Z_1 + \beta_3 Z_2 + \beta_4 (Z_1 * Z_2),$$

where P is the price of the good and the Z 's are quality attributes. For simplicity, assume that Z_1 represents the presence of an appealing color (dummy variable) and Z_2 represents the presence of an appealing taste (dummy variable). From this, it is clear that the WTP for a potato with an appealing color is $-\beta_2/\beta_1$ if the potato does not have a particularly appealing taste ($Z_2 = 0$), and $-(\beta_2 + \beta_4)/\beta_1$ if the potato has an appealing flavor. Thus the WTP for color is conditional on the taste of the potato.

Now assume that one wishes to conduct an experimental auction to assess the WTP for these potatoes. But instead of allowing for the effects of taste to influence final values, one conducts an experiment where the subject WTP is elicited after only a visual inspection of the potato. In this case, we implicitly assume that $\beta_4 = 0$, and the resulting WTP estimate will be $-\beta_2/\beta_1$. To the extent that taste matters, this experiment will inaccurately estimate WTP by β_4/β_1 . The more taste matters, the more inaccurate the WTP estimate.

Although our study does not directly test the hypothesis of complement/substitute relationships between attributes, it does implicitly account for the possibility by eliciting values for alternative bundles of attributes. Our finding of inconsistency of values across information sets lends some support to the Dickinson and Bailey (2002) findings.

Experimental Design

Subjects were recruited from undergraduate economics courses at Mississippi State University to participate in an economic experiment in decision-making. This included a subject base of agricultural economics majors and non-majors ranging from freshman to graduate students. Use of student subjects is more convenient and less costly than standard subject pools and there is ample evidence that students perform equally as well as profession-

als in economic experiments (Smith, Suchanek, and Williams 1988). This pool is certainly not representative of the general population either in terms of demographics or purchasing habits; however, it is not the purpose of this study to make predictions about market behavior for sweet potatoes *per se*. Rather, the purpose is to test specific hypotheses about different behavior under different sets of information. In this case, the use of students is justified and equally reliable as a sample as compared to other subject pools.

Furthermore, subjects were told the focus of the economic experiment was a sweet potato auction and they would be required to consume sweet potatoes in the experiment.¹ Auction type or format was not disclosed. Subjects were asked to report to an experimental lab at a specified time and place and told they would receive \$10 for participation.

Two treatments were conducted. In both treatments subjects were asked their WTP for a five-pound bag of each of three types of sweet potatoes after a visual inspection.² Subjects were then required to consume a cooked sample of each type of sweet potato. Based on this new piece of information, subjects were again asked their WTP for a five-pound bag of each type of sweet potato. Next, subjects were presented with several pieces of health information and a comparison of the sweet potato health benefits with the health benefits of the common Irish potato. Again, after subjects had time to assimilate the health information, they were asked to submit a WTP bid for a five-pound bag of each type of potato. In the first treatment, the sweet potatoes were defined as potato A, B, and C. In the second treatment, subjects knew the location in which the sweet potatoes were grown: A = Louisiana, B = Mississippi, and C = North Carolina.

A Vickrey-style sealed-bid auction was used to elicit WTP values. The advantage of using a Vickrey-style auction is that, theoretically, Vickrey auctions are demand-revealing. The 2nd-price Vickrey auction is commonly used; however, the 2nd-price auction often fails to engage off-margin bidders.

¹ The office for regulatory compliance and protection of human subjects requires subjects to be forewarned concerning items that they are required to consume.

² The sweet potatoes differed by the location in which they were grown—Mississippi, Louisiana, and North Carolina—and by the color of the potato. The color ranged from light yellowish-brown (North Carolina) to a purplish hue (Mississippi).

Off-margin bidders are bidders whose values for the good in question are much lower than the market price. In multi-round auctions, these bidders may quickly realize they have no possibility of winning and become disinterested, thereby not revealing their true value for the good. An alternative approach is the random n^{th} -price auction, which has the benefit of engaging off-margin bidders (Shogren et al. 2001). Unfortunately, product supply becomes an issue in this experiment. With forty total respondents bidding on a five-pound bag of potatoes, a total of 195 pounds of potatoes ($n - 1$ or $39 * 5$ pounds) would need to be procured with no prior knowledge of the actual quantity to be sold. Instead we use a uniform 5th-price auction³, which engages more bidders than the 2nd-price auction while providing certainty concerning the necessary quantity of sweet potatoes to be kept on hand.

Our general experiment design follows a 10-step process:⁴

Step 1. Subjects were assigned an identification number, signed a consent form, and were asked to complete a survey concerning demographics and past consumption of sweet potatoes.⁵ Each subject was paid a participation fee of \$10 to \$20.⁶

³ A uniform auction simply means that the market price determined by the auction is paid by all winners. In this case, the 5th-highest price is the market price. The four highest bidders all pay the 5th-highest price for the good.

⁴ Experiment instructions are available from the authors.

⁵ The purpose of the survey was two-fold. First, completion of the survey was intended to make the participant feel as if he had “earned” the initial endowment (Cherry, Frykblom, and Shogren 2002; Nalley, Hudson, and Parkhurst 2005). Second, the survey was used to collect socio-demographic data for use in the analysis. Although the pre-survey asked questions about sweet potatoes, the questions were asked in a general manner so as not to divulge information about the purpose of the experiment.

⁶ To allow for random variability in the initial endowments and attempt to eliminate the windfall effect, the participants were given an opportunity to increase their initial endowment by answering a set of ten randomly chosen Graduate Management Admissions Test (GMAT) questions. Participants received an additional dollar for every correct answer. By allowing participants to earn money, Cherry, Frykblom, and Shogren (2002) show that participants will act more rationally. Earnings were given to the participants in an envelope to preserve anonymity. This procedure has been shown to eliminate windfall effects in that heterogeneous endowments then have no impact on bidding behavior (Nalley, Hudson, and Parkhurst 2005).

Step 2. Instructions were read to the group, followed by clarifying questions and answers. To ensure subjects understood the structure of the uniform 5th-price auction, a non-binding trial auction⁷ was conducted in which subjects simultaneously submitted a bid for each of three different candy bars—Butterfinger, Baby Ruth, and Snickers. Bids were collected and rank-ordered, the market price determined and announced, and the identification numbers of winners publicly disclosed for each candy bar. If a participant won more than one candy bar he was given the option to choose which candy bar he would hypothetically buy. Following the candy bar auction, participants were again asked if they had any questions, and a short quiz on auction procedures was conducted and discussed.

Step 3. Participants were told they would be taking part in an identical auction dealing with sweet potatoes. However, this auction would be binding—meaning that winners would receive a five-pound bag of sweet potatoes for which they would pay the endogenously determined market price.⁸ Before the auction began, it was explained to the participants that there would be three rounds in this auction, of which only one round would be binding. The binding round would be randomly chosen at the conclusion of the auction.

Step 4. The three sweet potatoes were displayed.⁹ In Treatment 1 the sweet potatoes were denoted as A, B, and C. In Treatment 2 they were labeled Louisiana, Mississippi, and North Carolina. Participants were asked to come to the display table and examine the three sweet potatoes. To maintain control, participants lined up in single file and were asked to remain silent throughout the experiment.

⁷ Subjects were informed that this auction would be hypothetical but would be useful in learning the specifics of the auction procedure. The hypothetical practice auction was used to control for wealth effects.

⁸ Subjects were aware that money would be changing hands.

⁹ The displayed sweet potatoes (A, B, and C) were chosen randomly from forty-pound boxes with approximately the same number of potatoes per box. Each box was purchased directly from a packer from their supply bound for grocery stores. The sweet potatoes from each box were numbered and a number was then randomly chosen out of a hat to see which potato would represent potatoes A, B, and C in the auction. The potatoes used were approximately the same size and shape, but there were differences in skin color, as would be expected from potatoes grown in different soil conditions.

Step 5. Based on their visual inspection, participants simultaneously submitted three bids, representing their maximum WTP, one bid for each sweet potato. The bid sheets were then collected.

Step 6. Cooked samples of each of the three sweet potatoes were presented on separate trays behind each of the respective whole sweet potatoes. Participants were asked to approach the display table and eat a sample of each sweet potato. Before each sample, subjects were instructed to eat a saltine cracker followed with water so as not to confuse the taste of the previous sweet potato with the current. After sampling all three sweet potatoes, participants returned to their seats.

Step 7. Participants were instructed to simultaneously bid their maximum WTP for a five pound bag of each sweet potato based on its visual and taste attributes. Proctors then collected the bid sheets.

Step 8. An information sheet concerning the nutritional content of a sweet potato and a comparison of the nutritional values of a sweet potato and an Irish potato (white potato) was provided to each participant.¹⁰ The nutritional information was also projected on the board and read to the participants by the proctor. Subjects were given two minutes to compare the nutritional values of the sweet potato to the Irish potato.

Step 9. Participants were then asked to submit their maximum WTP bid for a five-pound bag of each sweet potato based on visual, taste, and health attributes. Bid sheets were then collected.

Step 10. The binding bidding round was randomly chosen and the identification numbers of winners and the endogenously determined market prices announced. The auction winners received a five-pound bag of sweet potatoes and paid the associated price. Participants who won auctions for more than one potato were only required to purchase one five-pound bag of their choice.

Results

We present our results in four stages: survey results, relative values, information effects, and location effects.

¹⁰ Nutritional handouts are available from the authors upon request.

Survey Results

The descriptive statistics for the demographic information are presented in Table 1. Male representation was 70 percent of the sample, and the majority of the participants in both treatments were Caucasian (these proportions are similar to the characteristics from the classes from which the sample was drawn). Average age was 23 for Treatment 1 and 25 for Treatment 2, which is indicative of a col-

lege sample. Roughly 65 percent of participants had purchased sweet potatoes prior to this experiment, suggesting that most consumers in the experiment had some prior experience with sweet potatoes. Not surprisingly, sweet potatoes were associated with holidays. Only 15 percent of participants had knowledge of where the sweet potatoes they had purchased in the past were grown. When asked if location of origin was an important attribute in their buying decision with 1 being very important and 5

Table 1. Survey Results: Descriptive Statistics.

Variable	Description	Treatment	
		Origin unknown (LU)	Origin known (LK)
Gender	1= male, 0= female	.800 (.410) ^a	.600 (.502)
Ethnicity	1= Caucasian; 2=African American; 3= Hispanic; 4= Asian; 5= Other	1.100 (.447)	1.650 (1.268)
Age	Age of participants	23.100 (4.063)	25.050 (6.210)
Purchased sweet potatoes	1= yes, 0 =no	.700 (.470)	.600 (.502)
Associate sweet potatoes with holidays.	1= yes, 0 =no	.650 (.4893)	.700 (.470)
Location of origin known	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)

^a Numbers in parentheses are standard deviations.

being very unimportant, the average response for participants was very high—roughly 4—suggesting that location of origin was not an important factor in prior purchase decisions.

Relative Value

Table 2 presents the descriptive statistics for aggregate bidding behavior across rounds and sweet potatoes. Note that differences in average bids exist across sweet potatoes at each information node. However, the variety of sweet potato is identical,

with only the growing conditions differing between states,¹¹ so the maintained hypothesis is that average WTP is equal across sweet potatoes. Alternatively, if growing conditions have a distinct influence on the sweet potato, individual valuations should differ across sweet potatoes. Formally, we state our null hypothesis:

$$(2) H_0: WTP_{LA} = WTP_{MS} = WTP_{NC}.$$

¹¹ Agronomists argue that differences in soil type have an effect on the sugar content and skin color and texture of the potatoes (Graves 2002).

Table 2. Descriptive Statistics: Aggregate Bids.

	Mean	Median	Mode	Standard deviation	Max	Min
Origin unknown						
Visual						
A—LA	1.74	1.25	1.00	1.39	4.25	0
B—MS	1.68	1.40	2.00	1.47	5.00	0
C—NC	1.71	1.00	1.00	1.42	4.75	0
Taste						
A—LA	1.30	1.13	0.25	1.03	3.00	0
B—MS	1.23	1.00	1.00	0.97	3.00	0
C—NC	1.57	1.50	1.00	1.19	3.50	0
Information						
A—LA	1.43	1.13	1.00	1.16	4.00	0
B—MS	1.32	1.00	0.50	1.09	3.75	0
C—NC	1.65	1.53	1.00	1.31	4.10	0
Origin known						
Visual						
A—LA	2.40	2.00	2.00	1.18	5.00	0
B—MS	2.40	2.00	2.00	1.74	7.00	0
C—NC	2.03	1.73	1.00	1.38	6.00	0
Taste						
A—LA	2.34	2.00	2.00	1.40	6.00	0
B—MS	2.58	2.50	3.00	1.62	7.00	0
C—NC	2.02	1.63	1.00	1.71	7.00	0
Information						
A—LA	2.47	2.00	2.00	1.48	6.00	0.50
B—MS	2.77	2.38	2.00	1.51	7.00	0.75
C—NC	2.18	1.50	1.00	1.24	5.00	1.00

A nonparametric Quade test¹² is used to examine differences in bids across sweet potatoes at each of the different bidding opportunities (Table 3). For both treatments—location of origin known and unknown—average bids were not statistically different following the visual inspection, indicating participants were indifferent across sweet potatoes, on average.¹³ However, following participants' tasting experience, significant differences in WTP emerged. In both treatments, bids were statistically different at the 5-percent level. In the origin-unknown treatment the North Carolina sweet potato was valued highest, while in the origin-known treatment the Mississippi sweet potato had the highest average value. When the participants were exposed to the

health information (Round 3), statistical differences ($P = 0.05$) persisted only in the origin-unknown treatment, and, as expected, the health information did not change aggregate preference ordering. However, in the location-of-origin-known treatment there was no statistical difference in the mean bids using the nonparametric Quade test for the "health" round, which is interesting because it indicates relative valuation changed in the face of information that should be value-neutral or consistent across sweet potatoes.

To summarize, no significant difference in mean bids was observed based on visual inspection only. However, upon experiencing the attribute of taste, a distinct preference ordering for sweet potatoes was revealed. Interestingly, the attribute of health, which should not alter preference ordering, did change the strength of preference ordering in the origin known treatment.¹⁴

Information Effects

Individuals' preferences for sweet potatoes were updated with two pieces of additional information: a taste experience and a health-information shock.

¹² The distribution of bids was tested for normality using Shapiro-Wilk and Kolmogorov-Smirnov tests and, in general, normality was rejected. There were a number of 0 bids, indicating respondents had no value for the potatoes, which led to differences in mean and median bids. Thus the non-parametric test results will be highlighted from this point forward. The non-parametric tests focus on median rather than mean bid values. For completeness, a parametric two-way ANOVA was also used to examine differences in bids across potatoes. The results are reported in Table 3.

¹³ In the origin-known treatment, if a "hometown bias" was prevalent and persistent, we would expect the Mississippi potato to be valued significantly higher, which was not the case.

¹⁴ From Table 2 we see that the ordering of mean bids remained the same, with each potato increasing by between \$0.13 and \$0.19. However the bids are more tightly clustered, which is evidenced by smaller standard deviations.

Table 3. Comparison of Mean Bids across Sweet Potatoes.

Round	Quade ^a	Two-way ANOVA ^b
Location of origin unknown		
1- Sight only	0.1369	0.017
2- Taste	5.2102*	3.341**
3- Health	3.9031*	3.735**
Location of origin known		
1- Sight only	0.8492	2.066
2- Taste	2.9842*	3.577**
3- Health	0.8324	3.904**

* Statistically significant at the 5% level.

** Statistically significant at the 10% level.

^a T-value as calculated from the Quade Test (Conover, p. 374).

^b F-value across potatoes sum of squares from two-way Anova.

We examine the taste experience first and the health-information shock second.

Taste Experience. There is no *a priori* expectation that taste should either increase or decrease the mean bid from the visual valuation. The expectation is that a negative tasting experience would decrease the individual's WTP and a positive experience would increase WTP. However, sweet potatoes are an established product (65 percent of our sample had purchased sweet potatoes), for which, presumably, participants have complete information sets—they already know how a sweet potato tastes and have factored the taste attribute into their WTP. Also apparent from the survey is that most respondents associate sweet potatoes with holidays. As such, they are not likely regular consumers. Thus their valuations are not likely confounded with prior experience. We construct our null hypothesis accordingly:

$$(3) H_0: WTP_{i,V} = WTP_{i,T},$$

$i = \text{LA, MS, NC}; V = \text{visual}; T = \text{taste}.$

After the participants were exposed to the experience attribute of taste, bids dropped by an average of \$0.44 (see Table 2). We formally test the null hypothesis for each treatment using a nonparametric Wilcoxon signed-rank test¹⁵ (Table 4). For the unknown-location-of-origin treatment the results indicate that for the Louisiana (LA) and Mississippi (MS) sweet potato mean WTP bids were statistically different ($p < 0.05$) between the visual and the taste rounds. Here taste had a significant negative effect on individuals' valuations. However, no significant impact was noted for the North Carolina (NC) sweet potato. In the treatment in which location of origin is known, we observe the opposite. NC sweet potatoes have a statistically significant negative impact ($p < 0.10$), whereas LA and MS sweet potatoes exhibit no significant difference in mean bids. One possible explanation for the change in mean WTP following taste is that our microwaved sweet potatoes were not prepared in the manner to which most of the participants were accustomed—68 percent of the participants associated sweet potatoes with Thanksgiving and Christmas. The samples that participants tasted were likely bland in comparison. Nevertheless, these results indicate a general lack

of correspondence between WTP values under alternative information sets, which is consistent with prior research.

Health-Information Shock. Unlike the taste experience, health information may or may not be known *a priori*. It is possible that individuals are unaware of sweet potato health benefits, regardless of past consumption. However, we do assume that most people place a positive value on healthy attributes. As such, the introduction of health information is expected to either increase or have no effect on mean bids. The null hypothesis is

$$(4) H_0: WTP_{i,T} \geq WTP_{i,H},$$

$i = \text{LA, MS, NC}; T = \text{taste}; H = \text{health}.$

Note from Table 2 that mean bids increased by roughly \$0.13 following the provision of health information. A Wilcoxon signed-rank test is used to test the null hypothesis for each treatment (Table 4). The presence of additional health information had a positive influence on mean WTP bids—for four of the six samples, health information had a significant positive influence: MS unknown origin ($p < 0.05$), MS known origin ($p < 0.08$), LA unknown origin ($p < 0.07$), and LA known origin ($p < 0.07$). These results indicate that providing individuals with health information will have a positive effect on consumer demand.

By examining the initial (sight-only) versus the final (sight + taste + health) bids, we see that bids were significantly different 50% of the time. This result further reinforces previous results by Melton, Huffman, and Wallace (1996) and Chern, Kaneko, and Tarakcioglu (2003) that simple visual inspection is insufficient to generate consistent WTP values with post-consumption WTP values. Furthermore, these results lend some support to the findings of Dickinson and Bailey (2002) that the total effect of the attributes may have a different outcome than the effect of an attribute examined in isolation.

Location Effects

A common practice in retail sales is to highlight to the local consumers the origin of homemade products, thus increasing the mean WTP of local consumers (creating a "hometown" bias). Following Lusk and Hudson (2004), we use a Mann-Whitney test to analyze the differences in mean bids between the location-of-origin-unknown (LU) treatment and

¹⁵ For completeness, a parametric paired t-test is also conducted. The results are in Table 4.

Table 4. Information Effects.

Round	Wilcoxon test ^a	Paired t-test ^b
Location of origin unknown		
Louisiana		
Sight vs. taste	-1.9904*	-2.1156*
Taste vs. health	1.5109**	1.3648**
Initial vs. final ^c	-1.7464*	-1.6577**
Mississippi		
Sight vs. taste	-2.1052*	-2.3528*
Taste vs. health	1.6977*	1.3589**
Initial vs. final	-1.6970**	-1.9086**
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**	1.4653**
Initial vs. final	0.3158	0.3158
Mississippi		
Sight vs. taste	0.9979	0.8788
Taste vs. health	1.4106**	1.5975**
Initial vs. final	1.7376**	1.7645**
North Carolina		
Sight vs. taste	-1.4067**	-0.0438
Taste vs. health	1.1779	0.6429
Initial vs. final	0.5976	.8164

* Denotes statistical significance at the 5% level.

** Denotes statistical significance at the 10% level.

^a T-value calculated from the Wilcoxon signed-ranks test.

^b T-value calculated from the paired t-test.

^c Comparison of Round 3 to Round 1.

the location-of-origin-known (LK) treatment. If the bids are constant between treatments, bidders did not distinguish sweet potatoes based on location of origin. The null hypothesis is

$$(5) H_0: WTP_{LU} = WTP_{LK}$$

Comparisons are conducted between treatments for each potato and each round, resulting in nine total tests. Test results are reported in Table 5.¹⁶ Of the nine tests, six show WTP bids were significantly different between treatments ($p < 0.10$). In every case, there was a notable increase—\$0.84 per bid, on average. Intuitively, this result suggests that the participants were placing a premium on the infor-

¹⁶ For completeness, the parametric equivalent two-sample t-test is reported in Table 5.

¹⁷ By placing a “premium” on the location of origin attribute, the consumer may be indicating that location of origin is a signal of quality.

mation attribute, location of origin.¹⁷ However, the existence of a “hometown” bias is neither accepted nor rejected by these results. Interestingly, though, preference orderings do change between treatments. In the origin-unknown treatment NC has the largest mean WTP, but in the origin-known treatment MS has the largest mean WTP.

These results further reinforce the findings that utility may not be additive. That is, if utility were additive, location-of-origin information would increase the overall level of bids but should not change preference ordering. Here, we find that preference order changes, suggesting that location of origin is interacting with other attributes. This experiment was not specifically designed to test interaction effects, but these findings do raise interesting questions to be addressed in future research.

Table 5. Location Effects: Mann-Whitney Test.

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

* Denotes statistical significance at the 5% level.

** Denotes statistical significance at the 10% level.

^a T-value calculated from the Mann-Whitney test.

^b T-value calculated from the two-sample t-test.

Conclusions

The results of this study point to several conclusions. First, from a marketing perspective, the lack of correspondence between consumer valuations across information sets potentially complicates repeat purchase decisions. If consumers initially value a potato high based on sight, but later discount that value based on taste (assuming sweet potato preparation is consistent with this experiment), some consumers may not try the product again. Thus more general studies designed to make specific marketing recommendations about product placement, form, or packaging and labeling should account for the potential lack of correspondence between visual appraisals and post-consumption values.

Second, results show that health advertising can be effective. While health advertising generally increased bids, the resulting increase in demand may be insufficient to offset advertising costs. Again, because this is a sample of students, the effects of health information may be underestimated¹⁸, but generally show the effects a credence attribute such as health may have on consumer valuation. Finally, knowledge of location of origin generally increases bids, and in this experiment changed preference ordering, suggesting that location of origin matters in purchase decisions. The limited size and demographic homogeneity of the sample limits generalization to a broader group. However, the results of this study raise interesting questions for future research. In particular, one would need to run identical experiments in North Carolina and Louisiana to examine if a "hometown bias" were present in those locations as well.

This study does point to the need for additional research on ordering and interaction effects. That is, would health advertising have the same effect on WTP if it were introduced before consumption as opposed to after? We observe statistical differences in WTP across potatoes when location of origin is unknown in both the taste and health rounds. However, when location of origin is known, we only observe statistical differences in the taste round. Thus the addition of the location-of-origin information changed the strength of preference ordering. While

¹⁸ We believe an interesting testable hypothesis is that student (younger) groups will not express as high a value for health attributes as will older groups, because they have fewer health problems or concerns. If that hypothesis is correct, the health premiums observed here would be underestimated.

not a direct test of this phenomenon, these results suggest the ordering of information introduction may have some influence on the marginal impact of that information. Additionally, these results along with those found by Dickinson and Bailey (2002) suggest that more research is needed on joint effects between attributes. Because attributes are not purchased in isolation, their complement/substitute relationship with other attributes may have serious implications for this type of research.

References

- Chern, W., N. Kaneko, and G. Tarakcioglu. 2003. "Willingness to Pay for PEF Orange Juice: Evidence from an Auction Experiment." Paper presented at The American Agricultural Economics Association Annual Meeting, Montreal Canada, 27–30 June.
- Cherry, T., P. Frykblom, and J. Shogren. 2002. "Hardnose the Dictator." *The American Economic Review* 92:218–221.
- Dickenson, D. and D. Bailey. 2002. "Meat Traceability: Are U.S. Consumers Willing to Pay for It?" *Journal of Agricultural and Resource Economics* 27:348–364.
- Fox, J. A., D. J. Hayes, and J. F. Shogren. 2002. "Consumer Preferences for Food Irradiation: How Favorable and Unfavorable Descriptions Affect Preferences for Irradiated Pork in Experimental Auctions." *The Journal of Risk and Uncertainty* 24:75–95.
- Graves, B. 2002. Plant Pathologist with the Mississippi Department of Agriculture and Commerce. Personal communication. June 19.
- Ippolito, P. M. and A. D. Mathios. 1990. "Information, Advertising and Health Choices: A Study of the Cereal Market." *Rand Journal of Economics* 21:459–480.
- Lancaster, K. 1966. "A New Approach to Consumer Theory." *Journal of Political Economy* 74:132–157
- Loureiro, M., and S. Hine. 2002. "Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for Local (Colorado Grown), Organic and GMO-Free Products." *Journal of Agricultural and Applied Economics* 34: 477–487.
- Loureiro, M. L. and W. J. Umberger. 2003. "Estimating Consumer Willingness to Pay for Country-of-Origin Labeling." *Journal of Agricultural*

- and *Resource Economics* 28:287–301.
- Louviere, J., D. Hensher, and J. Swait. 2000. *Stated Choice Methods*. Cambridge: Cambridge University Press.
- Lusk, J. 2003. “Using Experimental Auctions for Marketing Applications: A Discussion.” *Journal of Agricultural and Applied Economics* 35: 349–360
- Lusk, J. and D. Hudson. 2004. “Effect of Monitor-Subject Cheap Talk on Ultimatum Game Offers.” *Journal of Economic Behavior and Organization* 54:439–443.
- Melton, B., E. Huffman, and E. Wallace. 1996. “Consumer Preferences for Fresh Food Items with Multiple Quality Attributes: Evidence from an Experimental Auction of Pork Chops.” *American Journal of Agricultural Economics* 78:78–90
- Nalley, L., D. Hudson, and G. Parkhurst. 2005. “The Initial Endowment Effect in Experimental Auction Revisited: Further Evidence.” *Applied Economics Letters* 12:59–63.
- Shogren J., M. Margolis, C.Koo, and J. List. 2001. “A Random n th-Price Auction.” *Journal of Economic Behavior and Organization* 46: 409–421.
- Smith, V., G. Suchanek, and A. Williams. 1988. “Bubbles, Crashes, and Endogenous Expectations in Experimental Spot Asset Markets.” *Econometrica* 32:122–136.
- Suryanata, K. 1999. “Products for Paradise: The Social Construction of Hawaii Crops.” *Agriculture and Human Values* 17:181–189.
- Swartz, D. G. and I. E. Strand. 1981. “Avoidance Costs Associated with Imperfect Information: The Case of Kepone.” *Land Economics* 57: 139–150.
- Viscusi, W. K., W. A. Magat, and J. Huber. 1987. “An Investigation of the Rationality of Consumer Valuations of Multiple Health Risks.” *Rand Journal of Economics* 18:465–479.