Confounded by the Field: Bidding in Food Auctions When Field Prices Are Increasing

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Auction experiments are commonly used to determine consumers' willingness to pay for various food items. While their non-hypothetical nature is a positive, market substitutes create a probable confounding of bids by field prices. This study examines the influence of field prices on bids for four foods in two versions by conducting auctions before and after large price increases in 2007. Results show that bids were capped at given field prices and were significantly higher in sessions conducted after store prices increased. Percentage premiums, however, were not significantly different across sessions, suggesting that effects of field prices could be reduced. Overall, researchers must be conscious of how field prices affect bids.

Key Words: auction experiments, field prices, organic, bidding

Experimental auctions have become common for determining consumers' willingness to pay (WTP) for market and non-market goods. A large area of this research has involved eliciting consumer WTP for food products. Examples include research on genetically modified (GM) foods (Huffman et al. 2007, Lusk et al. 2006, Bernard, Zhang, and Gifford 2006), food safety issues and health information (Marette, Roosen, and Blanchemanche 2008, Fox, Hayes, and Shogren 2002), and preferences for such foods as bison meat (Hobbs, Sanderson, and Haghiri 2006) and steaks (Feuz et al. 2004). Part of the popularity of this method stems from its non-hypothetical nature. Specifically, subjects that are the highest bidders end up purchasing the food at a real cost. Combined with the incentive-compatible properties of the auction mechanisms used, this technique should do better at determining consumers' WTP than contingent valuation surveys or other hypothetical techniques [for a comparison of techniques, see Lee and Hatcher (2001) or Lusk and Hudson (2004)].

There are, however, limitations in the use of auction experiments. As noted by Alfnes and Rickertsen (2007), products in the auction must be available for the auctions to be real.[1] While the products may not yet be on the market or are available only on a limited basis, the non-hypothetical nature of auction experiments means that at least some close substitutes exist in the marketplace. Under standard consumer theory, it would be expected that changes in prices of substitute or complement goods outside the laboratory would influence consumers' WTP and their bidding behavior. These changes could have profound effects on results and conclusions drawn that experimenters need to be conscious of.

A few past studies have considered the effects of market prices on bidding. Harrison, Harstad, and Rutström (2004) expressed concerns about the likelihood that bids in experiments would be

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[1] The alternative would be to use deception, which is uncommon in economic experiments. For a discussion of the issues involving deception, see Hertwig and Ortmann (2001).

censored by opportunities to purchase the good in the field. Cherry et al. (2004) tested to see if outside options influenced bidders using induced values. They found that subjects shaved their bids towards the price of the outside option provided. They expressed concerns regarding what may happen in private, homegrown value auctions if substitutes in the field were not accounted for. Corrigan and Rousu (2008) looked at some of these issues while testing to determine if field auctions in a supermarket are demand-revealing. They compared subject bids, divided into groups by purchase intentions, with their expectations of the field price. For those that intended purchase on that occasion, bids were not significantly different from their field price expectations. While not quantified in their article, Corrigan and Rousu's graph made it appear that many intending purchasers bid over their price expectation. This may reflect lack of confidence on the part of those bidders regarding their expectations.[2]

Other studies have included recommendations on how to deal with the field price influence. Lusk and Shogren (2007) presented a model of expected bid behavior in the situation where market substitutes exist. Their conclusion was to not collect bids in their levels (referred to as the full bidding approach) due to possible upper censoring of values, but rather to use an endowment approach.[3] Alfnes (2009) followed this work with a separate theoretical model. In his framework, for products that consumers would purchase outside the laboratory, the optimal bid was the field price. For other products, the bid should be lower. Importantly, under the assumptions of his model, the differences in bids are equal to the differences in values, regardless of the market prices of substitutes. He therefore defended the full bidding approach, as long as bids are not compared by their individual levels, despite the influence of field prices.

As a concern beyond these studies, the influence of field prices could be more problematic in times where market prices are volatile. Decreases in field prices could lower bids in an auction experiment. Increased field prices could increase bids or, if the previous prices were at consumers' WTP, bids could remain consistent. If the effects of these possible changes in bids are large, then a great deal of care must be taken to determine what researchers are learning from bids. This has become more important as food prices have recently seen large increases and fluctuated substantially. Price changes were especially evident in 2007. Whole milk prices, for example, increased 23.2 percent in the first 11 months of the year (Bureau of Labor Statistics 2007). That these changes were unusual was evident in the number of articles appearing in the popular press [see for example O'Donnell (2007)]. These conditions offered an ideal opportunity to examine how bids are influenced by prices in the field.

The goals of this study were thus twofold. The first part was to determine whether or not field prices act as caps on subject bids in the laboratory. The second part was to see how bids from auction experiments changed in response to field price increases. As part of this study, a major secondary objective was to determine if analyzing bids directly or examining percentage premiums between different versions of products would be a better approach in such circumstances. These were investigated in auctions with four foods offered in conventional and organic versions. The foods were: milk, chicken breasts, chocolate chip cookies, and tortilla chips. Experimental auction sessions were run in both early and late 2007, with field prices for conventional milk and chicken breasts having increased substantially in the intermittent period, and the prices of the other two products having remained constant. Subjects were given the conventional prices for each and asked to supply their expected field price of the organic versions.

Conceptual Model

A conceptual model was formulated generalizing from Harrison, Harstad, and Rutström (2004) and Lusk and Shogren (2007). To begin, consider a utility-maximizing subject with a value, V, for the good of interest in the experiment. Under Hicksian welfare theory, this value measures the amount of compensation necessary after a change in price or goods bundle that holds the consumer's utility constant. In the static setting commonly assumed in auction experiments, this V could be consid-

[2] Alternatively, some subjects may have wished to help the experimenter by giving a bid nearer their WTP regardless of the field price. To our knowledge, this is an open area for investigation.

[3] In the endowment approach, subjects are given one version of a product and asked for a bid to exchange it for another version. See Corrigan and Rousu (2006) for a critique.

ered the maximum a subject would be willing to pay if shopping for the product. Thus, by collecting V from subjects the goal would be to estimate the field demand curve for a good.

However, as discussed in Zhao and Kling (2001, 2004), participants in an experiment may more appropriately be viewed as part of a dynamic market. In investigating these concerns, Corrigan (2005) obtained results leading him to suggest that outside markets must be carefully considered when conducting WTP auction experiments. Of interest here, when eliciting the value of private goods in an experimental auction, a subject usually has an option to purchase it outside the lab at some field price, P. When V is smaller than the sum of P and the transaction cost, T, associated with purchasing the good outside the lab, a subject is better off purchasing the product in the lab. In this case, it is optimal for a subject to submit a bid, B, equal to V so that the maximum WTP is elicited by the auction. However, if V is larger than the sum of T and P, a subject will be better off if he makes his purchase outside the lab. The maximum bid he would submit would be $P+T$. Therefore the researcher will be unable to capture V and it would not be possible to generate the field demand curve.

More specifically, assuming that the product offered in the lab and its field counterpart are perfect substitutes and that the field price does not affect the sale price in the lab, it could be expected that $B_i = \min [V_i, P + T_i]$ for each subject i. While the field and lab versions of a product are unlikely to be considered perfect substitutes, either due to different brand preferences or the basic dynamics of the two purchasing opportunities, for simplicity consider that this relationship will hold within a narrow range. Note also here that the transaction costs would have a subjective value for each subject. For example, a subject planning to go to the grocery store after the experiment would have a low T, while those viewing shopping for the item as a hassle should have a correspondingly higher T (Harrison, Harstad, and Rutström 2004). If a frictionless marketplace was assumed, $T = 0$, then it would be expected that a subject's bid, B, would be $\min[V, P]$. Thus, for cases where $V > P$, V cannot be determined although the value of T may allow for higher values of V to be observed. Therefore, the ability to get V from a rational subject depends on the field price and any transaction costs.

Next consider how an increase in the field price would alter bids and the ability to determine the field demand curve. Let P^1 be a new field price for the good such that $P^1 > P$. Now, $B_i = \min[V_i, P^1 + T_i]$. There are two direct consequences of this. First, the mean bid will be the same or higher. It would be the same if $B_i = V_i$ for all i under original price P. In other words, the field price was not a binding constraint on bidding. Arguably more likely, there would be subjects with $P < V_i < P^1$ whose values would be revealed in the new situation and lead to a higher mean bid observed in the laboratory. The second expectation would be that the variance of the bids would be higher or the same under the new price condition. The same variance would again represent the case where P was not a binding constraint on subject bids, since these subjects would have no rational reason to alter their bids. With any subjects increasing their bids coupled with those staying at lower bid levels, the spread of the bids would be wider.

The situation would be similar in the case where field prices were not known. Consider subjects with only an imperfect knowledge of the field price, P. Subjects would consider an expected field price, $E[P]$, in forming bids. Expectations would depend on the subject such that in this situation $B_i = \min[V_i, E_i[P] + T_i]$. Creating this expectation could be especially difficult for subjects in a time of fluctuating prices. The expectation of the field price would also depend on how close a substitute the good being auctioned is to the typical field alternative. Even for a good with a direct field substitute, if it is a lesser known niche product subjects would more likely use the known field price, P, of a more conventional version on which to base their expectation. In this case, $E_i[P]$ would be an increasing function of P. Therefore, if we consider again P and P^1 as the known price of the field substitute before and after a price increase, it would be expected that $E_i[P]$ will be greater under P^1. Note that while this formulation allows bids to exceed P, it still imposes a cap that may take effect below V, the value researchers desire. As with the previous model it would not be possible to capture a full field demand curve in an experiment. The main expected difference would be the lack of a clear price cap point given subjects' varying expectations.

Experimental Design

Two sets of auction sessions were conducted. The first set, consisting of six experiment sessions, was held in May of 2007. The second set, with two sessions, was conducted in November of that year. Each session had between 20 and 25 participants, for a total of 183 subjects (139 in the first set, 44 in the second set). Sessions lasted an hour and fifteen minutes. Subjects received $50, plus any extra earnings in practice rounds minus any food purchases.

A professional recruiter was used with instructions to create a sample representative of Delaware, and to be consistent between the two sets of sessions. Demographic profiles of the two sets of sessions appear in Table 1, along with p-values testing the hypothesis that the samples were not significantly different. Subjects in the first set of sessions were significantly older, more highly educated, and had higher incomes. Previous similar research would suggest that this could lead to changes in the mean WTP, and must be controlled for in the analysis (Bernard, Zhang, and Gifford 2006). No significant differences existed for gender or race.

Each session began with a questionnaire designed to collect subjects' incoming opinion and knowledge of the attributes of the foods in the auctions and their demographics. This was followed by a detailed presentation of the auction mechanism, the Vickrey fifth-price auction, with examples illustrating the potential to miss out on profits by underbidding or to lose money by overbidding. Two practice auctions using induced values were conducted to be sure that subjects understood the mechanism and that misconceptions were avoided (Plott and Zeiler 2005).

Once everyone understood the mechanism, four sets of food auctions were conducted. These were for 2-percent milk in the half-gallon size; one pound of boneless, skinless chicken breasts; a 16-ounce package of chocolate chip cookies; and a 14.5-ounce bag of tortilla chips. Each food was auctioned in four versions, with the focus here on conventional and organic.[4] Prices for the conventional versions of each product were explained to subjects as being averages based on prices at multiple area markets within the previous two days. In the first sessions, these were $2.35 for milk, $3.99 for chicken, $3.99 for cookies, and $3.29 for tortilla chips. For the second sessions the prices of milk and chicken were $2.77 (18 percent increase) and $5.49 (37.5 percent increase), respectively. Prices of cookies and tortilla chips did not change.

Subjects were given some additional information prior to the auctions. First, since the prices for conventional versions had been given, a short cheap talk style script was used impressing upon subjects to bid their WTP and not the store price. Second, it was announced that only one auction would be binding (e.g., organic milk). Following Bernard and Bernard (2009), the binding auction was randomly determined prior to each session with the result sealed in an envelope visible to the group. This design eliminated the waste of buying food products that would not be used, which was considered especially important given the perishable nature of some of the products. Third, subjects were told that if milk or chicken was chosen as the binding auction, they were purchased that day and stored in an on-site refrigerator. Chocolate chip cookies and tortilla chips were described as having been purchased within the previous two days.

A key aspect of the design was whether or not to provide the subjects with field prices for the food products. The role of reference prices from the field has been examined by Drichoutis, Lazaridis, and Nayga (2008). They ran two treatments of subjects: one was given field price information for various sandwiches, and one was not. Their results showed that the subjects given field prices had significantly higher bids. Here, knowledge of P was considered important, so subjects were given the field prices of the conventional versions of each food. However, to also determine what would happen in their absence, thus requiring subjects to rely on $E[P]$, field prices were not given for the organic versions.[5] It would be an open question if giving subjects conventional field prices but not giving them the organic field prices leads to smaller overall premiums.

[4] Other versions for milk were no antibiotics used and non-rBST; for chicken, no antibiotics used and free-range; for cookies, natural and 70 percent organic; and for chips, natural and non-GM.

[5] Subjects might view conventional versions as substitutes for the organic ones and anchor their expectations of the price for organic off the given conventional field price. However, it was felt that enough uncertainty would exist for an interesting comparison.

Table 1. Demographics from the First and Second Sets of Sessions

		Mean		H_0: Equal	Std. Dev.	
Variables	Definition	First	Second	p-value	First	Second
Age	Age of subject, in years	42.05	35.52	0.002 [b]	13.78	12.10
Income	Subject income (in $ thousands)	69.28	57.74	0.096 [b]	44.97	33.76
Education	1 if subject has less than high school, 2 if high school, 3 if some college, 4 if college, 5 if post-college	3.23	2.95	0.058 [a]	1.02	0.70
Gender	1 if subject is male and 0 if subject is female	0.44	0.47	0.33 [b]	0.50	0.51
White	1 if subject is white and 0 if otherwise	0.73	0.74	0.46 [b]	0.45	0.45
African American	1 if subject is African American and 0 if otherwise	0.18	0.24	0.21 [b]	0.39	0.43

[a] p-values are from Fligner-Policello tests.
[b] p-values are from Wilcoxon-Mann-Whitney tests.

After the auctions, subjects completed a second questionnaire where they were asked to give their expected store price for the organic versions of each of the food products. While they completed this, a volunteer subject opened the envelope and announced the binding auction to the group. The reigning price for the binding auction and the five buyers were then determined. Lastly, subjects were paid, the food item was distributed, and the session ended.

Methodology and Hypotheses

Data from the experiments were analyzed both graphically and through statistical tests. In terms of graphics, figures were created for each of the eight foods showing the demand curves for the first sessions and the second sessions. These were constructed, following Lusk and Schroeder (2006), by plotting the sorted bids against the frequency of the sample with bids greater than particular prices. After calculating the cumulative percentages at particular prices, the demand curves for the sample were produced by plotting both bids and cumulative percentages.

For statistical comparison of the bids, the first step was to determine their distribution so appropriate tests could be used. SAS software[6] was used to determine that all bid distributions were non-normal. In general, the common practice for comparing series of non-normal bids using the non-parametric Wilcoxon-Mann-Whitney test was followed. However, these comparisons are sensitive to differences in the distributions of the series. Fagerland and Sandvik (2009) showed that even small differences in variances can have large effects on conclusions. Therefore, in addition to checking for normality, Brown and Forsythe tests for homogeneity of variances were conducted. When variances were found to differ, the Fligner-Policello test, an alternative rank-based non-parametric technique, was used to compare means. For additional information, an examination of bids by the 25 percent, 50 percent, and 75 percent quantiles was conducted. Bids at the 50 percent quantile were compared using the non-parametric median test.

Comparisons were made to examine five hypotheses based on the research goals.

HYPOTHESIS 1. *Subjects would not bid above the given field prices for the conventional versions of the products in either set of sessions.*

Given the conceptual model above it was expected that rational subjects with WTP above the field prices would enter bids at the field price. Those viewing the lab version of the good as an inferior substitute for the field version would be expected to bid less than the field price regardless. Only a small fraction would bid above field prices, dependent on their subjective values for transaction costs in the market. This was investi-

[6] SAS OnlineDoc®9.1.

gated graphically and by determining the percentage of subjects that entered bids equal to or greater than the given field prices for the conventional foods. An additional method to see how field prices could act as bidding caps was conducted by determining the percentage of subjects in the second set of sessions that placed bids greater than the field prices from the first sessions. It was assumed that a large percentage would bid above the earlier prices as the lower binding cap on bids was removed.

HYPOTHESIS 2. *The mean and variance of the bids for the conventional versions in the second set of sessions would be the same or higher for products that had price increases and the same for products with constant prices.*

Based on the framework above, any rational consumer who found the lower field price capping his WTP would now bid up either to his WTP or to the cap of the higher field price. The existence of such subjects should lead to higher bid levels for the foods that had price increases, while bids for the other two products should have remained the same. As discussed, this increase in spread of rational bid values should increase the variance of the bids.

HYPOTHESIS 3. *The mean and variance of the bids for the organic versions in the second set of sessions would be the same or higher for products that had conventional price increases and the same for products with constant conventional prices.*

Even without subjects being given knowledge of the organic versions' prices, it was expected that bids would increase for those foods with higher conventional prices. If subjects use their price expectation in a manner similar to that hypothesized for field prices, then changes in bids similar to those under the first hypothesis should be expected for the organic versions.

The use of the known prices as anchors leads directly to the next hypothesis.

HYPOTHESIS 4. *Price expectations for the organic versions in the second set of sessions would be higher for products that had price increases and the same for products with constant prices.*

The goal of the fourth hypothesis was to examine how subjects' expectations of field prices changed for the organic versions of the foods between the two sets of sessions. It was hypothesized that the higher conventional prices for milk and chicken in the second set would lead to higher price expectations for the organic versions; the price expectations for the other two foods would remain the same.

HYPOTHESIS 5. *The percentage premium that subjects would pay for the organic version over the conventional version for each food would be consistent across the sets of sessions for all products.*

This hypothesis was related to the theory of Alfnes (2009), which showed that the differences in bids are equal to the differences in values, regardless of the market prices of substitutes. The idea was that any confounding from field prices on auction data could depend on the way it was analyzed. While it may seem natural to examine bids in their level, depending on a study's objectives, bids could instead be compared by the differences, or premiums, between them. Umberger and Feuz (2004) noted that looking at relative bids between products may be more valid than investigating bid levels. Note that using percentage premiums instead of just the premium was necessary to account for the higher prices in the second sessions. Lusk et al. (2005) showed the benefits, and necessity, of using percentages when examining bid data from various sources as part of their meta-analysis on GM foods.

Results

A graphical analysis of the first hypothesis—the demand curves for each set of sessions for the conventional versions of the products—appears in Figure 1. The figure provides evidence supporting subject bids being capped at the given field prices. For the bottom panels depicting products where prices had not changed, bids in both sets of sessions were clearly bounded by the field price. In the upper panels for the products that had price increases, the influence of the higher field price in the second set of sessions was evident in the difference between the curves. In each case, there were only a few instances of bids being submitted above the respective field price. These results provide preliminary evidence regarding the second hypothesis that the mean and variances of the bids would be higher under the higher field price situation. While the few bids above the price lines may reflect differing views

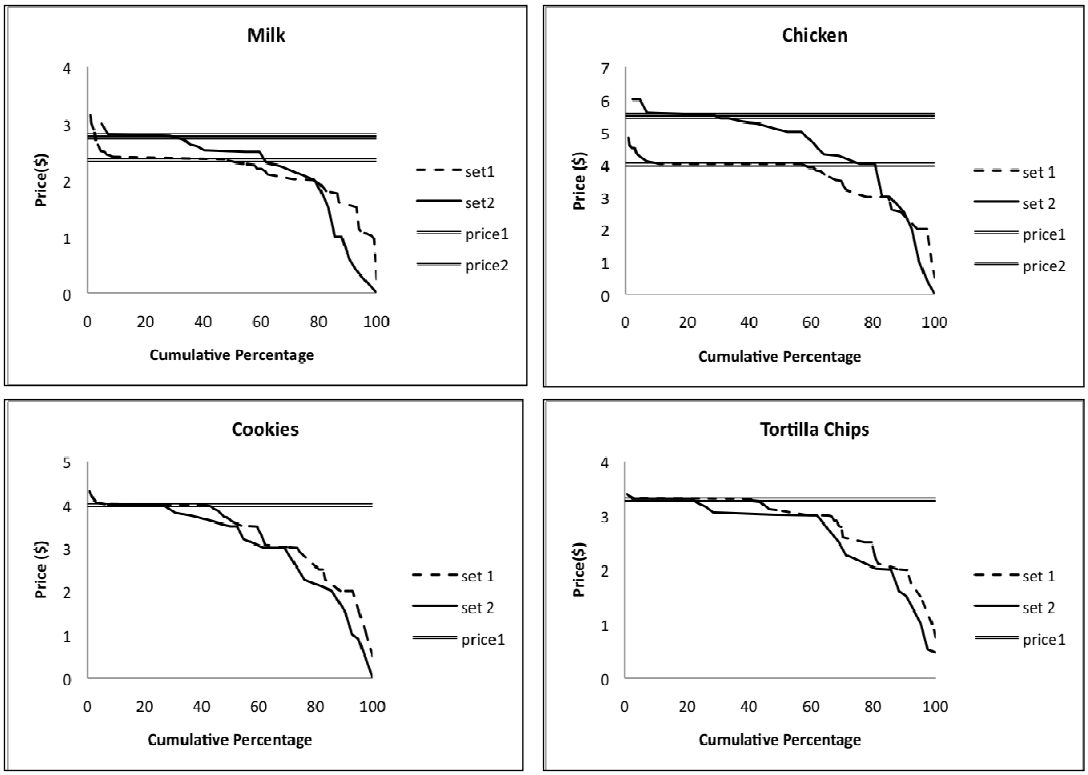

Figure 1. Demand Curves for the Conventional Versions of the Products by Session Set

of transaction costs beyond the laboratory, the limit of the field price seemed to be generating a clear confounding effect on bids. Overall these matched well with the findings of Corrigan and Rousu (2008). As they found in their supermarket study, for the commonly purchased products used here, bids were often near the field price.

For additional detail on what was illustrated in the figure, the percentage of bids equal to or greater than the field prices for the conventional versions are displayed in Table 2. Across all foods and both sets of sessions the percentage of subjects bidding above the field prices for the conventional versions was approximately 6.6 percent. The smallest percentage of subjects to bid over field prices was for tortilla chips.[7] In the first set of sessions more than a third of the subjects entered bids equal to the field price. In the second set of sessions a smaller group, around one-fifth of participants, entered bids equal to the given prices. Across both sets of sessions the remaining subjects bid less than the given field price. If this were a market situation, under the theory of Corrigan and Rousu (2008) those bidding at the field price would be viewed as likely purchasers, while those bidding less would not likely want to purchase.

As additional positive evidence for the first hypothesis, Table 2 also contains the percentage of subjects in the second set of sessions that bid greater than the field price from the first sessions for the foods that experienced price changes. These showed a majority of subjects bidding well above the earlier prices. Specifically, for milk, 60 percent of the subjects submitted bids greater than the previous field price, while for chicken the percentage was 76 percent. This again implies that the field price was generating a cap on bids as suggested by the above studies.

Results comparing the mean and variances of bids between the sets of sessions for the second

[7] Anecdotally, several subjects had remarked that tortilla chips are commonly available for sale below their stated field price. The effect of expectations of sales for products on WTP and bidding is another open avenue for investigation.

Table 2. Percentage of Bids Equal or Greater Than Field Price Across Sessions

Sessions	Food	Percentage of Bids		Percent Greater Than First Set FP
		Equal	Greater	
First Set	Milk	38.35%	9.02%	
	Chicken	45.86%	11.28%	
	Cookies	35.34%	6.02%	
	Tortilla chips	37.59%	3.01%	
Second Set	Milk	21.43%	7.14%	59.52%
	Chicken	21.43%	7.14%	76.19%
	Cookies	19.05%	7.14%	
	Tortilla chips	19.05%	2.38%	

hypothesis appear in Table 3. The variances of the bids for the conventional versions conformed to expectations. Specifically, variances were significantly greater in the second set of sessions for products that had field price increases and not for those with constant prices. Turning to the mean bids for the conventional versions, it was found that these were also consistent with the hypothesis, with bids significantly higher for the two foods that had experienced price increases. Bids for milk increased approximately 3 percent, which, while significant, was noticeably less than the store price increase (18 percent). Bids for chicken increased 25 percent, which was closer to the actual store price increase (37.5 percent). The larger increase of bids for chicken than for milk may not only be due to the larger percentage price increase. According to the left-digit effect, a price change where the leftmost digit of the price remains the same is perceived to be less meaningful than even an equivalent price change where the leftmost digit changes (Monroe 1979, Thomas and Morwitz 2005). Since both the milk prices began with 2, the overall effect on subjects from the price change might have been somewhat minimized. Together these still provided statistical validation of what was seen in Figure 1, that the values obtained from bids were being confounded by prices in the field.[8]

Another consideration across the two sets of sessions was the differences in their demographic makeup. It was believed this could account for unexpected differences, such as the significant decrease in bids in the second set of sessions for tortilla chips despite the constant field price. It was also important to check that the expected findings above were not due to changed demographics. To test this, a tobit model was constructed using the demographics in Table 1 with the parameter estimates used to predict how subjects in the second set of sessions would have bid given the initial prices. The predicted mean bids, displayed in Table 3, were very similar to mean bids from the first set of sessions. This suggested that the decrease in the mean bid for tortilla chips was due to demographic differences and strengthened the other results.

Also included in Table 3 were the bid medians and the 25 percent and 75 percent quantiles. Examining these for the conventional versions further showed differences between bidding for the increasing and constant priced foods. Medians were significantly different only for chicken. The median and 75 percent quantiles for tortilla chips were very close between the sets of sessions, suggesting that the difference in the means was due more to the lower bids in the 25 percent quantile than to a different upper bid limit. This was even more evident for cookies, where the 75 percent quantile was identical across the sets.

Moving to the analysis of the two hypotheses dealing with the organic versions, the demand curves are first presented in Figure 2. Of the four products, the demand for chicken was the most

[8] Another possibility for higher bidding was higher seasonal demand. However, while there is some seasonality in milk sales, USDA (2009a) data over the past five years show sales in May and November to be similar, with the former tending to be slightly higher. For chicken, USDA (2009b) numbers show lower consumption in November as sales of turkey increase.

Table 3. Quantile, Mean, and Variance Comparisons of Bids between First and Second Sets of Sessions

	Milk			Chicken			Cookies			Tortilla Chips		
Quantile	Set 1	Set 2	H_0: Equal p-value	Set 1	Set 2	H_0: Equal p-value	Set 1	Set 2	H_0: Equal p-value	Set 1	Set 2	H_0: Equal p-value
CONVENTIONAL												
25%	1.99	2.00		3.00	4.00		2.50	2.25		2.50	2.00	
50% (median)	2.30	2.50	0.101	3.99	5.00	0.001	3.69	3.50	0.166	3.05	2.99	0.144
75%	2.35	2.77		3.99	5.49		3.99	3.99		3.29	3.21	
Mean	2.11	2.16	0.001[a]	3.54	4.41	0.001[a]	3.27	3.01	0.172[b]	2.82	2.61	0.042[b]
Predicted mean[c]		2.12			3.76			3.28			2.81	
Variance	0.19	0.74	0.001	0.62	2.17	0.002	0.85	1.20	0.335	0.42	0.64	0.293
ORGANIC												
25%	2.26	2.00		3.50	4.75		3.10	2.50		3.00	2.50	
50% (median)	2.49	2.77	0.013	4.00	5.49	0.001	3.99	3.60	0.025	3.32	3.29	0.198
75%	2.96	3.00		4.45	5.50		4.30	3.99		3.59	3.45	
Mean	2.55	2.34	0.177[a]	3.96	4.87	0.001[a]	3.78	3.11	0.004[a]	3.28	2.84	0.040[a]
Predicted mean		2.56			3.94			3.71			3.20	
Variance	0.52	1.19	0.013	0.83	2.72	0.017	1.01	2.30	0.008	0.65	1.70	0.018

[a] p-values are from Fligner-Policello tests.
[b] p-values are from Wilcoxon-Mann-Whitney tests.
[c] Estimation based on demographics of how Set 2 subjects would have bid given Set 1 prices.

Note: The p-values for the variance equality test are from Brown and Forsythe's test.

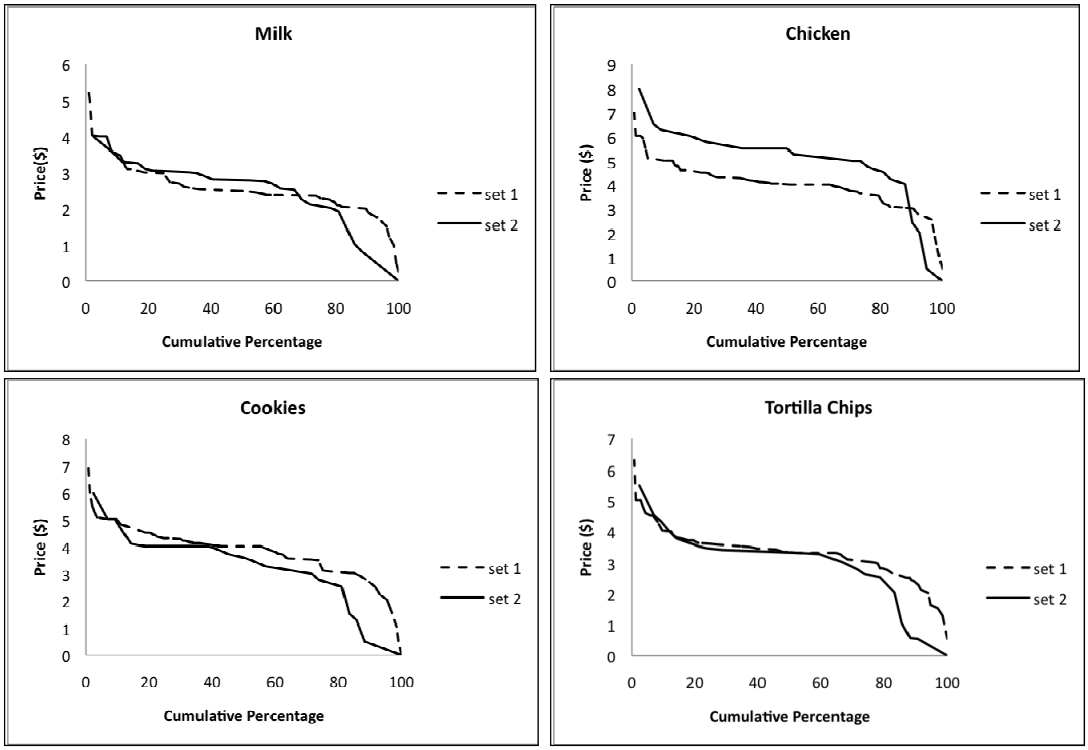

Figure 2. Demand Curves for the Organic Versions of the Products by Session Set

interesting. For almost the entire price range, the demand was higher in the second set of sessions where the corresponding field price for conventional was higher. This suggested that subjects used an anchoring technique, as considered in the conceptual model, from the conventional price to judge an appropriate bid price for the organic version. This fit well with the findings of Cherry et al. (2004) that rational bidders would consider prices of other options when formulating bids. It also conforms to the theory of Alfnes (2009) that bids for products with the same field alternatives should change equally when prices of those alternatives change. Similar changes in milk demand were not apparent, perhaps reflecting the smaller percentage increase in the conventional field price or, again, the left-digit effect.

Also noticeable from Figures 1 and 2 was a tendency for the demand curves to be lower in the second set of sessions over the lowest price ranges. Since these price levels were below field prices, it suggested that more subjects had lower actual valuations in the second set of sessions for some products. In other words, the potential field price censoring did not apply to these subjects' bids. This could be reflective of the differences in the demographic makeup of the two sets of sessions and the concerns that subjects in the latter sessions bid lower overall. At higher price levels, where censoring of bids would be expected, the demand curves were very similar between the two sets of sessions for the constant price foods.

The third hypothesis was examined more closely using results for the organic versions presented in Table 3. Findings here were mixed. On the positive side, for chicken the mean and variance were significantly higher in the second set of sessions, as hypothesized. For milk, while the means were not significantly different and the 75 percent quantile was almost the same, the median and variance in the second set of sessions were significantly higher. It thus appears that enough mid-value subjects bid higher when the conventional field price was higher. More on the negative side, the tendency for lower bids in general in the second set of sessions, noted with the demand

curves, was further seen with the rest of the organic bid comparisons. However, looking again at the predicted means for the second sessions it should be noted that, while still lower, these were much closer to those from the first sessions. It is thus believed that the heterogeneity between the subject pools was responsible, and further examination of this hypothesis may be worthwhile.

Table 4 provides evidence of how known field prices may influence expected field prices for substitute versions, testing the fourth hypothesis. These results from the survey data were as hypothesized, with expected organic milk prices up 6 percent and expected chicken prices up 36 percent in the second set of sessions, both significant at the 5 percent level. Interestingly, the increase in expected organic chicken price was very close to the 37.5 percent increase in the conventional price. While there were no significant differences in the other two expected organic prices at the 5 percent level, both showed unexpected decreases, with those for cookies being significant at the 10 percent level. Since these should not be influenced by subject values, it would be hard to consider demographic differences the cause. More examination here may also be warranted.

The remaining concern was to examine Hypothesis 5 and see what effect field prices may have on an analysis based on percentage premiums. These results are reported in Table 5. As is apparent, none of the percentage premiums for the organic versions were significantly different between the two sets of sessions for any food. This evidence conformed to Alfnes (2009), and demonstrated that the full bidding approach could still be considered as long as differences are the focus rather than bid levels. Using percentage premiums to analyze bid data could at least partially offset the confounding aspects of price changes in the field. This approach would thus be recommended over examining bid levels as long as the experimental design allows it.

Conclusion

Auction experiments are often used to gauge consumers' WTP for various products. One of their main advantages is their non-hypothetical nature. By this it is meant that subject bids have real consequences in that high bidders will actually purchase the product of interest for real money. The focus of this research, however, was to examine if this aspect could lead to difficulties in terms of gaining subjects' WTP. The concern was that the existence of a product meant that it, or a close substitute, was available in the marketplace at a price subjects may know. Under consumer theory, the knowledge, or even approximation, of this field price would confound bidding in auction experiments to the detriment of gaining consumer WTP.

Results showed that subject bids in auctions for products that have market substitutes were confounded by the pricing situation in the field. This was especially apparent when subjects were provided with field prices, but was also evident when they were bidding based on their own price expectations. This finding is both good news and bad news for researchers. On the positive side, it demonstrates that subjects in experiments follow the expectations of standard consumer theory. If anything else were the case, there would be concern over the appropriateness of the method overall. From a negative viewpoint, however, it showed that it is not possible to derive the field demand curve for a product within the laboratory. These concerns show that researchers must be careful about the way they collect, examine, and interpret data in auction experiments. While debate will continue between the full bidding and endowment approach, it is clear that analyzing the former with bids at their level is inappropriate.

More positively for auctions, and the full bidding approach, was that examining the percent price premium subjects were willing to pay appeared to be a promising alternative even across times of field price changes. For the food products studied here, the percentage premiums were invariant to changing field prices. In this sense, results back Umberger and Feuz's (2004) assertion that auctions are strongest at determining relative consumer values. They also suggest that Alfnes (2009) was correct in his support of the full bidding approach when differences are analyzed. These findings should be important to consider in the design and analysis of similar auction experiments where consumer values are of concern.

In general, the use of auctions in food studies remains new enough that further consideration of both its strengths and weaknesses is necessary. These findings show there are potential weaknesses to the auction experiment approach to determining consumer WTP. In this regard, the

Table 4. Comparison of Organic Price Expectations between Sets of Sessions

Food	Mean of Session		H_0: Equal p-value [a]
	First	Second	
Milk (2%)	3.220	3.417	0.0134
Chicken breasts	4.517	6.142	0.0001
Chocolate chip cookies	4.079	3.847	0.0600
Tortilla chips	3.604	3.440	0.1300

[a] p-values are from Wilcoxon-Mann-Whitney tests.

Table 5. Comparison of Percent Premiums Organic over Conventional

Food	Mean of Session		H_0: Equal p-value [a]
	First	Second	
Milk (2%)	21.52%	17.42%	0.2147 [b]
Chicken breasts	14.80%	20.46%	0.3197 [a]
Chocolate chip cookies	19.25%	11.98%	0.1081 [a]
Tortilla chips	17.79%	16.22%	0.2996 [a]

[a] p-values are from Fligner-Policello tests.
[b] p-values are from Wilcoxon-Mann-Whitney tests.

technique is no different from methods that may be prone to hypothetical bias or other problems. For the case of field prices, more research may be needed to fully understand the issue or to devise methods to limit its effect. As a final note, it should be mentioned that many auctions are conducted in the field. These experiments, described in Harrison and List (2004), leave the control of the laboratory for the potential benefits of running an auction in a market setting where the field is not just a confounding element but an aspect of the design. The results here though demonstrate that the field is always in the lab and should not be ignored.

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