Charity Auctions in the Experimental Lab[*]

Jeffrey Carpenter[†] Jessica Holmes[‡] Peter Hans Matthews[§]

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Abstract

To transform donations "in kind" into cash, charities of all sizes often use auctions and raffles. Despite this, neither the theory nor the practice of efficient fund-raising - and, in particular, charity auctions - has received sufficient attention from economists. In this paper we describe, in detail, the design and implementation of a project which draws on experimental methods to provide an examination of fifteen charity auction mechanisms. The list of mechanisms includes standard sealed bid formats (first price, second price), standard sequential mechanisms (English button, Dutch, three versions of the silent), various all-pay mechanisms (first price, button, raffle) and a set of new mechanisms (last price all pay, first price winner pay – lottery hybrid, and three versions of what we call a 'bucket' auction). While some of the mechanisms have already received attention from both theorists and empiricists, ours is the first comprehensive examination of all existing mechanisms and the first to explore the revenue potential of six new formats.

1   Introduction

Nonprofit organizations employ more than 15 percent of all service sector workers in the United States (Benz, 2005) and depend on charitable donations to provide more than 20 percent of all cash revenue (Andreoni, 2004). In 2004, these revenues amounted to $250 billion (Giving USA, 2005) or a little more than 2 percent of GDP. Both the size of the nonprofit sector and its reliance on donations are more pronounced than in other industrialized economies. In much of Western Europe, for example, the size of the nonprofit sector and their reliance on donations is much closer to 10 percent (Benz, 2005; Andreoni, 2004). In more concrete terms, American cultural, educational and religious institutions count on private philanthropic support more than their counterparts elsewhere. This support does not come cheap, however. In 2001, for example, 200 major charities spent almost $2.5 billion

on their efforts to raise funds. Despite this, neither the theory nor the practice of efficient fundraising has received as much attention from economists as they should.

The immediate motivation for our study is found in charities' increased use of fundraisers to transform "in kind" donations into cash. The scale of these fundraisers ranges from local church raffles that produce a few hundred dollars to the annual Napa Valley Wine Auction, which raises almost $10 million (Engers and McManus, 2006) or the Robin Hood Foundation auction which raised $71 million on one night in 2007. A brief examination of eBay's special site for charity auctions, Giving Works which by itself has raised more than $80 million since 2000, reveals wide variation in both the items sold and the nearly 7,000 non-profits who benefit from their sale. There is much less variation, however, in the mechanisms charities use to auction these items. The familiar oral ascending or English auction, silent auction and first price sealed bid auction dominate the landscape.

We have conducted a large set of laboratory experiments to examine the revenue generating properties of three broad categories of fundraising mechanisms. The first set are those that have received some attention in the empirical literature, in particular raffles, first price sealed bid winner pay and first price sealed bid all-pay auctions. The second set are motivated by the growing theoretical literature on auctions but have received little or no attention in the lab or field for example, second price sealed bid winner pay, k^{th} price sealed bid all-pay, English, Dutch, and silent auctions. The final set are new mechanisms developed as a result of our experience conducting charity auctions in the field.

In this paper we focus on the design and implementation of this project. We begin, in the next section, by reviewing the small literature on charity auctions. In section 3, we describe each of the fifteen mechanisms under investigation. In section 4, we describe the details of our experimental design. In section 5, we discuss summary statistics describing our participants from the post-experiment survey and test for randomization into treatment in section 6. Three sets of instructions and the full survey appear in the appendices.

2   Previous Work on Charity Auctions

The theoretical literature on auctions is extensive (see Klemperer 2004 for an overview) and numerous experimental studies have tested the theoretical predictions either in the lab (e.g. Isaac, Salmon and Zillante, 2005a; Kagel ,1995) or in the field (e.g. Hossain and Morgan, 2003; Isaac, Salmon and Zillante, 2005b; List and Lucking-Reiley, 2000, 2002; Lange, Price and List, 2004; Lucking-Reiley, 1999). The literature on charitable fundraising is also well-developed (e.g. Andreoni 1989, 1998; List and Lucking-Reiley, 2002), but few studies have focused on the intersection of these two literatures: charity auctions. This is an important distinction since the externality that all participants can expect to receive from the winning bid in a charity auction substantially alters standard predictions about optimal bids and expected revenues.

The first puzzle we examine is the disjunction between what is observed in the field where lotteries and winner-pay auctions dominate and recent theoretical models of charity auctions which predict that these mechanisms should be "revenue dominated" by others; more specifically, Engers and McManus (2006) and Goeree, Maasland, Onderstal and Turner (2005) predict that charities would do better with all-pay auctions, in which all bidders forfeit

their bids, than any of the winner pay mechanisms now in use. The basic intuition for this result is not difficult. To paraphrase Goeree et al (2005), if all bidders derive some benefit from the revenues that accrue to the nonprofit, winner pay formats compel bidders to sacrifice positive externalities when they outbid their competitors, and this results in lower revenues.

Davis, Razzolini, Reilly and Wilson (2006) find support for this prediction in the lab. Specifically, they find that lotteries - which could be viewed as inefficient all-pay auctions in the sense that all "bidders" forfeit their bids but the bidder who has purchased the most tickets is only the most likely, rather than the certain, winner - generate more revenues than ascending auctions. Furthermore, Davis et al (2006) show that this outcome is robust with respect to the distribution of bidder values, the attachment of bidders to the charity, and repeated play. Morgan (2000) and Morgan and Sefton (2000) also focus on lotteries as fundraising mechanisms and find (both theoretically and experimentally) that when raffle proceeds are used to fund charitable organizations, the revenues raised are higher than with fundraising through voluntary contributions; here the chance of winning the raffled item alleviates the free-rider problem commonly associated with the standard voluntary contributions mechanism.

Schram and Onderstal's (2006) experiment, in which altruistic private values are induced in the lab, provides even more direct evidence: the all-pay mechanism was observed to revenue dominate the lottery which in turn revenue dominated the first price sealed bid mechanism. In Orzen (2003), which Schram and Onderstal (2006) cite, lotteries and two variations of the all-pay are compared but, in this experiment, values were common not private. Lastly, Isaac and Schneir (2005) use both the lab and the field to testbed features of the silent charity auction; in particular, they focus on the impact of minimum bid increments on efficiency, revenue and the presence of jump-bidding.

There are a handful of empirical studies of the effects of endogenous participation, based on the theoretical contributions of McAfee and McMillan (1987), Menezes and Monteiro (2000) and others. None of these solve the problem of mechanism-specific participation in charity auctions, however. Most (e.g., Bajari and Hortacsu, 2003 and Reiley, 2004) focus on the impact of entry or reserve prices on the decision to participate in for-profit auctions. We are aware of only two empirical studies that specifically examine the effect of auction format on the entry decision. Ivanova-Stenzel and Sonsino (2004) conduct an experiment in which subjects are allowed to choose between a standard first price sealed bid auction and a modified two-bid auction in which the subjects submit a high bid and a low bid such that the winner pays her low bid if it was higher than all other bids; they find strong subject preferences for the two-bid format. Ivanova-Stenzel and Salmon (2004) examine bidder preferences for sealed-bid and ascending auctions and show that subjects strongly prefer the ascending format when entry prices are the same.

The proposition that the all-pay auction revenue dominates other winner pay formats had not been tested in the field, however, until Carpenter, Holmes and Matthews (2008). To our initial surprise, we were unable to confirm Schram and Onderstal's (2006) result. Instead, in 80 auctions conducted 20 at a time at four local preschools, we found that first price sealed bid auctions raised more revenue and were more efficient than either second price sealed bid or all-pay auctions. The unusual circumstances and design features of the experiment, which allowed us to collect data from active and inactive bidders, lead to a tentative explanation for the differences in outcomes in the lab and field: *participation in*

charity auctions is endogenous and mechanism-specific. In particular, the ratio of active to potential bidders was much smaller in the all-pay auctions, and this was sufficient to drive revenues below the revenues produced in the first price sealed bid auctions. In a companion paper (Carpenter, Holmes and Matthews 2007), we construct a hybrid model, based on Engers and McManus (2006) and the work of Menezes and Monteiro (2000) of endogenous participation that provides a theoretical framework for our field results. Because revenue in the field seemed to depend as much on participation as on bidding behavior, we decided to make participation a primary element of our new experimental design. In fact, our unique experimental design allows us to formally test for mechanism-specific participation effects.

While our field work highlighted endogenous participation as an important (yet little studied) component of mechanism design, we were unable to fully explain the reason(s) for the differences in field participation. There are at least two explanations for participation differentials, each with its own implications for charities or, for that matter, mechanism design. The first is that some formats are less familiar and/or harder to "solve" than others. In our experience, for example, even professional microeconomists find it to difficult to derive optimal all-pay bids on the spur of the moment if they are unfamiliar with auction theory. If this is the reason for the differential, however, charities that switch from winner pay to all-pay mechanisms could eventually extract more revenue, as bidders become more comfortable. Our panel design in both the lab and the field allows us to explore this possibility.

The second explanation is that the participation differential is a consequence of bidder preferences or norms. The potential bidder in our field experiment who told us that he resented the "forced contribution" under the rules of the all-pay - an objection that did not extend to the raffle that the preschool itself held on the same day - seemed to be motivated by a context-specific and perhaps idiosyncratic norm: he seemed to feel that the raffle, in which everyone has a chance to win, was more fair. A bidder with loss averse preferences, on the other hand, will be more wary of bid forfeiture in the all-pay for another reason. In these cases, however, the participation and consequent revenue differentials will be more persistent, since the problem is not familiarity. Our exit surveys help us to separate these.

3   Auction Mechanisms

We extend the current empirical literature in several directions, each of which we describe in more detail below. First, whereas previous studies have been limited to small (and often different) sets of mechanisms - so that some comparisons are indirect, and assume that results are transitive across experiments - we consider the broadest possible set of fifteen formats, one that includes almost all of those tested in the past and some that have never been tested in the lab. Second, and as a consequence of what we have learned in the field, our choice of design is intended to introduce endogenous participation in the lab. As a result, we will be able to provide a richer characterization of sample selection than we did for our field data. Third, to isolate the possible effects of learning on auction revenue, a modified panel design has been used.

In each treatment, all bidders, whether they subsequently decide to participate or not, received a private value v_i, determined as the realization of a random variable with uniform distribution over the interval $[0, 100]$. The other common feature is that each bidder received

a benefit β for each experimental monetary unit (EMU) she contributes to the "charity," and a benefit $\alpha \leq \beta$ for each EMU that another bidder contributes where, following Engers and McManus (2003), the difference $\gamma = \beta - \alpha$ is "warm glow." Our implementation employed $\alpha = 0.10$ and $\gamma = 0.05$. To streamline the descriptions of each mechanism, suppose that there are $M < N$ active bidders and that their bids are ordered $b_1 < b_2 < ... < b_M$, where it is at least possible that some b_i are zero. The values of these bids may differ across formats.

The first three mechanisms that we examine are those that have received the most attention in the literature:

First Price Sealed Bid Winner Pay: Each active bidder submits a sealed bid. The prize is awarded to bidder M, who pays the value of her bid b_M, for a payoff of $v_M - (1 - \gamma)b_M + \alpha b_M$. No other active bidder pays anything, so that the payoffs for all other bidders, active and nonactive, is αb_M. Auction revenues are b_M .

First Price Sealed Bid All-pay: Each active bidder submits a sealed bid. The prize is awarded to bidder M, who pays the value of her bid b_M, but all other active bidders must pay the values of their own bids, too. Bidder M's payoff is therefore $v_M - (1 - \gamma)b_M + \alpha \sum_{j=1}^{M} b_j$. Each of the other active bidders receives $-b_i + \alpha \sum_{j=1}^{M} b_j$, and each nonactive bidder receives $\alpha \sum_{j=1}^{M} b_j$. Revenues are $\sum_{j=1}^{M} b_j$.

Raffle: Each active bidder spends b_i on "tickets" that cost r each, and one ticket is drawn at random to determine the winner. (To approximate the continuous strategy spaces in other mechanisms, the value of r will be set low, perhaps 0.10.) If the winner is bidder k, where k and M need not be the same, she receives $v_k - (1 - \gamma)b_k + \alpha \sum_{j=1}^{M} b_j$. Each of the other active bidders $i \neq k$ receives $-b_i + \alpha \sum_{j=1}^{M} b_j$, and each of the nonactive bidders receives $\alpha \sum_{j=1}^{M} b_j$. Revenues are $\sum_{j=1}^{M} b_j$.

The next four have appeared in the theoretical literature but have been tested less often. Some have never been tested in the charity context:

Second Price Sealed Bid Winner Pay: Each active bidder submits a sealed bid. The prize is awarded to bidder M but she pays only b_{M-1}, the value of the second highest bid. Bidder M's payoff is therefore $v_M - b_{M-1} + (\alpha + \gamma)b_{M-1}$. All other bidders, active and nonactive, receive αb_{M-1}. Revenues are b_{M-1}.

First Price Ascending Oral (English button): A computer screen "clock" starts at some very low value and becomes the bid of the first active bidder to "claim" it. The clock then ticks upward a small amount (0.10), and the new value can be claimed by some (other) bidder. If no one claims a value within some preannounced interval, the prize is awarded to the bidder who claimed the previous value, b_M. The winner's payoff is $v_M - (1 - \gamma)b_M + \alpha b_M$. All other bidders, active and nonactive, receive αb_M. Revenues are b_M.

All-Pay Button: This mechanism proceeds just as the English "button" auction except that all bidders pay their bids. The winner's payoff is $v_M - (1 - \gamma)b_M +$

$\alpha \sum_{j=1}^{M} b_j$. All other active bidders receive $-b_i + \alpha \sum_{j=1}^{M} b_j$, nonactive bidders receive $\alpha \sum_{j=1}^{M} b_j$ and revenues are $\sum_{j=1}^{M} b_j$.

Oral Descending (Dutch): A computer screen "clock" starts at some very high bid value and ticks downward. The first bidder to stop the clock wins the auction and pays the listed price, b_M, for a payoff of $v_M - (1 - \gamma)b_M + \alpha b_M$. All other bidders, active and nonactive, receive αb_M. Revenues are b_M.

Silent Auction(s): Bidders submit increasing bids until a predetermined ending point and each active bidder sees the entire bid history evolve in real time. The winner is the bidder who has submitted the highest bid b_M, and she receives $v_M - (1 - \gamma)b_M + \alpha b_M$. All other bidders, active and nonactive, receive αb_M. Revenues are b_M. There are also two variants of the basic silent format. In the first, the "no-sniping" variation, the auction ends 30 seconds after the last bid. In the second, the bidders are given heterogeneous times to be active in the auction. We are interested if this is an explanation of "jump" bidding.

The next, which to our knowledge has never been tested in either the charity or non-charity context, finds its inspiration in the work of Goeree et al (2006) on "k^{th} price all-pay" charity auctions which should, in theory, do even better than the $k - 1^{st}$ price all-pay:

Last Price Sealed Bid All-Pay: Each bidder submits a sealed bid. The prize is awarded to bidder M, who pays the value of the *lowest* bid submitted b_1, *as do all of the other active bidders.* Bidder M's payoff is $v_M - (1 - \gamma)b_1 + \alpha M b_1$. Each of the other active bidders receives $-b_1 + \alpha M b_1$, and each of the nonactive bidders receives $\alpha M b_1$. Revenues are $M b_1$.

To maximize the benefits of our research to nonprofits, however, it will be important to see whether what we have learned in either the field or lab can be used to develop new, perhaps hybrid, mechanisms that perform even better than these. Based on our initial experience in the field and standard results in behavioral economics, the final two mechanisms are:

First Price / Lottery Hybrid: To become active bidders, participants must first submit an entry fee r, but those who do so are simultaneously entered in an "$s-$lottery." The winner of the lottery receives srM, for some preannounced s between 0 and 1, and the charity receives $(1 - s)rM$. If $s = 1/2$, as in our implementation, this is the familiar "$50 - 50$ lottery." At the same time, active bidders submit bids under the rules of the first price sealed bid mechanism. If bidder M wins both the auction and the lottery, she receives $(v_M + srM) - (1 - \gamma)(b_M + r) + \alpha(b_M + (1 - s)rM)$. If she wins the auction but not the lottery, she receives $v_M - (1 - \gamma)(b_M + r) + \alpha(b_M + (1 - s)rM)$. An active bidder who wins the lottery but not the auction receives $srM - (1 - \gamma)r + \alpha(1 - s)rM$. Last, an active bidder who wins neither receives $-(1 - \gamma)r + \alpha(1 - s)rM$. Auction revenues are $b_M + (1 - s)rM$.

"Bucket Auction(s)": A computer "bucket" circulates in predetermined order. Subjects "bid" by adding a small fixed increment to the bucket and the auction is

over when $M-1$ of the other participants drop out so the winner is the *last* person to have contributed to the bucket. If bidder L is the last contributor and her total contribution is b_L, her payoff is $v_L - (1 - \gamma)b_L + \alpha \sum_{j=1}^{M} b_j$. Each of the other active bidders receives $-b_i + \alpha \sum_{j=1}^{M} b_j$, each nonactive bidder receives $\alpha \sum_{j=1}^{M} b_j$ and revenues are $\sum_{j=1}^{M} b_j$. There are also two bucket variations. Instead of the prize going to the last person to bid, in the first variant, it goes to the person who contributed the most. In the second variant (the poker bucket), the bidding proceeds according to the "seeing" and "raising" protocol of poker.

4   Experimental Design

Based on Kagel (1995) which reports auction sizes of between 3 and 10 bidders, we decided that 10 potential bidders would be needed for each 1.5 hour session. The number of active bidders averaged 4.8 which is in the middle of this range. We calibrated the final expected earnings to be \$25 per participant including a \$10 show-up fee (the actual average was \$25.15). To run the experiment we used ZTree by Fischbacher (2007). To recruit participants we used the Orsee recruitment program and advertised mainly via email. Because of the number of participants needed we ran approximately half of the sessions at Middlebury College and the other half at the University of Massachusetts - Amherst. Figure 1 details the sessions and their locations.

Session count ->	1	2	3	4	5
Bucket (Basic)	1	9	11	13	14
Bucket (Largest Contribution)	46	47	48	72	74
Bucket (Poker)	40	41	42	73	75
Dutch (Individual Counters)	25	37	61	62	63
English Button	23	39	64	65	66
First Price All Pay	2	3	4	8	10
All Pay Button	26	27	29	30	71
Last Price All Pay	21	28	55	56	57
First Price Winner Pay	5	6	7	12	15
First Price - Lottery Hybrid	18	35	49	50	51
Raffle	16	38	67	68	69
Second Price Winner Pay	31	32	33	34	70
Silent (With bid history)	17	20	22	58	59
Silent (Heterogeneous time)	24	43	44	45	60
Silent (No Sniping)	19	36	52	53	54

Figure 1: Experimental session log (shading indicates sessions run at UMass-Amherst).

Subjects were provided with a comprehensive set of instructions and ample time to read

and ask clarifying questions about the protocol (See Appendix A for a sample of the instructions[1]). At the beginning of the first round, subjects were asked to take a quiz designed to test their basic numeracy and comprehension skills. They were asked four questions which requires some multiplication and addition about how their payoffs were calculated and had to select the correct answer from four choices. After they took the quiz, they were shown the answers in an effort to eliminate any lingering confusion. The fraction of correct answers will be used as a proxy for our subjects' cognitive ability.

A two stage design allowed us to partially attenuate earned income effects (i.e., "playing with house money") and to endogenize participation. At the start of the experiment, each subject was asked to solve a number of "word scrambles" or anagrams in a predetermined time period (12 minutes), similar in spirit to Gneezy, Niederle and Rustichini (2003) or Hoff and Pandey (2003). Subjects were paid a piece rate of 10 EMUs per correct response and the scramble difficulty, the rate and the time limit were chosen so that mean earnings would be about $15 with little variance. While we wanted subjects to earn their endowments for the auctions, we did not want there to be a lot of variation in the endowments which might cause income effects. Indeed, it turned out to be relatively easy to get 10 scrambles right but it was hard to get more than 16 right. Figure 2 illustrates the distribution of endowments earned in the first stage of the experiment. The mean is 14.00 correct responses and the standard deviation is 1.81. Although the majority of participants ended up in our targeted range, two people did extremely poorly (0 correct and 2 correct) because of confusion.
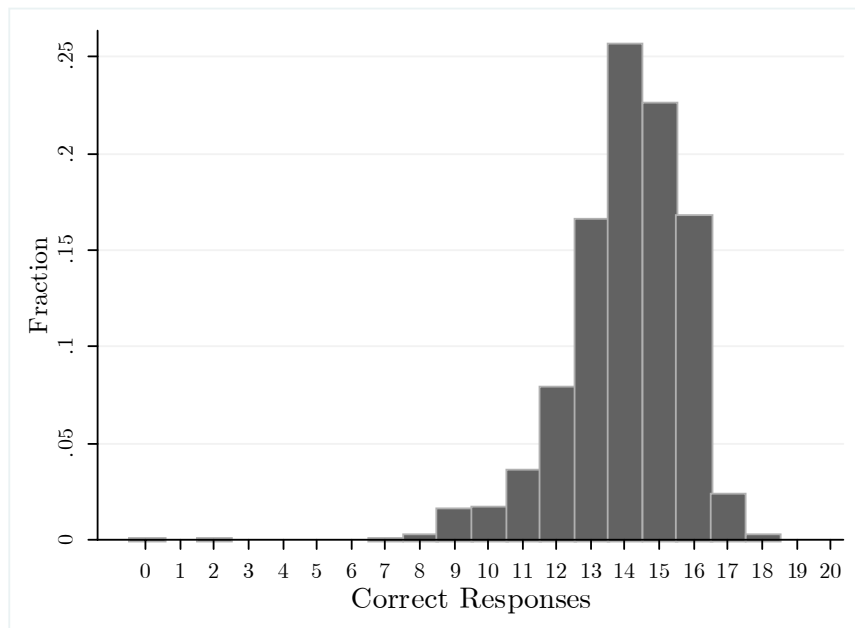

Figure 2: The distribution of earned endowments in the first stage (each correct response was worth 10 EMUs).

After the 12 minute endowment stage, the auctions (or raffles) began. At the beginning of each of the ten trials in a session, subjects were offered a choice to participate in the

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[1]We chose to append only a few versions of the instructions because the full set for all the 15 mechanisms fills about 75 pages. Any of the omitted instructions are available upon request.

auction whose rules were again explained in detail, and in which all bids were paid from the cash accumulated in the first stage. So that participants did not condition their choice of whether to participate or not on the observed choices of the others, participation choices were conveyed privately and those participants who chose not to participate in the auction remained in the computer lab and solved a word scramble for a fixed piece rate of 15 EMUs per correct response. The opportunity cost of participating was equalized across mechanisms.

Subjects learned their private values before the participation decision but they did not know how many other participants selected into the auction. This was done because we expected that there might be an interesting interaction between auction mechanism and private value that justified complicating the design. Furthermore, theory suggests that participation will depend on one's value.

Along with their private values, participants were also told how hard (on a scale of 1-5) the alternative word scramble would be for the round. The difficulty measure allows us to identify selection separately from bidding behavior in our analysis (i.e., there is no reason to believe that the difficulty of the scramble will affect one's bid amount). We initially selected a sequence of difficulty levels randomly and then used this sequence of difficulty levels for every session. This allowed us to separate the effect on participation of scramble difficulty from the mechanism effect. Subjects were then asked how many bidders they expected to enter the auction, what they thought that their (subjective) chances were to get the puzzle (of stated difficulty) correct and were given the choice of participating in the auction or attempting the scramble.

As we noted earlier, our interest in the possible effects of learning on both participation and, conditional on this, the decisions of active bidders prompted us to run ten trials during each session. Between auction trials, participants received feedback that might have facilitated learning (e.g., the winning bid and the share of active bidders). However, To prevent as much as possible on trial from spilling over to affect the results of others (e.g., trying to make up losses in earlier tirals), each participant was re-endowed at the beginning of each auction with the amount they earned in the first stage of the experiment and only one trial, choosen randomly, was paid.

Prior to leaving, we conducted a survey of the socio-demographic characteristics of our participants and got their reactions to the experiment (see Appendix B).

5   Participant Characteristics

We ran 75 sessions (five sessions per treatment). This translates into 745 participants.[2] We actively recruited non-students to increase the variation in our demographics. Table 1, which provides an overall summary and summaries by location, reports the characteristics of our participants. The mean age of our participants was a little more than 24 years and exactly half of our participants were female. However, our Middlebury participants were significantly older ($p<0.01$) and more female ($p<0.10$) than at UMass. We were able to recruit just a few townspeople (1 percent) and faculty (6 percent) but these numbers were

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[2]Despite running 71 sessions with 10 participants, we were forced, because of no-shows, to run three nine-person sessions (one basic bucket, one basic silent and one all-pay button) and one second price winner pay that had only eight participants.

statistically the same at each location. We were more successful in attracting staff members at Middlebury ($p<0.01$) and as a result students make up a significantly larger share of the UMass participants ($p<0.01$). Unfortunately, we were unable to get much racial diversity. Overall, 75% of the participants were Caucasian and 81% were born in the U.S. and the distributions do not vary significantly by location. There were some significant differences in the educational achievements by location. More of the UMass participants were either still in college or had only partially completed their bachelor's degree ($p<0.05$) but there were more participants with graduate degrees in Amherst ($p<0.10$). Finally, as one might expect given UMass is a large state school and Middlebury is a small liberal arts school, there were more participants from households that earn less than \$25,000 at UMass ($p<0.01$) and more participants from households that earn more than \$150,000 per year in Middlebury ($p<0.01$).

We asked three questions about previous experience in experiments and auctions. The overall mean number of previous experiments (not necessarily economic experiments) was 0.52 (72% of the participants had never participated in an experiment before) but the number was significantly higher in Middlebury which makes sense because the pool of potential subjects is smaller and ours was one of the first large-scale experiments conducted in the new Resource Economics experimental lab at UMass. The Middlebury participants also had more experience in both charity ($p<0.01$) and non-charity ($p<0.01$) auctions. Indeed, very few (8%) of the UMass participants had ever participated in a real charity auction.

Consistent with the format used by Dohmen et al. (2005), we asked relatively straightforward questions about our participants' attitudes towards risk, loss and competitiveness. For example we asked, "In general, do you see yourself as someone who is willing, even eager, to take risks, or as someone who avoids risks whenever possible?" The mean response was 5.18 which is directly in the middle of the 1 (low) to 10 (high) scale and neither the responses to this or any of the other similar questions varied significantly by location.[3] What is interesting however, is that in the broader population of participants, people demonstrated some of the common trends seen in similar experiments. For example, people are significantly more averse to losses in both the general ($p<0.01$) and financial ($p<0.01$) domains.

Lastly, we asked three vignette questions to determine the extent to which people are sensitive to sunk costs. In the first vignette, the participant has to decide whether or not she would buy another movie ticket after losing the first one. Overall, 34% of the participants said that they would not buy another ticket and the percentage was 10% higher at UMass ($p<0.01$). There was also a significant difference in the rate of committing the sunk cost fallacy in the second vignette. Here, participants were told that they had made reservations, and paid a deposit in Montreal, but then decided that they could have more fun by going somewhere else. In this case 55% of the people said that they would still go to Montreal and, again, the response rate differed by almost 10% ($p<0.01$). The last vignette was a little more complicated in that they could choose among five responses. In this scenario the participant had bought wine for \$20 a bottle in the past but could now sell it on eBay for \$75 a bottle. When asked how much it cost to drink one of the bottles 24% of the people said \$20. The rate of responding with \$20 did not vary significantly by location.

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[3]Except the fact that there are slightly more financial risk takers at UMass ($p<0.10$)

Table 1: Survey Summary Statistics (overall and by location)			
	Overall (N=745)	Middlebury (N=365)	Umass (N=380)	F-stat | p-value
Age	24.20 (9.96)***	26.32 (12.45)	22.16 (6.09)	1.48 | 0.11
Female (fraction)	0.50 (0.50)*	0.53 (0.50)	0.46 (0.50)	0.83 | 0.63
Subject Pool (fraction):				
Townsperson	0.01 (0.11)	0.01 (0.12)	0.01 (0.10)	1.17 | 0.29
Faculty	0.06 (0.23)	0.04 (0.21)	0.07 (0.25)	1.36 | 0.17
Staff	0.14 (0.35)***	0.21 (0.41)	0.07 (0.25)	1.44 | 0.13
Student	0.79 (0.41)***	0.73 (0.45)	0.85 (0.35)	1.08 | 0.37
Race (fraction):				
African-American	0.03 (0.16)	0.02 (0.15)	0.03 (0.18)	0.72 | 0.75
Asian-American/Asian	0.13 (0.34)	0.14 (0.35)	0.12 (0.33)	0.55 | 0.91
Latino/Hispanic	0.03 (0.17)	0.02 (0.15)	0.04 (0.19)	1.04 | 0.41
White/Caucasian	0.75 (0.43)	0.76 (0.43)	0.74 (0.44)	0.72 | 0.75
Other/Mixed	0.06 (0.23)	0.05 (0.23)	0.06 (0.24)	1.21 | 0.26
Born in the United States (fraction)	0.81 (0.39)	0.79 (0.41)	0.83 (0.38)	1.06 | 0.39
Schooling (fraction):				
High School degree	0.07 (0.25)	0.08 (0.38)	0.06 (0.23)	0.78 | 0.69
some College	0.68 (0.47)**	0.63 (0.48)	0.72 (0.45)	1.41 | 0.14
College degree	0.14 (0.35)***	0.19 (0.40)	0.09 (0.29)	1.15 | 0.31
Graduate degree	0.11 (0.31)*	0.09 (0.29)	0.13 (0.34)	1.52 |0.10
Houshold Income (fraction):				
less than $25,000	0.24 (0.43)***	0.15 (0.35)	0.34 (0.47)	3.31 | <0.01
$25,001-$50,000	0.13 (0.34)	0.14 (0.34)	0.12 (0.33)	1.13 | 0.33
$50,001-$75,000	0.15 (0.36)*	0.18 (0.38)	0.13 (0.33)	1.04 | 0.41
$75,001-$100,000	0.16 (0.37)	0.16 (0.37)	0.16 (0.37)	1.46 | 0.12
$100,001-$125,000	0.11 (0.31)	0.12 (0.32)	0.10 (0.30)	1.01 | 0.44
$125,001-$150,000	0.07 (0.25)	0.07 (0.26)	0.06 (0.24)	1.07 | 0.38
more than $150,000	0.14 (0.35)***	0.19 (0.39)	0.09 (0.29)	1.71 | 0.05
Previous Experiment Participation (#)	0.52 (1.14)***	0.73 (1.41)	0.33 (0.76)	1.77 | 0.04
Past Participation in a Charity Auction (fraction)	0.16 (0.37)***	0.24 (0.43)	0.08 (0.27)	1.94 | 0.02
Past Participation in a Non-Charity Auction (fraction)	0.43 (0.49)***	0.50 (0.50)	0.36 (0.48)	0.95 | 0.50
General Risk Taker (1=low, 10=high)	5.18 (2.58)	5.15 (2.50)	5.21 (2.67)	0.94 | 0.52
Financial Risk Taker (1=low, 10=high)	3.48 (2.42)*	3.33 (2.26)	3.63 (2.56)	0.73 | 0.74
General Loss Averter (1=low, 10=high)	3.87 (2.38)	3.97 (2.35)	3.78 (2.41)	1.69 | 0.05
Financial Loss Averter (1=low, 10=high)	3.01 (2.28)	3.01 (2.24)	3.01 (2.31)	1.31 | 0.20
General Competitiveness (1=low, 10=high)	6.10 (2.83)	6.13 (2.70)	6.06 (2.95)	1.55 | 0.09
Sports Competitiveness (1=low, 10=high)	6.14 (3.12)	5.96 (3.09)	6.31 (3.14)	0.87 | 0.59
Sunk Cost Sensitivity (fraction):				
Commit fallacy one	0.34 (0.47)***	0.29 (0.45)	0.39 (0.49)	1.33 | 0.18
Commit fallacy two	0.55 (0.50)**	0.50 (0.50)	0.59 (0.49)	0.54 | 0.91
Commit fallacy three	0.24 (0.43)	0.24 (0.42)	0.24 (0.43)	0.85 | 0.61

Note: Means and (standard deviations); * indicates a significant difference (ttest) between locations at the 10%, ** 5% and ***1% levels.

The F-statistic and p-value in the last column are from the linear regression of each characteristic on treatment indicators.

6   Randomization to Treatment

The obvious test of whether we achieved randomization to treatment in our experiment is to regress each of the characteristics in Table 1 on treatment indicators and test whether any of the point estimates are significantly different from another. For the sake of brevity, we employ a slightly cruder method. In the last column of Table 1 we report just the F-statistics and p-values from these regressions. Our test is whether the treatment indicators are jointly significant or not.[4]

It appears that, based on four-fifths of the characteristics, our randomization worked well. In 28 of the 35 characteristics, the F-statistic is relatively low and insignificant at the conventional 10% level. However, the other fifth of the characteristics show more of a pattern. For example, ti appears that having a gaduate degree and mechanism are related. This is likely due to the fact that more of the last price all-pay and first price raffle hybrids occurred at UMass where there were more graduate degrees. SImilarly, there appears to also be a relationship between income and format, but, again, this is not much of a surprise because there were more students from households earning less than $25,000 at UMass and more from families earning more than $150,000 at Middlebury. In particular, the fact that most of the silent auctions and (again) last price all-pay suctions were run at UMass accounts for this result. Differential participation of UMass participants, who had significantly less experience in experiments and auctions, in the silent, Dutch and English auctions explains the significant F-statistics on previous experiment and charity auction experience. Both of the last two cases are less obvious but apparently due to the fact that more of the silent and (non-basic) bucket auctions were run at UMass. While not perfect, our randomization worked pretty well and our full set of survey responses allows us to correct for any biases that might result from differential selection into one treatment or another.

7   Appendix A - Sample Instructions

7.1   First Price Winner Pay

Introduction

Today you are participating in a decision making experiment. You will earn $10 just for showing up. The instructions are straightforward, and if you follow them you may be able to make a considerable amount of money. During the experiment, all decisions will be framed in terms of 'experimental monetary units,' or EMUs. At the conclusion of the experiment, all the EMUs that you have accumulated will be converted into real dollars at the rate of 10 EMUs per real dollar (i.e., we will divide your EMUs by 10). You will be paid in cash at the end of the experiment.

Please read these instructions carefully, as understanding the rules is essential for doing well. You may refer to these instructions at any time during the experiment. If you have any questions while these instructions are being read, please raise your hand and we will attempt to answer them. *You are not allowed to communicate with other participants during the experiment, even to clarify instructions; doing so may be grounds for dismissal from*

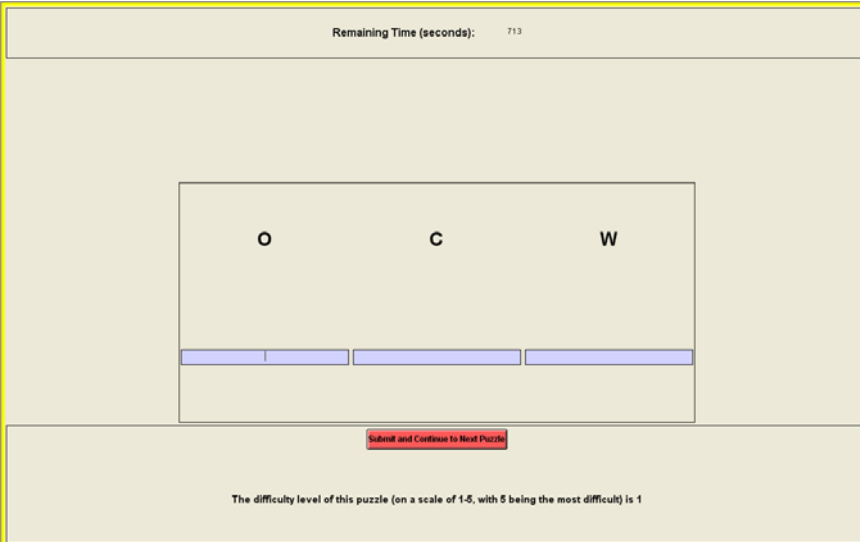[4]We use linear probability models in the case of dichotomous characteristics.

the experiment, forfeiture of earnings, and being banned from future experiments. The same is true of opening other computer programs or modifying the computer setup during the experiment.

The experiment consists of three phases, all conducted using the computer: in the first, you will earn an amount of money, your 'endowment,' in the second you will be able to use those earnings to take part in an auction, if you so choose, and in the last phase you will complete a brief survey. Your final payoff will depend upon your performance in the first phase and your own actions as well as the actions of the other participants in the second phase.

Experiment Phase One: Endowment

During the first part of the experiment, the 'endowment phase,' you will be asked to solve a series of word scrambles—puzzles in which the letters of a word are mixed up. It is your task to unscramble them. On your computer screen you will see one scrambled word at a time, with a blank below each given letter. In each blank, enter the letter that you think belongs in that space in the correct, unscrambled word—see the example below for clarification. *In each blank, please enter only one letter, with no spaces, and use only the letters given in the original scramble. Failure to do so will result in an error message, which you will have to correct before moving on. Note that you can use the tab key to quickly move from one cell to the next.*

You will have a total of 12 minutes to correctly solve as many scrambles as you can, and for each that you solve correctly, you will earn an additional 10 EMUs. The puzzles increase in difficulty as you progress, and you will have only one chance to solve each puzzle. You may leave a puzzle blank, but once you click the 'Submit and Continue to Next Puzzle' button, you will not be able to return to that puzzle. There are a total of 25 scrambles. You will not know how many you have solved correctly until the phase is over.

Once you have reached the end of the puzzles, please sit quietly and wait for other participants to finish. At the end of the phase, the number of puzzles you solved correctly and the total EMUs you earned will be shown to you. This amount of EMUs constitutes

your endowment and will be used to participate in the second phase of the experiment.

Experiment Phase Two: Auction

Motivation

In the second phase of the experiment we simulate a charity auction. Charity auctions are different from regular, for profit, auctions because everyone associated with the charity benefits from the money that is raised. In non-charity auctions, only winners benefit. To simulate this difference, participants in these charity auction simulations will earn benefits from three sources: they earn benefits from winning the auction, they earn benefits from the total amount of money raised by the auction, and they earn benefits from their own contributions. The second source of benefits represents the fact that everyone benefits when money is contributed to charity and the third source represents the fact that people often feel good about themselves for giving money.

Deciding Whether to Participate and Bidding

In the second phase of the experiment, there will be ten periods. At the beginning of each period you will decide whether you want to participate in an auction or try to solve another word scramble. In the auction, you will have the opportunity to bid on a single unit of a fictitious good. Although the good is fictitious, it will have some real 'value' to you—you can think of this as being the amount of money that the experimenter would pay you for the item if you obtained it in the auction. Each participant will learn his or her value for the item at the beginning of each period, but will not know any of the other participants' values. **Other participants will have different values.** Your value for the good will change each period, and how this value is determined is described in detail below.

If you choose to participate in the auction, you will submit a bid for the fictitious commodity. The computer will show you your value for the period and will prompt you to enter a bid. You will make one bid per auction and you will not know the bids of the other participants when you choose your own bid. The person who bids the most will win the auction. If you win the auction, you will have to pay your bid out of your endowment, so your bid must be greater than or equal to zero but less than your endowment. Bids and values will both be denominated in EMUs. When you make a bid, you will not know how many others are participating in the auction–in each auction, there could be as few as 0 or as many as 10 total bidders, depending on the decisions of the other participants. How auction gains are determined is described in the next section.

As indicated above, participation in the auction is a choice. Before you decide to enter a bid or solve a scramble you will be shown the value you will have for the fictitious good in the auction and the difficulty of the scramble you will have to solve. If you choose not to participate in the auction, you will have 2 minutes to solve the word scramble. If you solve it within the time limit, you will earn 15 EMUs; if you do not, you will earn 0 EMUs. The difficulty of the puzzle will change randomly at the beginning of each period **but the difficulty is the same for all scramble solvers within a period.**

Auction Rules and Determining Profits

The highest bidder wins the auction. The revenue generated by the auction is the amount paid by the auction winner. As mentioned in section 3.1, this revenue has value for all participants, regardless of whether they participate in the auction or try the scramble: **each person earns 0.10 times the total auction revenue** - the second source of benefits

referred to above. The amount the winning bidder contributes to the auction revenue has an additional value for him or her, so that **the winner earns an additional 0.05 times the amount (s)he pays**. This is the third source of benefits mentioned in section 3.1.

We can work through an example to illustrate the payoffs. Suppose that 6 people have entered the auction – let's call them Arthur, Barbara, Charles, Diane, Ethan and Frances – and that four others have attempted the scramble. Suppose, too, that Diane bids the most and therefore has won the auction. To calculate how much Diane gains or loses from this win, we need to know how much she values the object and how much she bid. Suppose, for the sake of argument, that the object is worth 75 EMUs to her, she bid 50.

Diane's direct gain, the difference between what the object is worth and what she paid for it, is 75 – 50 or 25.

Because the winning bid is 50, all 10 participants, will receive an additional benefit worth 0.10×50 or 5 EMUs because the charity raised 50 EMUs of revenue from the auction.

And last but not least, Diane's good feeling is worth 0.05 of her contribution or $0.05 \times 50 = 2.5$ EMUs to her.

Altogether, Diane's direct and additional gains are therefore equal to $25 + 5 + 2.5 = 32.5$ EMUs. If she started the auction with an endowment of, say, 120 EMUs, she would leave it with $120 + 32.5 = 152.5$ EMUs.

What about someone like Arthur, who didn't win the auction? Let's suppose that Arthur's endowment was 110 EMUs, that the object was worth 40 EMUs to him and that he bid 15 EMUs. Arthur's direct gain is 0 EMUs (that is, he gains nothing) since he bids 15 EMUs but does not win the object. The first of his two additional gains is the same as Diane's, or $0.10 \times 50 = 5$ EMUs, while the second is $0.05 \times 0 = 0$ EMUs because he did not win and therefore his bid does not determine the auction revenue.

Altogther, Arthur's net gain is $0 + 5 + 0$ or 5 EMUs. Since he entered the auction with an endowment of 110 EMUs, he leaves with 115 EMUs.

Finally, what about those who attempted the word scrambles? Let's consider the hypothetical cases of Gerry, who does not solve his scramble, and Hannah, who does solve her scramble.

Gerry doesn't earn the 15 EMUs for solving the scramble but he does receive the $0.10 \times 50 = 5$ EMUs that each of the bidders and non-bidders received in this auction. If he started with the auction with an endowment of 120 EMUs, he therefore ends it with 125 EMUs.

Hannah earns 15 EMUs for her scramble and the $0.10 \times 50 = 5$ EMUs that all participants receive so her combined gain is 20 EMUs. If she started the auction with an endowment of 130 EMUs, for example, she ends it with 150 EMUs.

In algebraic terms, the earnings of any participant can be summarized as follows:

$$Winning \; Bidder \; Earnings = [Endowment + (Value - Bid)] + (0.10 \times Bid) + (0.05 \times Bid)$$

The total earnings for an auction participant who does not win are:

$$Earnings \; of \; other \; Bidders = Endowment + (0.10 \times Winning \; Bid)$$

The earnings of people who choose to try the scramble instead of participating in the auction are,
if you get it right:

$$Earnings \ of \ Scrambler = (Endowment + 15) + (0.10 \times Winning \ Bid)$$

if you get it wrong:

$$Earnings \ of \ Scrambler = Endowment + (0.10 \times Winning \ Bid)$$

Determination of Final Dollar Payoffs

After 10 rounds of the auction have been played, the computer will randomly pick one round to count towards your final earnings from the experiment. Because the computer will pick one round randomly, each auction period is completely independent of the others (i.e., you do **not** accumulate gains or losses from one period to the next). **However, if you make losses in the auction phase they will be deducted from the money you earn in the first, endowment phase.** The computer will report to you the randomly chosen round and your final payoff in EMUs. After the questionnaire stage is complete, the computer will report your earnings in dollars. All data collected in the experiment will be anonymous and used only for academic research. You will be paid privately, and no other participant will be told what you earned in the experiment.

Auction Details

How are the values generated?

Values are chosen randomly from the interval 0 to 100 EMUs. Your value is independent of the values of all other experiment participants and of your value from other rounds: knowing your value in a given round tells you nothing about the values of other experiment participants, and knowing your values in previous rounds tells you nothing about your value in the current round. All values between 0 and 100 are equally likely.

Tie-breakers

In the event of a tie - when two or more people make the highest bid - the computer randomly determines a winner from among the group of high bidders. Each high bidder has the same chance of winning as the others.

7.2   English Button

Introduction

Today you are participating in a decision making experiment. You will earn $10 just for showing up. The instructions are straightforward, and if you follow them you may be able to make a considerable amount of money. During the experiment, all decisions will be framed in terms of 'experimental monetary units,' or EMUs. At the conclusion of the experiment, all the EMUs that you have accumulated will be converted into real dollars at the rate of 10 EMUs per real dollar (i.e., we will divide your EMUs by 10). You will be paid in cash at the end of the experiment.

Please read these instructions carefully, as understanding the rules is essential for doing well. You may refer to these instructions at any time during the experiment. If you have any questions while these instructions are being read, please raise your hand and we will attempt to answer them. *You are not allowed to communicate with other participants during the experiment, even to clarify instructions; doing so may be grounds for dismissal from the experiment, forfeiture of earnings, and being banned from future experiments. The same*
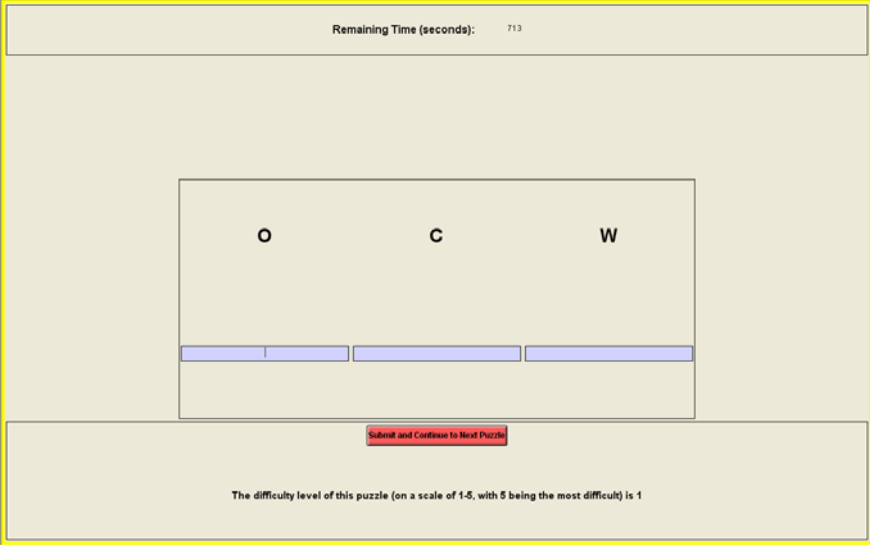
is true of opening other computer programs or modifying the computer setup during the experiment.

The experiment consists of three phases, all conducted using the computer: in the first, you will earn an amount of money, your 'endowment,' in the second you will be able to use those earnings to take part in an auction, if you so choose, and in the last phase you will complete a brief survey. Your final payoff will depend upon your performance in the first phase and your own actions as well as the actions of the other participants in the second phase.

Experiment Phase One: Endowment

During the first part of the experiment, the 'endowment phase,' you will be asked to solve a series of word scrambles—puzzles in which the letters of a word are mixed up. It is your task to unscramble them. On your computer screen you will see one scrambled word at a time, with a blank below each given letter. In each blank, enter the letter that you think belongs in that space in the correct, unscrambled word—see the example below for clarification. *In each blank, please enter only one letter, with no spaces, and use only the letters given in the original scramble. Failure to do so will result in an error message, which you will have to correct before moving on. Note that you can use the tab key to quickly move from one cell to the next.*

You will have a total of 12 minutes to correctly solve as many scrambles as you can, and for each that you solve correctly, you will earn an additional 10 EMUs. The puzzles increase in difficulty as you progress, and you will have only one chance to solve each puzzle. You may leave a puzzle blank, but once you click the 'Submit and Continue to Next Puzzle' button, you will not be able to return to that puzzle. There are a total of 25 scrambles. You will not know how many you have solved correctly until the phase is over.

Once you have reached the end of the puzzles, please sit quietly and wait for other participants to finish. At the end of the phase, the number of puzzles you solved correctly and the total EMUs you earned will be shown to you. This amount of EMUs constitutes your endowment and will be used to participate in the second phase of the experiment.

Experiment Phase Two: Auction
Motivation

In the second phase of the experiment we simulate a charity auction. Charity auctions are different from regular, for profit, auctions because everyone associated with the charity benefits from the money that is raised. In non-charity auctions, only winners benefit. To simulate this difference, participants in these charity auction simulations will earn benefits from three sources: they earn benefits from winning the auction, they earn benefits from the total amount of money raised by the auction, and they earn benefits from their own contributions. The second source of benefits represents the fact that everyone benefits when money is contributed to charity and the third source represents the fact that people often feel good about themselves for giving money.

Deciding Whether to Participate and Bidding

In the second phase of the experiment, there will be ten periods. At the beginning of each period you will decide whether you want to participate in an auction or try to solve another word scramble. In the auction, you will have the opportunity to bid on a single unit of a fictitious good. Although the good is fictitious, it will have some real 'value' to you—you can think of this as being the amount of money that the experimenter would pay you for the item if you obtained it in the auction. Each participant will learn his or her value for the item at the beginning of each period, but will not know any of the other participants' values. **Other participants will have different values.** Your value for the good will change each period, and how this value is determined is described in detail below.

If you choose to participate in the auction, you will submit a bid for the fictitious commodity. The computer will show you your value for the period and will prompt you to enter a bid. Bidding in the auction will be done via a 'price clock' the counts upwards from 0 EMUs. You will actively be bidding in the auction and commit to pay the displayed price until you click the 'Drop Out' button. In other words, your bid will be equal to the displayed price at which you click the 'Drop Out' button. The auction ends automatically when only one bidder is left. This bidder wins the fictitious good and pays the price at which the second-highest bidder dropped out. You will have to pay your bid out of your endowment, so your bid must be greater than or equal to zero but less than your endowment. Bids and values will both be denominated in EMUs. When you make a bid, you will not know how many others are participating in the auction–in each auction, there could be as few as 0 or as many as 10 total bidders, depending on the decisions of the other participants. How auction gains are determined is described in the next section.

As indicated above, participation in the auction is a choice. Before you decide to enter a bid or solve a scramble you will be shown the value you will have for the fictitious good in the auction and the difficulty of the scramble you will have to solve. If you choose not to participate in the auction, you will have 2 minutes to solve the word scramble. If you solve it within the time limit, you will earn 15 EMUs; if you do not, you will earn 0 EMUs. The difficulty of the puzzle will change randomly at the beginning of each period **but the difficulty is the same for all scramble solvers within a period.**

Auction Rules and Determining Profits

The highest bidder (i.e., the last person to drop out) wins the auction. The revenue generated by the auction is the amount paid by the auction winner. As mentioned in section

3.1, this revenue has value for all participants, regardless of whether they participate in the auction or try the scramble: **each person earns 0.10 times the total auction revenue** - the second source of benefits referred to above. The amount the winning bidder contributes to the auction revenue has an additional value for him or her, so that **the winner earns an additional 0.05 times the amount (s)he pays**. This is the third source of benefits mentioned in section 3.1.

We can work through an example to illustrate the payoffs. Suppose that 6 people have entered the auction – let's call them Arthur, Barbara, Charles, Diane, Ethan and Frances – and that four others have attempted the scramble. Suppose, too, that Diane bids the most and therefore has won the auction. To calculate how much Diane gains or loses from this win, we need to know how much she values the object and how much she bid and the amount of the second highest bid. Suppose, for the sake of argument, that the object is worth 75 EMUs to her, she dropped out at 55 and that the second highest bidder dropped out at 50. Diane will therefore have to pay 50 EMUs.

Diane's direct gain, the difference between what the object is worth and what she paid for it, is 75 – 50 or 25.

Because the revenue generated is 50, all 10 participants, will receive an additional benefit worth 0.10×50 or 5 EMUs because the charity raised 50 EMUs of revenue from the auction.

And last but not least, Diane's good feeling is worth 0.05 of her contribution or $0.05 \times 50 = 2.5$ EMUs to her.

Altogether, Diane's direct and additional gains are therefore equal to $25 + 5 + 2.5 = 32.5$ EMUs. If she started the auction with an endowment of, say, 120 EMUs, she would leave it with $120 + 32.5 = 152.5$ EMUs.

What about someone like Arthur, who didn't win the auction? Let's suppose that Arthur's endowment was 110 EMUs, that the object was worth 40 EMUs to him and that he bid 15 EMUs. Arthur's direct gain is 0 EMUs (that is, he gains nothing) since he bids 15 EMUs but does not win the object. The first of his two additional gains is the same as Diane's, or $0.10 \times 50 = 5$ EMUs, while the second is $0.05 \times 0 = 0$ EMUs because he did not win and therefore his bid does not determine the auction revenue.

Altogether, Arthur's net gain is $0 + 5 + 0$ or 5 EMUs. Since he entered the auction with an endowment of 110 EMUs, he leaves with 115 EMUs.

Finally, what about those who attempted the word scrambles? Let's consider the hypothetical cases of Gerry, who does not solve his scramble, and Hannah, who does solve her scramble.

Gerry doesn't earn the 15 EMUs for solving the scramble but he does receive the $0.10 \times 50 = 5$ EMUs that each of the bidders and non-bidders received in this auction. If he started with the auction with an endowment of 120 EMUs, he therefore ends it with 125 EMUs.

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In algebraic terms, the earnings of any participant can be summarized as follows:

$$Winning\ Bidder\ Earnings = [Endowment + (Value - Second\ highest\\ Bid] + (0.10 \times Second\ highest\ Bid) + (0.05 \times Second\ highest\ Bid)$$

The total earnings for an auction participant who does not win are:

$$Earnings\ of\ other\ Bidders = Endowment + (0.10 \times Second\ highest\ Bid)$$

The earnings of people who choose to try the scramble instead of participating in the auction are,
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$$Earnings\ of\ Scrambler = (Endowment + 15) + (0.10 \times Second\ highest\ Bid)$$

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$$Earnings\ of\ Scrambler = Endowment + (0.10 \times Second\ highest\ Bid)$$

Determination of Final Dollar Payoffs

After 10 rounds of the auction have been played, the computer will randomly pick one round to count towards your final earnings from the experiment. Because the computer will pick one round randomly, each auction period is completely independent of the others (i.e., you do **not** accumulate gains or losses from one period to the next). **However, if you make losses in the auction phase they will be deducted from the money you earn in the first, endowment phase.** The computer will report to you the randomly chosen round and your final payoff in EMUs. After the questionnaire stage is complete, the computer will report your earnings in dollars. All data collected in the experiment will be anonymous and used only for academic research. You will be paid privately, and no other participant will be told what you earned in the experiment.

Auction Details

How are the values generated?

Values are chosen randomly from the interval 0 to 100 EMUs. Your value is independent of the values of all other experiment participants and of your value from other rounds: knowing your value in a given round tells you nothing about the values of other experiment participants, and knowing your values in previous rounds tells you nothing about your value in the current round. All values between 0 and 100 are equally likely.

Tie-breakers

In the event of a tie - when two or more people make the highest bid - the computer randomly determines a winner from among the group of high bidders. Each high bidder has the same chance of winning as the others.

7.3   Basic Bucket

Introduction

Today you are participating in a decision making experiment. You will earn $10 just for showing up. The instructions are straightforward, and if you follow them you may be able to make a considerable amount of money. During the experiment, all decisions will be framed in terms of 'experimental monetary units,' or EMUs. At the conclusion of the experiment, all the EMUs that you have accumulated will be converted into real dollars at the rate of 10 EMUs per real dollar (i.e., we will divide your EMUs by 10). You will be paid in cash at the end of the experiment.
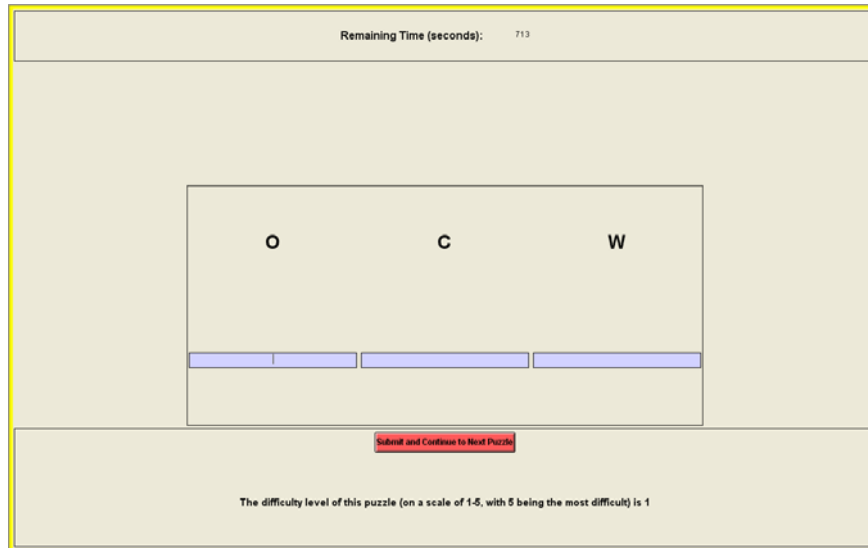
Please read these instructions carefully, as understanding the rules is essential for doing well. You may refer to these instructions at any time during the experiment. If you have any questions while these instructions are being read, please raise your hand and we will attempt to answer them. *You are not allowed to communicate with other participants during the experiment, even to clarify instructions; doing so may be grounds for dismissal from the experiment, forfeiture of earnings, and being banned from future experiments. The same is true of opening other computer programs or modifying the computer setup during the experiment.*

The experiment consists of three phases, all conducted using the computer: in the first, you will earn an amount of money, your 'endowment,' in the second you will be able to use those earnings to take part in an auction, if you so choose, and in the last phase you will complete a brief survey. Your final payoff will depend upon your performance in the first phase and your own actions as well as the actions of the other participants in the second phase.

Experiment Phase One: Endowment

During the first part of the experiment, the 'endowment phase,' you will be asked to solve a series of word scrambles—puzzles in which the letters of a word are mixed up. It is your task to unscramble them. On your computer screen you will see one scrambled word at a time, with a blank below each given letter. In each blank, enter the letter that you think belongs in that space in the correct, unscrambled word—see the example below for clarification. *In each blank, please enter only one letter, with no spaces, and use only the letters given in the original scramble. Failure to do so will result in an error message, which you will have to correct before moving on. Note that you can use the tab key to quickly move from one cell to the next.*

You will have a total of 12 minutes to correctly solve as many scrambles as you can, and for each that you solve correctly, you will earn an additional 10 EMUs. The puzzles increase in difficulty as you progress, and you will have only one chance to solve each puzzle. You may leave a puzzle blank, but once you click the 'Submit and Continue to Next Puzzle' button, you will not be able to return to that puzzle. There are a total of 25 scrambles. You will not know how many you have solved correctly until the phase is over.

Once you have reached the end of the puzzles, please sit quietly and wait for other participants to finish. At the end of the phase, the number of puzzles you solved correctly and the total EMUs you earned will be shown to you. This amount of EMUs constitutes your endowment and will be used to participate in the second phase of the experiment.

Experiment Phase Two: Auction

Motivation

In the second phase of the experiment we simulate a charity auction. Charity auctions are different from regular, for profit, auctions because everyone associated with the charity benefits from the money that is raised. In non-charity auctions, only winners benefit. To simulate this difference, participants in these charity auction simulations will earn benefits from three sources: they earn benefits from winning the auction, they earn benefits from the total amount of money raised by the auction, and they earn benefits from their own contributions. The second source of benefits represents the fact that everyone benefits when money is contributed to charity and the third source represents the fact that people often feel good about themselves for giving money.

Deciding Whether to Participate and Bidding

In the second phase of the experiment, there will be ten periods. At the beginning of each period you will decide whether you want to participate in an auction or try to solve another word scramble. In the auction, you will have the opportunity to bid on a single unit of a fictitious good. Although the good is fictitious, it will have some real 'value' to you—you can think of this as being the amount of money that the experimenter would pay you for the item if you obtained it in the auction. Each participant will learn his or her value for the item at the beginning of each period, but will not know any of the other participants' values. **Other participants will have different values.** Your value for the good will change each period, and how this value is determined is described in detail below.

If you choose to participate in the auction, you will submit bids for the fictitious commodity. This will be done by adding money to a 'bucket' which holds all the bids. Each participant will be able to bid by paying money, at least 5 EMUs at a time, into the bucket. The bucket will be passed from one participant to another in an order which is randomly

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set at the beginning of the period. Once you have placed money in the bucket, it cannot be taken back and must be paid out of your endowment, so you cannot put more than your endowment into the bucket.

At any time during the auction when it is your turn to add money to the bucket, you can 'pass' which means you pass the bucket to the next participant without adding anything. Once you pass you will be removed from the bidding for the period. The auction will end when there are two people left in the auction and one passes. **The winner of the auction will be the person who last put money into the bucket, even if that person has not added the most in total.** Bids and values will both be denominated in EMUs. How auction gains are determined is described in the next section.

As indicated above, participation in the auction is a choice. Before you decide to enter a bid or solve a scramble you will be shown the value you will have for the fictitious good in the auction and the difficulty of the scramble you will have to solve. If you choose not to participate in the auction, you will have 2 minutes to solve the word scramble. If you solve it within the time limit, you will earn 15 EMUs; if you do not, you will earn 0 EMUs. The difficulty of the puzzle will change randomly at the beginning of each period **but the difficulty is the same for all scramble solvers within a period.**

Auction Rules and Determining Profits

After all but one of the bidders have passed, the auction will end and the last person to add to the bucket will win. The revenue generated by the auction is the total amount in the bucket—the amount paid by all participants. As mentioned in section 3.1, this revenue has value for all participants, regardless of whether they participate in the auction or try the scramble: **each person earns 0.10 times the total auction revenue** - the second source of benefits referred to above. The amount each bidder contributes to the bucket has an additional value for them, so that **each bidder earns an additional 0.05 times the amount (s)he placed in the bucket**. This is the third source of benefits mentioned in section 3.1.

We can work through an example to illustrate the payoffs. Suppose that 6 people have entered the auction – let's call them Arthur, Barbara, Charles, Diane, Ethan and Frances – and that four others have attempted the scramble. Suppose, too, that after Diane added some EMUs to the bucket, Ethan, Francis, Arthur, Barbara and Charles all passed, so that Diane has won the auction. To calculate how much Diane gains or loses from this win, we need to know how much she values the object, how much she contributed to the bucket and how much all of the others contributed. Suppose, for the sake of argument, that the object is worth 50 EMUs to her, she contributed 10, and that the five other bidders put a total of 90 EMUs in the bucket.

Diane's direct gain, the difference between what the object is worth and what she paid for it, is 50 – 10 or 40.

Because 100 EMUs have been contributed to the bucket – the 10 that Diane contributed and the 90 that Arthur, Barbara, Charles, Ethan and Frances combined contributed – each of them, and each of the four non-bidders, will receive an additional benefit worth 0.10 x 100 or 10 EMUs because the charity raised 100 EMUs of revenue from the auction.

And last but not least, Diane's good feeling is worth 0.05 of her contribution or 0.05 x 10 = 0.5 EMUs to her.

Altogether, Diane's direct and additional gains are therefore equal to 40 + 10 + 0.5 =

50.5 EMUs. If she started the auction with an endowment of, say, 120 EMUs, she would leave it with 120 + 50.5 = 170.5 EMUs.

What about someone like Arthur, who didn't win the auction? Let's suppose that Arthur's endowment was 110 EMUs, that the object was worth 40 EMUs to him and that he added 30 EMUs to the bucket. (Even if Arthur contributes more than Diane, he does not win the auction if he is not the **last** one to add to the bucket.)

Arthur's direct gain is –30 EMUs (that is, he suffers a direct loss) since he bids 30 EMUs but does not win the object. The first of his two additional gains is the same as Diane's, or 0.10 x 100 = 10 EMUs, while the second is 0.05 x 30 = 1.5 EMUs because he put 30 EMUs in the bucket.

Altogether, Arthur's net gain is –30 + 10 + 1.5 or –18.5 EMUs. Since he entered the auction with an endowment of 110 EMUs, he leaves with 91.5 EMUs.

Finally, what about those who attempted the word scrambles? Let's consider the hypothetical cases of Gerry, who does not solve his scramble, and Hannah, who does solve her scramble.

Gerry doesn't earn the 15 EMUs for solving the scramble but he does receive the 0.10 x 100 = 10 EMUs that each of the bidders and non-bidders received in this auction. If he started with the auction with an endowment of 120 EMUs, he therefore ends it with 130 EMUs.

Hannah earns 15 EMUs for her scramble and the 0.10 x 100 = 10 EMUs that all participants receive so her combined gain is 25 EMUs. If she started the auction with an endowment of 130 EMUs, for example, she ends it with 155 EMUs.

In algebraic terms, the earnings of any participant can be summarized as follows:

$$Winning\ Bidder\ Earnings = [Endowment + (Value - Amount\ Placed\ in\ Bucket)] + 0.10 \times (Total\ Amount\ in\ Bucket) + 0.05 \times (Amount\ Placed\ in\ Bucket)$$

Where *Amount Placed in Bucket* is the amount added by just this bidder, and *Total Amount in Bucket* is the amount added by all bidders combined. The total earnings for an auction participant who is not the last one to add to the bucket are:

$$Earnings\ of\ other\ Bidders = (Endowment - Amount\ Placed\ in\ Bucket) + 0.10 \times (Total\ Amount\ in\ Bucket) + 0.05 \times (Amount\ Placed\ in\ Bucket)$$

The earnings of people who choose to try the scramble instead of participating in the auction are,
if you get it right:

$$Earnings\ of\ Scrambler = (Endowment + 15) + 0.10 \times (Total\ Amount\ in\ Bucket)$$

if you get it wrong:

$$Earnings\ of\ Scrambler = Endowment + 0.10 \times (Total\ Amount\ in\ Bucket)$$

Determination of Final Dollar Payoffs

After 10 rounds of the auction have been played, the computer will randomly pick one round to count towards your final earnings from the experiment. Because the computer will pick one round randomly, each auction period is completely independent of the others (i.e., you do **not** accumulate gains or losses from one period to the next). **However, if you make losses in the auction phase they will be deducted from the money you earn in the first, endowment phase.** The computer will report to you the randomly chosen round and your final payoff in EMUs. After the questionnaire stage is complete, the computer will report your earnings in dollars. All data collected in the experiment will be anonymous and used only for academic research. You will be paid privately, and no other participant will be told what you earned in the experiment.

Auction Details

How are the values generated?

Values are chosen randomly from the interval 0 to 100 EMUs. Your value is independent of the values of all other experiment participants and of your value from other rounds: knowing your value in a given round tells you nothing about the values of other experiment participants, and knowing your values in previous rounds tells you nothing about your value in the current round. All values between 0 and 100 are equally likely.

How much and how little can I add to the bucket?

You can add as little as 5 EMU, and as much as you like as long as the total amount you have placed in the bucket does not exceed your endowment. The bucket will start out empty. If all active bidders pass the bucket before anyone adds money to it, the auction ends, there is no winner and auction revenues and all auction participants' gains are zero. If this is the randomly chosen round for payment, all the auction participants will just earn their phase one endowments.

8 Appendix B - The Survey

Experiment Summary and Concluding Questionnaire

While we determine how much money we owe you, please complete a short questionnaire to be used in our analysis of the experimental data. The questionnaire should take less than 10 minutes to complete. All responses will be kept confidential and will not be stored with any personally identifiable information. By completing this survey, you consent to having this anonymous information used solely for purposes of academic research.

[Begin Questionnaire]

Questionnaire (Page 1 of 6) - Basic Information

How old are you? _____

What is your sex?
- ○ Female
- ○ Male

From which group were you recruited?
- ○ Student
- ○ Staff
- ○ Faculty
- ○ Not directly affiliated with the College

Which of these racial/ethnic groups describes you best?
- ○ White/Caucasian
- ○ African-American
- ○ Asian-American/Asian
- ○ Latino/Hispanic
- ○ Other/Mixed

Were you born in the United States?
- ○ Yes
- ○ No

If you were not born in the U.S., how many years have you lived here? _____

What is the zip code of your permanent residence?
_____

What is your occupation?
_____

How much schooling have you had?
- ○ less than High School
- ○ High School degree
- ○ some College
- ○ College degree
- ○ Graduate degree

What is your annual household income?
- ○ less than $25,000
- ○ $25,001 - $50,000
- ○ $50,001 - $75,000
- ○ $75,001 - $100,000
- ○ $100,001 - $125,000
- ○ $125,001 - $150,000
- ○ more than $150,000

[Continue to Next Page]

Questionnaire (Page 2 of 6) - Your thoughts

In how many economics experiments (besides this one) have you participated?

Have you ever participated in a charity auction?
- ○ Yes
- ○ No

Have you ever participated in a non-charity auction?
- ○ Yes
- ○ No

Approximately how many auctions have you participated in over the past 2 years (including online auctions like eBay)?
- ○ none
- ○ 1 - 10
- ○ more than 10

How difficult was it to understand the rules of this experiment?

very easy |_____| very difficult

Briefly, how did you decide whether or not to participate in a given round?

[   ]

Briefly, how did you decide what to bid in the auction (or how much money to spend on tickets in the raffle)?

[   ]

In the **first** round in which you bid or bought raffle tickets, how difficult was it to decide how much money to spend?

very easy |_____| very difficult

In the **last** round in which you bid or bought raffle tickets, how difficult was it to decide how much money to spend?

very easy |_____| very difficult

In your opinion, how many rounds (between 1 and 10) would it take the typical person to fully understand this fundraising mechanism?

Do you think that participants in this fundraising mechanism are treated fairly?

no |_____| yes

[Continue to Next Page]

Questionnaire (Page 3 of 6)

We are interested in your opinion as to the ability of different mechanisms to raise money for charity. Please consider some other mechanisms that you might not have participated in today. In each case we will describe the mechanism and then ask you how well you think it will perform based on three criteria: revenue for the charity, fairness to participants and complexity.

Move the slider bar to the left or right to indicate your ranking.

The **standard auction** in which an auctioneer calls out prices and the highest bidder wins and pays his or her bid.

Low revenue |_____| High revenue

Unfair to participants |_____| Fair to participants

Easy to understand |_____| Very complex

The **all-pay auction** in which the highest bidder wins but all participants have to pay their bids whether they win or lose.

Low revenue |_____| High revenue

Unfair to participants |_____| Fair to participants

Easy to understand |_____| Very complex

The **silent auction** in which participants write bids on a sheet of paper and the highest bidder wins and pays his or her bid.

Low revenue |_____| High revenue

Unfair to participants |_____| Fair to participants

Easy to understand |_____| Very complex

[Continue to Next Page]

Questionnaire (Page 4 of 6)

Please continue your ranking with the next two mechanisms.

The **raffle** in which participants buy tickets and the winning ticket is drawn at random.

Low revenue |___,___,___,___| High revenue

Unfair to participants |___,___,___,___| Fair to participants

Easy to understand |___,___,___,___| Very complex

The mechanism you participated in today if it is not listed above.

Low revenue |___,___,___,___| High revenue

Unfair to participants |___,___,___,___| Fair to participants

Easy to understand |___,___,___,___| Very complex

[Continue to Next Page]

Questionnaire (Page 5 of 6)

We would also like to ask you a few questions about your personal preferences and attitudes.

In general, do you see yourself as someone who is willing, even eager, to take risks, or as someone who avoids risks whenever possible?

unwilling to take risks |___,___,___,___,___,___,___| willing to take risks

Concerning just personal financial decisions, do you see yourself as someone who is willing, even eager, to take risks, or as someone who avoids risks whenever possible?

unwilling to take risks |___,___,___,___,___,___,___| willing to take risks

In general, do you see yourself as someone who, when faced with an uncertain situation, worries a lot about possible losses, or someone who seldom worries about them?

unwilling to incur losses |___,___,___,___,___,___,___| willing to risk losses

Concerning just personal financial decisions, are you someone who, when faced with an uncertain situation, worries a lot about possible losses, or someone who seldom worries about them?

unwilling to incur losses |___,___,___,___,___,___,___| willing to risk losses

In general, how competitive do you think that you are?

Don't like to compete |___,___,___,___,___,___,___| Very competitive

Concerning just sports and leisure activities, how competitive do you think that you are?

Don't like to compete |___,___,___,___,___,___,___| Very competitive

[Continue to Last Page]

Questionnaire (Page 6 of 6)

Lastly, we would also like to ask you to predict how you would behave in a few hypothetical situations.

Imagine that you've decided to see a movie in town and have purchased a $10 ticket. As you're waiting outside the theater for a friend to join you, you discover that you've lost the ticket. The seats are not marked and the ticket cannot be recovered because the person who sold it doesn't remember you. Would you buy another $10 ticket?

○ Yes
○ No

Imagine that a month ago, you and a friend made a non-refundable $100 deposit on a hotel room in Montreal for the coming weekend. Since the reservation was made, however, the two of you have been invited to spend the same weekend at another friend's cottage in Vermont. You'd both prefer to spend the weekend at the cottage but if you don't go to Montreal, the $100 deposit will be lost. Would you still go to Montreal?

○ Yes
○ No

Finally, imagine that sometime during the summer of 2000, you purchased several bottles of the same wine at a price of $20 each, in anticipation of some later celebration. The celebration never happened, however, and, until now, the bottles were forgotten. You find out, however, that the wine can now be sold on eBay for $75 per bottle. You nevertheless decide to drink one of the bottles. Which of the following best captures your own feeling of the cost, to you, of drinking the bottle?

○ -$55
○ $0
○ $20
○ more than $20 but less than $75
○ $75

[Finished]

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