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Allowing options in experimental auctions

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Experimental auctions are a popular method to examine economic issues. However, given a fixed budget, a concern among experimental economists is maximizing the number of usable bids. A new experimental auction method has the potential to increase the number of usable responses. The options in auctions method allows the winning participant(s) to choose the product they most prefer to purchase from multiple products in the auction. The results of the experimental auction show that allowing options in auctions can increase the number of usable bids, especially when products are substitutes.

I. Introduction

Although experimental auctions are a popular method to examine economic issues; researchers are continually looking for ways to increase the number of usable bids, particularly on a fixed budget. Lusk *et al*. (2001) noted that 'facilitating large sample sizes for a given research budget... has long been a concern in experimental economics'. This problem is exacerbated when participants have no value for a particular product. For example, Shogren *et al*. (1994) used pork sandwiches in a series of auctions to examine how irradiation affects consumers' demand. In the experiment, individuals who did not value pork sandwiches were preemptively excluded from participation because their bid would not have provided meaningful information on the preference for irradiation.[2]

There are two alternative methods to increase the number of usable bids that have been used by a number of studies (Alfnes and Rickertsen, 2003; Rousu *et al*., 2004a, b). The first method entails repeated rounds of bidding; however, because the selection probability of an individual bidding round is quite small, participants have little incentive to bid their true value in auctions with multiple bidding rounds (Harrison, 1989). The second method elicits separate bids for multiple products within a round of bidding. When using multiple products, however, researchers must offer products that are neither complements nor substitutes because these types of products may produce biased bids (List and Lucking-Reiley, 2000).

This study presents the findings of a test of a new experimental auction method. In this method, each auction participant bids for multiple products and chooses the one product he or she most prefers. Because consumers chose from multiple products, the number of usable bids may increase. By allowing consumers the option to choose a preferred good

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[1] RTI International is a trade name of Research Triangle Institute.
[2] Whether zero bids are indeed problematic for a researcher depends on the issue being studied. If a researcher was studying the demand for pork sandwiches, a zero bid for a pork sandwich would not cause concern, as that is a representation of the consumer's demand. However, if the broader issue the researcher wants to examine is irradiation, then zero demand for the sandwich would be bad in that no information on the consumer's preference for irradiation would be provided.

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from a variety of products, the possibility that a consumer will change his or her bid based on the presence of complements or substitutes is eliminated. Furthermore, the options in auctions method does not require several rounds of bidding, which keeps the cost of untruthful bidding high.

Using experimental auction data, the viability of allowing consumers options in an auction is examined by testing two (null) hypotheses:

H1. Allowing multiple options in an auction will not decrease the number of participants who bid zero.

H2. Having consumers place one bid for multiple products and choose their most preferred product will yield bids equal to the bids of the consumers' most preferred product.

II. Experimental Design

In February 2003, experimental auctions were conducted with undergraduate students at a large midwestern university during their regularly scheduled class time, without the course instructor present. Approximately 50% of the students solicited agreed to participate, for a total of 122 participants. Using the second price auction, eight experimental sessions were conducted, with 13 to 19 participants in each group. The second price auction is a demand-revealing auction; therefore, each participant has a weakly dominant strategy to bid his or her true value for a product (Vickrey, 1961).

After each participant completed a consent form, participants were provided with written and oral instructions on how the second price auction works. To eliminate the potential for a participant's bid to move down his or her demand curve (List and Lucking-Reiley, 2000); participants were informed that only one of the nine bidding rounds would be binding (or valid). Next, participants completed a short quiz to demonstrate their understanding of the auction mechanism.

After addressing participants' questions, the bidding rounds commenced. In the first of three bidding sessions, participants bid on the following items in four separate rounds: a cold, 12-ounce can of Coca-Cola; a cold, 12-ounce can of Diet Coke; a 13-ounce bag of M&M's candies; and a 12.32-ounce bag of KitKat candies. Again, participants were informed that only one round of the experiment would be binding, so they would not win the same product in multiples. To prevent correlated bids caused by market price feedback (List and Shogren, 1999), bid prices were not posted until the end of the experiment.

In the second bidding session, participants bid in two separate rounds to obtain multiple products. In one round, participants bid on both cans of Coca-Cola and Diet Coke. In the other round, participants bid on both bags of KitKat and M&M's candies. Before this session began, participants were reminded again that only one round in the experiment would be binding.

In the final bidding session, participants bid in three separate rounds for the option to choose one of two products. In each of these three rounds, participants bid for the option to choose, if they won the auction, either a can of Coca-Cola or a can of Diet Coke, either a bag of KitKat or M&M's candies, and either a can of Coca-Cola or a bag of M&M's candy.

After the three bidding sessions concluded, the auction monitor determined the binding round and the first and second highest bid prices, while participants completed a short post-auction questionnaire. At the end of the experiment, the auction monitor announced the winner(s), and the highest bidder(s) purchased the product(s) for the second highest bid price.

III. Results

The study first examines whether allowing options in an auction will increase the number of usable bids or decrease the number of zero bids. Table 1 presents the percentage of participants who placed zero bids. For two of the three combinations,

Table 1. Percentage of zero bids using the alternative method ($N = 122$)

Product	Percentage of zero bids
Coca-Cola	20
Diet Coke	43[a]
Coca-Cola or Diet Coke	24
KitKat	21[a]
M&M's	20[b]
KitKat or M&M's	15
Coca-Cola	20
M&M's	20
Coca-Cola or M&M's	17

[a] The difference between percentage of zero bids on individual product and the percentage with multiple options is statistically significant at the 1% level.
[b] The difference between percentage of zero bids on individual product and the percentage with multiple options is statistically significant at the 5% level.

Table 2. Percentage of participants' option bids that equalled their most preferred item bid ($N = 122$)

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
KitKat and M&M's	52.3	61.5
Coca-Cola and M&M's	36.1	45.1

the percentage of zero bids decreased when participants bid for the option to choose their most preferred product. Therefore, Hypothesis 1 is rejected because fewer participants placed zero bids when given the option to choose one product. Support for this hypothesis, however, is only marginal for the cans of soda because the number of zero bids for the can of Diet Coke approximately doubled, whereas the number of zero bids for the can of Coca-Cola decreased slightly. This finding suggests that options in auctions method may be less useful for lower-priced products, especially if the researcher has prior knowledge on what products participants prefer. Although allowing options in an experimental auction appears to decrease the number of zero bids, this finding is not sufficient to claim that using options in experimental auctions can be employed effectively. It remains to be determined how bids for the option to purchase one of two products relate to bids placed on individual products.

When using a demand-revealing auction mechanism – such as 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 bid for the participant's most preferred item, as shown in Equation 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 the value for his or her most preferred item because he or she may forgo a profitable purchase. Nor should a participant bid more than his or her value for the most preferred item, because he or she could pay more than his or her value for the item. As shown in Table 2, when participants bid for two products that are substitutes, a higher percentage of participants placed bids for the option to choose their favourite good equal to the maximum of their two individual bids. The same trend holds true when bids within 10 cents of satisfying Equation 1 are examined.

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

Product(s)	Mean	Median	Standard deviation
Part A. Bids for cans of Coca-Cola and Diet Coke			
Coca-Cola	0.52	0.50	0.61
Diet Coke	0.27	0.06	0.37
Coca-Cola or Diet Coke	0.51	0.50	0.66
Part B. Bids for bags of KitKat and M&M's			
KitKat	1.41	1.00	1.95
M&M's	1.29	1.00	1.56
KitKat or M&M's	1.51	1.00	2.39
Part C. Bids for can of Coca-Cola and bag of M&M's			
Coca-Cola	0.52	0.50	0.61
M&M's	1.29	1.00	1.56
Coca-Cola or M&M's	0.92	0.50	1.51

The mean and median bids for the products sold in the auction are presented in Table 3. Table 4 displays the difference between the maximum bids for various products and the bid for the option to purchase one of two products. For the cans of soda and the bags of candy, this difference is relatively small (2 cents to 4 cents) and not statistically significant at the 10% level. Thus, Hypothesis 2 is not rejected when products are substitutes because consumer bids for the option to purchase a can of Coca-Cola or a bag of KitKat candy are quite different from the maximum bids placed for either product. When the products are complements, however, Hypothesis 2 is rejected. Notably, regressions were also ran to examine how explanatory demographic variables, such as gender and income, impact the potential usefulness of the options in auctions method and no evidence was found that demographic characteristics affect bids.[3]

[3] These results are available from the author upon request. Reviewers: see the Appendix.

Table 4. Does allowing options provide efficient bids?

	Median deviation	Mean deviation
Bid premium for options – Coca-Cola and Diet Coke (Standard Deviation)	0.00	−0.04 (0.30)
Bid premium for options – M&M's and KitKat (Standard Deviation)	0.00	0.02 (1.13)
Bid premiums for options – M&M's and Coca-Cola (Standard Deviation)	−0.05	−0.41[a] (1.23)

[a]Using both *t*-test and Wilcoxon signed rank test, the bid premium is statistically significant at the 1% level.

The results raise the question of why options in an auction only decreases the number of zero bids when the products are substitutes. In this experiment, it seems participants fully understood the auction mechanism when the products were substitutes but did not understand the process when the products were complements. Possibly, participants are more able to determine values for products when the products can be easily sorted into groups. When the products are not related, like the can of soda and the bag of candy, the same participants are not able to give logical bids or satisfy Equation 1. This explanation is consistent with the findings of Heiner (1983), which shows that consumers use mechanisms to simplify complex choices into less complex ones. The results indicate that it is easier for consumers to provide reasonable bids using the options in auctions method when products are substitutes.

IV. Discussion

Repeated bidding rounds and multiple products within a round are commonly used by researchers to increase usable data in experimental auctions. Although both methods are used frequently and can be successfully implemented in appropriate circumstances, each method has notable drawbacks. The results of this experimental auction demonstrate that allowing options in auctions can also increase the number of usable bids, especially when products are substitutes. In Shogren and colleagues' series of experiments using pork sandwiches to produce more usable, non-zero bids (Shogren *et al*., 1994; Fox *et al*., 2002), they could have allowed participants the option to purchase either a pork sandwich or a 'veggie' sandwich rather than prescreening participants. When studying consumers preference (e.g., irradiation), allowing options may be preferable to prescreening participants. This method is more likely to be preferred in situations where pre-screening participants is difficult, as it often is during a field experiment (e.g. see Lusk *et al*., 2001).

Allowing consumers the option to choose their preferred good from multiple products is a method that can increase the useable data in experimental auctions. Future research could provide additional insight into the effectiveness of this new method. One issue that warrants further investigation is how substitutable products must be configured for the options in auctions method to work effectively. For example, could cookies and muffins (both snack foods) be sold together and provide reasonable bids? Replicating this study with different auction mechanisms (e.g., the random *n*th price auction) could also yield useful information.

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References

Alfnes, F. and Rickertsen K. (2003) European consumers' willingness to pay for US beef in experimental auction markets, *American Journal of Agricultural Economics*, **85**, 396–405.

Fox, J. A., Hayes, D. J. and Shogren, J. F. (2002) Consumer preferences for food irradiation: how favourable and unfavorable descriptions affect preferences for irradiated pork in experimental auctions, *Journal of Risk and Uncertainty*, **24**, 75–95.

Harrison, G. W. (1989) Theory and misbehavior of first-price auctions, *American Economic Review*, **79**, 749–63.

Heiner, R. A. (1983) The origin of predictable behavior, *American Economic Review*, **73**, 560–95.

List, J. A. and Lucking-Reiley D. (2000) Demand reduction in multiunit auctions: evidence from a sportscard field experiment, *American Economic Review*, **90**, 961–72.

List, J. A. and Shogren, J. F. (1999) Price information and bidding behavior in repeated second-price auctions, *American Journal of Agricultural Economics*, **81**, 942–9.

Lusk, J. L., Fox, J. A., Schroeder, T. C., Mintert, J. and Koohmaraie, M. (2001) In-store valuation of steak tenderness, *American Journal of Agricultural Economics*, **83**, 539–50.

Rousu, M., Huffman, W. E., Shogren, J. F. and Tegene, A. (2004a) Are United States consumers tolerant

of genetically modified foods?, *Review of Agricultural Economics*, **26**, 19–31.
Rousu, M., Huffman, W. E., Shogren, J. F. and Tegene, A. (2004b) Estimating the public value of conflicting information: the case of genetically modified foods, *Land Economics*, **80**, 125–35.
Rousu, M. C., Corrigan, J. R. and Beach, R. H. (2004) Demand curve shifts in multi-unit auctions: evidence from a laboratory experiment, Working Paper.
Shogren, J. F., Shin, S. Y., Hayes, D. J. and Kliebenstein, J. B. (1994) Resolving differences in willingness to pay and willingness to accept, *American Economic Review*, **84**(1), 255–70.
Vickrey, W. (1961) Counterspeculation, auctions, and competitive sealed tenders, *Journal of Finance*, **16**, 8–37.

Appendix

Appendix A (for reviewers only): 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		0.00		−0.00
Income (in 100's)		(0.02)		(0.02)
GPA			−0.08*	−0.07
			(0.05)	(0.05)

Notes:
*Statistically significant at the 10% level.

Appendix B (for reviewers only): 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		0.05		0.04
income (in 100's)		(0.07)		(0.07)
GPA			−0.15	−0.12
			(0.17)	(0.18)

Appendix C (for reviewers only): 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		0.04		0.04
Income (in 100's)		(0.07)		(0.07)
GPA			−0.07	0.04
			(0.19)	(0.19)

Notes:
*** Statistically significant at the 1% level.