Allowing Options in Experimental Auctions

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October 2003

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Abstract

Experimental auctions have become a popular method to examine economic issues, but the large costs associated with conducting experiments are problematic. A method that increased the number of usable responses from economic experiments without increasing costs would increase the reliability of results. We report on a new method that has the potential to increase the number of usable responses from experimental auctions: having consumers place one bid on multiple products and allowing the winning bidder(s) to choose the product they most prefer to purchase. We find evidence that this method increases the number of usable responses and produces reliable bids when the products are substitutes. This "options in auctions" method does not appear to work when the products being sold are complements.

Key words: Experimental economics, laboratory auctions

JEL Code: C91

Experimental auctions have become a popular method to examine problems in many economic fields. Experimental auctions have been used to determine consumer preferences for food products of different quality (e.g., Lusk et al., 2001b); gain insight into how information affects consumer demand for risky products (e.g., see Rousu et al. [2004b] and Fox et al. [2002]); and determine the causes of the willingness to pay/willingness to accept disparity (for a review of this issue, see Horowitz and McConnell, 2002). Although experiments can elicit important information from consumers, the large fixed costs of researchers' time, in addition to costs that are incurred to recruit and pay participants, rent facilities, and purchase materials, can make experimental auctions quite expensive.

Many experimental auctions attempt to gain information on consumer preferences by selling an item that varies by one or two attributes.[1] A problem can arise in experiments if an auction participant does not value (has zero demand for) a particular commodity that is being auctioned and thus places a bid of zero for the commodity. The auction participant must first have a positive demand for the product before researchers can determine how changing one attribute of a product affects a consumer's demand.[2] This problem forces researchers to either

[1]A noncomprehensive list of papers that report results from experiments that sell items that vary by 1 or 2 attributes include Fox et al. (1994), Fox et al. (1995), Fox (1995), Fox, Hayes, and Shogren (2002), Buhr et al. (1993), Shogren et al. (1994, 2000), Lusk et al. (2001a, 2001b), Hayes et al. (1995), Dickinson and Bailey (2002), Hoffman et al. (1993), VanWechel et al. (2002), Huffman et al. (2003), Rousu et al. (2004a, 2004b), and Noussair et al. (2002a,b).

[2]Whether a zero bid causes a problem depends on the research question being examined. If one wants to determine the demand for a new product, then zero bids are expected and one should only be worried about "protest bids," where a participant bids zero because there is something about the auction that he/she dislikes. However, many experiments are looking at an attribute, like genetic modification, irradiation, or tenderness. To test the willingness to pay for the specific attribute, one must first have positive bids. Suppose one wants to examine the demand for genetic modification in food products. Estimates indicate that two-thirds of the products on grocers' shelves are genetically modified, which means that virtually all consumers will have positive demand for many products that could be genetically modified. If one sold only potatoes in an experiment and 25% of participants did not like potatoes and bid zero, those people are providing no information on their taste for genetic modification, they just do not demand potatoes, which is information that is not relevant to the research question at hand.

expend more resources to increase the sample size to get a desired number of positive responses or settle for a smaller sample of usable responses. As stated in Lusk et al. (2001b), "Facilitating large sample sizes for a given research budget … has long been a concern in experimental economics." To waste resources because a person does not demand a product is problematic. Sometimes, zero demand for a product can even confound results.[3]

One way to circumvent the problem of zero bids is to have auction participants place separate bids on several different products (e.g., see Noussair et al. [2002b], Rousu et al. [2004a], VanWechel et al. [2002]). This method can be quite effective in reducing the number of participants who provide useless information. For example, in Huffman et al. (2003), auctioning multiple products helped maximize the number of positive bids. In that study, two versions (GM labeled and plain labeled) of vegetable oil, tortilla chips, and potatoes were sold. For each product, between 8 and 17% of participants bid zero for each of the two versions of a product; these participants provided no information on preferences for genetic modification for that specific product. But only 4% of participants placed a zero bid for every product, a much smaller percentage provided useless information when three products were used.

There is a problem with offering multiple goods, however. One needs to be careful that the products are neither complements nor substitutes. For example, in Noussair et al. (2002b) and VanWechel et al. (2002), a participant had a chance of winning multiple products that were substitutes (four types of biscuits in Noussair et al., three snack foods in VanWechel et al.). In this situation, it is conceivable that an auction participant could have bid less for the second

[3]For example, if an experiment endows participants with one unit of an inferior good (e.g., a genetically modified [GM] food product) and asks them to "upgrade" to a more preferred good (e.g., the same food product, but non-GM) and consumers have zero demand for the food product, they should bid zero. Thus, a zero bid will not necessarily reflect zero demand for the changing attribute, just zero demand for that product in general. The problem of confounded bids can be alleviated, however, if a consumption requirement is put in place, where the researcher forces the participant to consume the product at the end of the experiment (e.g., see Hayes et al. [1995] or Fox, Hayes, and Shogren [2002]). Unfortunately, forcing immediate consumption of products is not always feasible, (e.g., see Rousu et al. [2004] where vegetable oil was sold).

product, if he/she thought there was a reasonable probability that he/she would win the first product bid on. Researchers cannot know if a change in bid prices was due to a change in the product's attributes or from a participant bidding on close substitutes, thus confounding results.[4] Until now, it appeared that offering multiple products was the only way around the zero bid problem.

In this paper, we explore another way in which researchers can sidestep the problem of participants placing zero bids in experimental auctions. We test a new auction method which has each auction participant place one bid for multiple products and allows the participant to choose the one product he or she most prefers. By allowing consumers the option to choose a preferred good, there is no possibility that a consumer will change his or her bid because of the possibility of purchasing multiple products. In addition, since consumers are choosing from multiple products, the number of zero bids might decrease by using this method. Using data from experimental auctions with 122 participants, we examine the viability of allowing consumers' options in auctions by testing the following (null) hypotheses: H1) Allowing multiple options in auctions will not decrease the number of participants who bid zero. H2) When two items are substitutes, having a consumer place one bid for multiple items and allowing them to choose their preferred product (henceforth allowing options in auctions) will yield bids equal to a consumer's bid for her most preferred item of the pair. H3) When two items are not substitutes, allowing options in auctions will yield bids equal to a consumer's bid for his/her most preferred item of the pair.

Experimental Design

We designed an experiment to determine whether experimental auctions can obtain reliable information from auction participants when allowing options in auctions. These auctions

[4]Offering products that are complements could cause the same problems.

were conducted in February 2003 using undergraduate students at a large midwestern university.[5] The students were given the option to participate in the experiment during their scheduled class time. Approximately 50% of the students we solicited agreed to participate. We conducted eight experimental auction sessions that each contained 13 to 19 participants, yielding a total of 122 participants.

Participants bid on four items in various rounds, specifically, a 12-ounce can of Coca-Cola, a 12-ounce can of Diet Coke (both cans of soda were cold), a 13-ounce bag of M&M's candies, and a 12.32-ounce bag of Kit-Kats candies. In most locations, the cans of soda and the bags of candy sell individually for approximately $0.60 and $2.50, respectively. The different store prices for these products allowed us to test if allowing options in experimental auctions only works for products in a certain price range.

Because our participants were college students, they may have known other students in the class. To minimize the probability that a participant would bid low in an attempt to free-ride off a friend in the class who she thought might win a particular product and share it with her, we chose to use the second price auction which only allows one person to "win" in each group (this is not usually the case with other demand-revealing auctions like the Becker, DeGroot, and Marshack [BDM] mechanism or the random nth-price auction). The second price auction works as follows. Each participant places a sealed bid for a product. The auction monitor collects all the bids and determines the highest and the second highest bid. The person who places the highest bid wins the auction and purchases the product for the second highest bid price. No one

[5] Note that to avoid the possibility of participants trying to behave a certain way in the experiment to please the instructor, the experiments were not conduct by the instructors of the courses.

else purchases the product. Each participant has a weakly dominant strategy to bid his/her true value for a product in the second price auction (Vickrey, 1961).[6]

All participants bid on the food products in three sessions of multiple rounds, with a total of nine rounds of bidding. To eliminate the potential of a participant's bid moving down his or her demand curve (List and Lucking-Reiley, 2000), participants were informed that only one of the nine rounds would be binding (or valid). We also randomized the order that participants bid on products (for evidence on why this is important, see Huffman et al. [2003]). In Session A, participants bid on one unit of each of the four products. Session B contained two different rounds, and participants bid on a pair of products; in one round they bid on both bags of candy, and in the other round they bid on both cans of soda.[7] Session C contained three different rounds in which participants bid for the option to pick one of two products; more specifically, participants were shown two products and were asked to place their bid, knowing that if they won, they would get to choose only one of the two products. To ensure that participants fully understood how these rounds worked, they were provided both oral and written instructions.

The experiment included six steps. In Step 1, each participant completed a consent form and was assigned an I.D. number to maintain anonymity. In Step 2, participants were given written and oral instructions on the second price auction. After the instructions were given, the participants completed a short quiz on the specific details of the auction mechanism and were the participants were explicitly told that it was in their best interest to bid their true value for a product.

[6]For information on how the random nth-price auction and the BDM mechanism work, we refer the interested reader to Shogren et al. (2001) and Becker, DeGroot, and Marshack (1964).

[7]The results from these rounds are not reported in this paper; they are being analyzed to determine the effects of bidding on products that are complements and substitutes.

In Step 3, participants bid on the products in Session A. They were shown the four products being sold in the auction, the cans of Coca-Cola and Diet Coke and the bags of Kit-Kats and M&M's, and each participant placed a separate bid on each item. Participants were informed that only one round of the experiment would be binding (valid) to help avoid bid reduction from moving down one's demand curve. To prevent correlation of bids across participants that can be caused with market price feedback (e.g. see List and Shogren), we did not post bid prices until the end of the experiment. Because recent evidence has shown that an endowment effect exists that can distort participant bids when they are initially endowed with a product (Lusk and Shroeder, 2002; Corrigan and Rousu, 2003), we chose not to endow our participants with one unit of the product, then have them bid to "upgrade" to a different product as many studies do (e.g., Hayes et al. [1995] and Lusk et al. [2001]).

In Step 4, participants bid in the two rounds of Session B. In one round, participants bid on both the can of Coca-Cola and the can of Diet Coke. In the other round, participants bid on both the bag of Kit-Kats and the bag of M&M's. Participants were reminded before this session of bidding that only one round in the experiment would be binding (valid).

In Step 5, participants bid in the three rounds of Session C. In each of these rounds, participants were presented two products and bid for the right to choose one of the two products. If the participant won the auction, she indicated which of the two products she wanted and paid for that item. In one of these three rounds, the participants were bidding for the option to choose either a can of Coke or a can of Diet Coke. In another round, participants were bidding for their choice of either the bag of Kit-Kats or the bag of M&M's, and in the remaining round, participants bid on the can of Coca-Cola and the bag of M&M's. We chose these product combinations because two of the three rounds contained close substitutes (the two bags of candy

and the two cans of soda). The other round contained the bag of M&M's and the can of Coca-Cola; since candy and soda are often consumed together, these products are considered complements. This will allow us to examine whether allowing options in auctions is a feasible method for researchers to use.

In Step 6, the binding round and the first and second prices were determined. Before the experiment concluded, all participants filled out a short post-auction questionnaire and the highest bidder purchased the product(s) for the second highest bid price.

Results

We first discuss the unconditional summary statistics, and then we examine the conditional results based on regression analysis. To determine whether allowing consumers to bid for the option to purchase one of two products can be used effectively, we first wanted to find out whether this method will decrease the number of people who place bids of zero. Table 1 shows the percentage of people who placed zero bids. For the cans of Coca-Cola and Diet Coke, 20% and 43% of participants placed bids of zero on these products, respectively. When participants were given the option to purchase either of the two products, 24% bid zero. This is considerably lower than the 43% of participants who bid zero for the Diet Coke but slightly higher than the percentage of participants who bid zero for the Coca-Cola.

Part B of Table 1 shows the percentage of zero bids for the bags of candy. When bid on individually, 20% or more of the participants bid zero for the bags of Kit-Kats or M&M's. When given the option to purchase one of the two, the percentage of participants who bid zero fell to 15%. For the can of Coca-Cola and the bags of M&M's, a similar trend emerges, where the percentage of zero bids declined when consumers were given the option to purchase items. The preponderance of the evidence suggests that we can *reject Hypothesis 1*; that is, fewer

participants will place bids of zero when allowed to bid for the option to choose one product. However, relative to the round of bidding to purchase either can of soda, there were almost double the number of zero bids for the can of Diet Coke but slightly fewer zero bids for the can of Coca-Cola, so the support of this hypothesis is only marginal for the cans of soda. This suggests that for low-priced products, if the researcher has prior knowledge on products that the group prefers, the options in auctions method will be less useful. When the products are more expensive (in this experiment when a bag of candy is included), the number of zero bids falls when participants are presented with multiple options. Although we found that allowing multiple options in experimental auctions can decrease the number of zero bids, this finding is not sufficient to claim that using options in experimental auctions can be employed effectively. One also needs to know how the bids for the option to purchase one of two products relate to bids placed on each individual product.

When using a demand-revealing auction mechanism like the second price auction, in the absence of participant confusion, the bid for the option to purchase one of two products should be equal to the participant's bid for her most preferred item, as shown in Eq. (1):

$$\max[bid\_product\_a, bid\_product\_b] = option\_bid[a,b] \quad (1)$$

When faced with the option to purchase one of two products, a participant should not bid less than her value for the most preferred item, because she might forego a profitable purchase; nor should she bid more than her value for the most preferred item, because she could pay more than her value for the item.

We first examine the percentage of participants whose bids satisfied Eq. (1). As shown in Table 2, a higher percentage of participants placed a bid for the option to choose their favorite good that was equal to the maximum of their two individual bids when the products were

substitutes (the two cans of soda and the two bags of candy) compared to the percentage who did so when the products were not substitutes (the can of Coca-Cola and the bag of M&M's). The second column examines the percentage of bids that were within $0.10 of satisfying Eq. (1), and the same trend appears—more people bid within 10 cents when the two products were close substitutes.

Table 3 shows the mean bids for the products sold in the auction. Part A looks at the bids for the can of Coca-Cola and Diet Coke. The bid for the option to purchase either the can of Coca-Cola or the can of Diet Coke is $0.04 less than the mean maximum bid for Coca-Cola and Diet Coke. Part B of Table 3 contains information on the bids for the bags of candy. The mean maximum bid for the two bags of candy is only $0.02 cents different than the mean bid for the option to purchase one of the two products. The last two rows contain information on the bids for the can of Coca-Cola and the bag of M&M's. The mean maximum bid for the Coca-Cola or bag of M&M's was $0.41 higher than the mean bid for the option to purchase either product.

Table 4 shows the difference in bids between the maximum bids for various products and the bid for the option to purchase one of two products. This information allows us to test Eq. (1). The median difference between the maximum bid for a product and the bid for the option to purchase one of two products is small. For the two cans of soda and for the two bags of candy, the median difference is zero. For the Coca-Cola and the bag of Kit-Kats, the difference is a nickel. The second column shows the mean difference in bids between the option round and the maximum bids for the corresponding products. For the cans of soda and the bags of candy, this difference is relatively small ($0.04 and $0.02) and not statistically significant at the 10% level. Thus, we *do not reject Hypothesis 2*, when products are substitutes, allowing consumers options in auctions provides mean bids that are reasonable. This is true for both the cans of soda (lower-

priced goods) and the bags of candy (higher-priced goods). However, consumer bids for the option to purchase a can of Coca-Cola or a bag of Kit-Kats are quite different from the maximum bid placed on either of the two products, $0.41. This difference is statistically significant at the 1% level using both a parametric t-test and a nonparametric Wilcoxon signed rank test. Thus, we *reject Hypothesis 3*, allowing options in auctions does not provide reasonable bids when the products are not substitutes.

We now consider the conditional results based on regression analysis. The dependent variable in these regressions is the difference in bid prices for the option of purchasing one of the two products and the maximum bid price for the two products when the bids were submitted individually. We derive this price difference by subtracting one inverse demand equation for a commodity from the other over the two products. The inverse demand equations for the each specification are as follows:

(2) $$P_j^{OptionBid} = \beta_1^{OptionBid} + \beta_2^{OptionBid} X_{j2} + \mu_j^{OptionBid}$$

and

(3) $$P_j^{Maxbid} = \beta_1^{Maxbid} + \beta_2^{Maxbid} X_{j2} + \mu_j^{Maxbid}.$$

Differencing equations (2) and (3) we can derive the following equation:

(4) $$P_j^{Maxbid} - P_j^{OptionBid} = \beta_1^{Maxbid} - \beta_1^{OptionBid} + \left(\beta_2^{Maxbid} - \beta_2^{OptionBid}\right)X_{j2} + \mu_j^{Maxbid} - \mu_j^{OptionBid}$$

The coefficients and error terms can be condensed and rewritten as:

(4a) $$P_j^{Maxbid} - P_j^{OptionBid} = \beta_1^* + \beta_2^* X_{j2} + \mu_j^*.$$

The difference in bid prices is explained by an intercept term β_1^*, a slope term β_2^* that is multiplied by a vector of exogenous characteristics X_{j2}, and a random error term μ_j^*. Differencing the data before model estimation allows us to remove any linear time-invariant

individual-specific unobserved effect, and this method leads to unbiased and consistent estimates of the impact of allowing options in experimental auctions (Wooldridge, pp. 299-314).[10]

The results of the regressions are presented in tables 5, 6 and 7. Overall, demographic variables do not seem to have a statistically significant influence on whether allowing options in auctions can be an effective method. The most important thing to note is that the intercept coefficients for the bids for the two cans of soda and the two bags of candy (tables 5 and 6) are not statistically significant, providing more evidence that the allowing options is a method that could work when the products are close substitutes. However, in table 7, the coefficient on the intercept is statistically significant at the 1% level for 2 of the 4 specifications, confirming the result that allowing options in auctions does not seem to work when the products are not substitutes.

This raises the question of why allowing options in auctions appears to work only when the products are substitutes. Participants who behaved as if they fully understood the process when the products were substitutes behaved as if they did not understand the process when the products were complements. One potential explanation for this is that participants are better able to determine the values for products when the products can be easily sorted into groups (i.e., the two cans of soda or the two bags of candy). When the products are not related, like the can of soda and the bag of candy, the same participants were not able to give logical bids; that is, participant bids did not satisfy Eq. (1). This explanation is consistent with the findings of Heiner (1984), who shows that consumers use mechanisms to simplify complex choices into less complex ones. Our results indicate that this was easier for consumers when the products were close substitutes but more difficult when the products were not substitutes.

Given the exploding popularity of experimental auctions and the large costs associated with conducting them, allowing consumers to bid on multiple options seems to be an approach that could work in certain situations. This could be an effective method when selling products that have close substitutes. A look at some recent experimental auction papers gives many examples of how this method could be used. Some potential product categories are types of biscuits (Noussair et al., 2002b), types of steaks (Lusk et al., 2001b), and types of vegetable oil (e.g., canola, soybean [Rousu et al., 2004a]). For example, in Rousu et al. (2004a), where preferences for GM foods were examined, consumers could have placed a bid in one round for the option to purchase either plain-labeled canola oil or plain-labeled vegetable oil, and in the other round they could have bid for the option to purchase either GM-labeled canola oil or GM-labeled vegetable oil.

Discussion and Conclusion

Given the sizeable costs to conduct experimental auctions, increasing the number of usable responses is an important goal. In this paper, we report the results of an experiment that tests a new method to increase the number of usable responses in experimental auctions. Having consumers place one bid on multiple products for the option to choose the one product they most prefer could increase the number of usable responses in experimental auctions. Allowing consumers the opportunity to bid for the option to choose the good they most prefer was more effective at reducing the number of zero bids when the products for sale in the auction were more expensive. In addition, we found that when the products in an auction were substitutes or could be easily sorted by participants into a generic group (e.g., cans of soda), consumers' bids for the option to choose one of two products were similar to the maximum of their bids for the individual products. This result is robust to the price range of the products. However, allowing

options in auctions does not appear to work efficiently when the products are not substitutes or cannot be easily sorted by consumers into a generic group.

Future research that determines how substitutable products must be for the options in auctions method to work would be quite useful. For example, could cookies and muffins (both snack foods) be sold together and provide reasonable bids? Research that examines how allowing options in auctions works for products in a wider price range will help contribute to an understanding of when this method can be employed effectively. Replicating this study with different auction mechanisms (e.g. the random nth price auction) would also be a useful extension. Given the surge of experimental auctions to examine issues in agricultural economics, ensuring nonconfounded results and a method that allows for more usable observations is important. This paper contributes to the literature by showing that allowing consumers to bid on multiple products with the option to choose their preferred good is a method that can increase the number of useable responses in experimental auctions.

REFERENCES

Becker, Gordon, M., Morris H. DeGroot, and Jacob Marschak. "Measuring Utility by a Single Response Sequential Method." *Behavioral Science* 9 (July 1964): 226-236.

Buhr, Brian L., Hayes, Dermot J., Shogren, Jason F., and Kliebenstein, James B. "Valuing Ambiguity: The Case of Genetically Engineered Growth Enhancers." *Journal of Agricultural and Resource Economics*, December 1993, *18* (2), pp. 175-184.

Corrigan, Jay R. and Rousu, Matthew. "The Endowment Effect in the Absence of Loss Aversion." RTI working paper, 2003.

Dickinson, David L. and Bailey, DeeVon. "Meat Traceability: Are U.S. Consumers Willing to Pay for It?" *Journal of Agricultural and Resource Economics*, December 2002, *27*, pp. 348-364.

Fox, John A., Hayes, Dermot J., Kliebenstein, James, and Shogren, Jason F. "Consumer Acceptability of Milk from Cows Treated with Bovine Somatotropin." *Journal of Dairy Science*, 1994, *77* (3), pp. 703-707.

Fox, John A., Buhr, Brian L., Shogren, Jason F., Kliebenstein, James, and Hayes, Dermot J. "A Comparison of Preferences for Pork Sandwiches Produced from Animals With and Without Somatotropin Administration." *Journal of Animal Science*, 1995, *73*, pp. 1048-1054.

Fox, John A. "Determinants of Consumer Acceptability of Bovine Somatotropin." *Review of Agricultural Economics*, January 1995, *17*, pp. 51-62.

Fox, John A., Hayes, Dermot J., and Shogren, Jason F. "Consumer Preferences for Food Irradiation: How Favorable and Unfavorable Descriptions Affect Preferences for Irradiated Pork in Experimental Auctions." *Journal of Risk and Uncertainty*, January 2002, *24*, pp. 75-95.

Hayes, Dermot J., Shogren, Jason F., Shin, Seung Youll, and Kliebenstein, James B. "Valuing Food Safety in Experimental Auction Markets." *American Journal of Agricultural Economics,* February 1995, *77,* pp. 40-53.

Heiner, Ronald A. "The Origin of Predictable Behavior." *The American Economic Review*, September 1983, 73, pp. 560-595.

Hoffman, Elizabeth, Menkhous, Dale J., Chakravarti, Dipankar, Field, Ray A., and Whipple, Glen D. "Using Laboratory Experimental Auctions in Marketing Research: A Case Study of New Packaging for Fresh Beef." *Marketing Science*, Summer 1993, *12*, pp. 318-338.

Horowitz, John K. and Kenneth E. McConnell. "A Review of WTA/WTP Studies." *Journal of Environmental Economics and Management*, November 2002, 44, pp. 426-447.

Huffman, Wallace E., Shogren, Jason F., Rousu, Matthew, and Tegene, Abebayehu. "Consumer Willingness to Pay for Genetically Modified Food Labels in a Market with Diverse Information: Evidence from Experimental Auctions." *Journal of Agricultural and Resource Economics*, Forthcoming December 2003.

List, John A. and Lucking-Reiley, David. "Demand Reduction in Multiunit Auctions: Evidence from a Sportscard Field Experiment." *American Economic Review*, September 2000, *90*, pp. 961-72.

Lusk, J.L. and Schroeder, T.C. "An Alternative Test for the Endowment Effect." Working Paper, Mississippi State University, Department of Agricultural Economics, May 2002.

Lusk, Jayson L., Daniel, M. Scott, Mark, Darrell, and Lusk, Christine L. "Alternative Calibration and Auction Institutions for Predicting Consumer Willingness to Pay of Nongenetically Modified Corn Chips." *Journal of Agricultural and Resource Economics*, July 2001a, *26*, pp. 40-57.

Lusk, Jayson L., Fox, John A., Schroeder, Ted C., Mintert, James, and Koohmaraie, Mohammad. "In Store Valuation of Steak Tenderness." *American Journal of Agricultural Economics*, August 2001b, *83*, pp. 539-550.

Noussair, Charles, Robin, Stephane, and Ruffieux, Bernard. "Do Consumers Not Care about Biotech Foods or Do They Just Not Read the Labels?" *Economics Letters*, 2002a, *75*, pp. 47-53.

Noussair, Charles, Robin, Stephane, and Ruffieux, Bernard. "Consumer Behaviour with Regard to Genetically Modified Organisms in the Food Supply?" Working paper, April 6, 2002b.

Rousu, Matthew, Huffman, Wallace E., Shogren, Jason F., and Tegene, Abebayehu. "Are United States Consumers Tolerant of Genetically Modified foods?" *Review of Agricultural Economics*, Forthcoming, *2004a*.

Rousu, Matthew, Huffman, Wallace E., Shogren, Jason F., and Tegene, Abebayehu. "Estimating the Value of Conflicting Information: The Case of Genetically Modified Foods." *Land Economics*, Forthcoming, *February 2004b*.

Shogren, Jason F., Margolis, M., Koo, C., and List, John A. "A Random *n*th-Price Auction." *Journal of Economic Behavior and Organization*, December 2001, *46*, pp. 409-421.

Shogren, Jason F., Shin, Seung Y., Hayes, Dermot J., and Kliebenstein, James B. "Resolving Differences in Willingness to Pay and Willingness to Accept." *The American Economic Review*, March 1994, *84*, (1), pp. 255-270.

Shogren, Jason F., List, John A., and Hayes, Dermot J. "Preference Learning in Consecutive Experimental Auctions." *American Journal of Agricultural Economics*, November 2000, *83*, pp. 1016-1021.

Shogren, Jason F., Shin, Seung Y., Hayes, Dermot J., and Kliebenstein, James B. "Resolving Differences in Willingness to Pay and Willingness to Accept." *The American Economic Review*, March 1994, *84*, (1), pp. 255-270.

Tversky, Amos and Daniel Kahneman. "Loss Aversion in Riskless Choice: A Reference-Dependent Model," *Quarterly Journal of Economics*, 1991, *106*, pp. 1039-61.

VanWechel, Tamara, Wachenheim, Cheryl J., Shuck, Eric, and Lambert, David. "Consumer Valuation of Genetically Modified Foods and the Effect of Information Bias." North Dakota State University Agribusiness and Applied Economics Report No. 513. May 2003.

Vickrey, William. "Counterspeculation, Auctions, and Competitive Sealed Tenders." *Journal of Finance*, March 1961, *16*, pp. 8-37

Wooldridge, J. M. Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: MIT Press, 2002.

Table 1. Percentage of zero bids using alternative methods (N = 122)

Products	Percentage of Zero Bids
Part A. Percentage of zero bids for cans of Coca-Cola and Diet Coke	
Coca-Cola	20%
Diet Coke	43%***
Bid for the option to purchase Coca-Cola or Diet Coke	24%
Part B. Percentage of zero bids for bags of Kit-Kats and M&M's	
Kit-Kats	21%***
M&M's	20%**
Bid for the option to purchase Kit-Kats or M&M's	15%
Part C. Percentage of zero bids for cans of Coca-Cola and bags of M&M's	
Coca-Cola	20%
M&M's	20%
Bid for the option to purchase Coca-Cola or M&M's	17%

*** The difference between this percentage and the percentage of zero bids with multiple options is statistically significant at the 1% level.

** The difference between this percentage and the percentage of zero bids with multiple options is statistically significant at the 5% level.

Table 2. Percentage of participants whose option bid equaled their bid for the item they most preferred (N = 122)

Product Combination	Percentage of Participants Whose Maximum Bid = Bid for Either Product	Percentage of Participants Whose Maximum Bid is Within 10 Cents of Bid for Either Product
Coca-Cola and Diet Coke	62.3%	72.1%
Kit-Kats and M&M's	52.3%	61.5%
Coca-Cola and M&M's	36.1%	45.1%

Table 3. Mean and median bids (N = 122)

Product(s)	Mean	Median	Standard Deviation
Part A. Bids for cans of Coca-Cola and Diet Coke			
Coca-Cola bid	0.52	0.50	0.61
Diet Coke bid	0.27	0.06	0.37
Maximum bid for Coca-Cola or Diet Coke	0.55	0.50	0.62
Bid for the option to purchase Coca-Cola or Diet Coke	0.51	0.50	0.66
Part B. Bids for bags of Kit-Kats and M&M's			
Kit-Kats bid	1.41	1.00	1.95
M&M's bid	1.29	1.00	1.56
Maximum bid for Kit-Kats or M&M's	1.49	1.00	1.95
Bid for the option to purchase Kit-Kats or M&M's	1.51	1.00	2.39
Part C. Bids for cans of Coca-Cola and bags of M&M's			
Coca-Cola bid	0.52	0.50	0.61
M&M's bid	1.29	1.00	1.56
Maximum bid for Coca-Cola or M&M's	1.33	1.00	1.54
Bid for the option to purchase Coca-Cola or M&M's	0.92	0.50	1.51

Table 4. Does allowing options provide efficient bids?

	Median Deviation	Mean Deviation
Bid premium for options—Coca-Cola and Diet Coke	0.00	–0.04
(Std. Deviation)		(0.30)
Bid premium for options—M&M's and Kit-Kats	0.00	0.02
(Std. Deviation)		(1.13)
Bid Premiums for Options—M&M's and Coca-Cola	–0.05	–0.41***
(Std. Deviation)		(1.23)

*** Statistically significant at the 1% level (using both T-test and Wilcoxon signed rank test)

Table 5. Regression model explaining the difference in bids for the two cans of soda when allowed options relative to when bidding on products individually (N=122)

Dependent variable: Bid for option of purchasing either soda – maximum bid for either soda

	(1)	(2)	(3)	(4)
Intercept	-0.02	-0.04	0.20	0.20
	(0.04)	(0.04)	(0.14)	(0.14)
Gender	-0.07			-0.04
	(0.06)			(0.06)
Monthly Disposable Income (in 100's)		0.00		-0.00
		(0.02)		(0.02)
GPA			-0.08 *	-0.07
			(0.05)	(0.05)

*** Statistically significant at the 1% level

* Statistically significant at the 10% level

Table 6. Regression model explaining the difference in bids for the two bags of candy when allowed options relative to when bidding on products individually (N=122)

Dependent variable: Bid for option of purchasing either candy – maximum bid for either candy

	(1)	(2)	(3)	(4)
Intercept	-0.05	-0.08	0.45	0.33
	(0.14)	(0.16)	(0.52)	(0.55)
Gender	-0.09			-0.04
	(0.22)			(0.22)
Monthly Disposable Income (in 100's)		0.05		0.04
		(0.07)		(0.07)
GPA			-0.15	-0.12
			(0.17)	(0.18)

*** Statistically significant at the 1% level

* Statistically significant at the 10% level

Table 7. Regression model explaining the difference in bids for bag of candy and can of soda when allowed options relative to when bidding on products individually (N=122)

Dependent variable: Bid for option of purchasing either candy – maximum bid for either candy

	(1)	(2)	(3)	(4)
Intercept	-0.48 ***	-0.47 ***	-0.61	-0.67
	(0.15)	(0.17)	(0.57)	(0.60)
Gender	-0.19			0.18
	(0.24)			(0.24)
Monthly Disposable Income (in 100's)		0.04		0.04
		(0.07)		(0.07)
GPA			-0.07	0.04
			(0.19)	(0.19)

*** Statistically significant at the 1% level

* Statistically significant at the 10% level