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Does a promise script work to reduce the hypothetical bias? Evidence from an induced value experiment

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Abstract
This paper explores whether a truth-telling promise can work to reduce the hypothetical bias in preference elicitation. Using an induced value experiment in China with a random nth-price auction, the author finds: 1) Hypothetical bias exists in a random nth-price auction with induced values and making a truth-telling promise can reduce the hypothetical bias. 2) All treatments are demand-revealing except for the hypothetical baseline.

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Keywords Hypothetical bias; oath; random *n*th-price auction; induced value experiment

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1 Introduction

Cost and benefit analysis is important in policy decision making. However, there is no direct market for environmental goods. Economists rely on the contingent valuation methods (CVM) to measure the environmental benefits to the public. However, many literature find there is a hypothetical bias – the gap between subjects' stated willingness to pay and their real willingness to pay (Bohm (1972); List and Gallet (2001); Murphy et al. (2005); Ehmke et al. (2008)). The gap leads to critics about the reliability of the CVM method (Hausman (2012)). To eliminate the hypothesis bias, many methods such as CVM-X, cheap talk, and consequentiality are proposed with mixed success (Fox et al. (1998); Cummings and Taylor (1999); Carson and Groves (2007)). Cummings and Taylor (1999) introduce a cheap talk script by informing subjects there is a tendency for them to overestimate the willingness to pay. They find that cheap talk can reduce the hypothetical bias and perform equally as well as real monetary incentives in referendums of public goods. However, the effect of cheap talk depends on the length of the script and the type of respondent. Aadland and Caplan (2006) use a short and neutral cheap talk script in a 4,000-household phone contingent valuation survey and find that the cheap talk script exacerbates the hypothetical bias. They suggest caution in using cheap talk to control the hypothetical bias ex-ante. Contemporary guidance for CVM studies is compiled by renowned environmental economists to promote the best practice of CVM and to increase its reliability (Johnston et al. (2017)). A recent attempt to eliminate the hypothetical bias is proposed by Jacquemet et al. (2013). They use a solemn oath script and find it leads to truth-telling in an induced value experiment. In the homegrown valuation experiment, the oath also reduces the hypothetical bias. The effect of the oath is tested by later studies which are summarized in Table 1 with success.

Although oaths work well in reducing the hypothetical bias, it might be too strong a mechanism. Oaths are rare and typically used only in serious situations such as the court, marriage, or joining a political party. Overuse of the oath may weaken its power. I step back and use a weaker version of the oath: a promise. The open question I consider is whether the promise is still a sufficiently strong commitment device to induce truth-telling in preference elicitation. If so, the promise could be used as a substitute for an oath in stated preference methods without a loss of commitment. If not, the oath is still the non-market commitment mechanism that one needs to use to generate more sincere bidding in preference elicitation.

Herein I step back and explore whether a more common promise works as well as the rare oath to create a commitment to truth-telling in a random nth-price auction (see Shogren et al. (2001b)). I find that hypothetical bias exists and making a promise did improve subjects' sincere bidding.

To the best of my knowledge, my paper is the first directly test the effect of a promise script in reducing the hypothetical bias in an induced value (IV) experiment. The IV experiment allows me to know the real private values and to calculate the hypothetical bias. My paper differs from Carlsson et al. (2013), which use a promise script in the field with a contingent valuation study in both China and Sweden. My paper also differs from Jacquemet et al. (2013) which tests the effect of an oath in France with a Vickrey auction. I use a random nth-price auction and run it in China. The random nth-price auction has some improvements over the Vickrey auction as it is

Table 1: Oath and environmental valuation

	Findings
Jacquemet et al. (2013)	Oath treatment performs better than other treatments such as money, hypothetical, and money+oath, in an induced value experiment In a homegrown value experiment, oath reduces hypothetical bias and increases bids relative to the real treatment Eliciting mechanism: second price auction
Stevens et al. (2013)	Oath eliminates hypothetical bias in a homegrown public good experiment Eliciting mechanism: referendum BDM
de Magistris and Pascucci (2014)	Oath reduces WTP Eliciting mechanism: hypothetical choice experiment for a private good
Carlsson et al. (2013)	Oath reduces extreme WTP values and results in small variance. Oath reduces WTP in China, and increases WTP in Sweden Eliciting mechanism: contingent valuation
Jacquemet et al. (2017)	They reject the null hypothesis that a hypothetical bias does not exist Oath increases truthfulness in votes and people who sign an oath are significantly less likely to vote for a public good. Eliciting mechanism: voting referenda

incentive-compatible and can engage both on-margin bidders and off-margin bidders (Shogren et al. (2001b)).

2 Experimental Design

The goal of commitment theory is to create a nonmarket mechanism to correct the hypothetical bias ex-ante. This experiment follows Jacquemet et al. (2013), but I start by using the weaker promise as a commitment device to see whether subjects bid sincerely in a random nth-price auction. This is an ex-ante approach to correct both the hypothetical bias in a hypothetical survey and the downward bias in a real economic commitment auction. The experiment uses an induced value auction and has four treatments: (i) baseline hypothetical, (ii) hypothetical + promise, (iii) monetary incentive, and (iv) monetary + promise. The experimental design and the main features of the experiment are summarized in Table 2.

Design of the IV experiment. I use a random nth-price auction as the elicitation mechanism. In a random nth-price auction, the market price will be determined by a random draw from the bids. If a random draw is the nth highest bid, the $n-1$ highest bidders will win the auction and pay the nth highest bid (Shogren et al. (2001b)). The random nth-price auction mechanism works

Table 2: Experimental Design

	Commitment	Induced value
Baseline-hypothetical		X
Promise	X	X
Monetary incentive		X
Monetary incentive + Promise	X	X
Number of repetition	1	9
Group size	1	9 (2 groups for each treatment)
Payment	-	sum of earnings in each round

similarly to the classic second-price auction except for the market-clearing price.[1] After all the bids are ranked, a random number will be drawn from $[2,N]$ (the number of total participants). Assuming that n is the randomly drawn number, the $n-1$ highest bidders will win the auction and pay the nth highest price. The merits of this mechanism are that it separates what you pay from what you say like the Vickrey auction and it also has more than one winner like the BDM (Becker-deGroot-Marschak) mechanism (Becker et al. (1964)). This mechanism is incentive compatible and also has an endogenously determined market-clearing price. Shogren et al. (2001b) show that this mechanism is demand revealing in aggregate like the Vickrey auction and that it can engage both the on-margin bidders and the off-margin bidders. Previous studies employing the random nth-price auction include Fox et al. (1998), Shogren et al. (2001a); Shogren et al. (2001b), List and Shogren (1998), Parkhurst et al. (2004), and Lusk and Rousu (2006). These studies prove that the random nth-price auction can reveal the subjects' true preferences in aggregate and engage off-margin bidders.

I run the experiment in China. Chinese are more experienced with promises than with oath taking (Carlsson et al. (2013)). Subjects are recruited from Xi'an Jiaotong University, Xi'an. I place a notice on a campus bulletin board to recruit participants. Subjects are students from different majors. The experiments are carried out in a classroom. My instructions and questionnaires (see the appendix) are translated into Chinese from Jacquemet et al. (2013). I make some changes to fit the random nth-price auction. Subjects are not informed that their dominant strategy is to bid their resale values.

Each round has 9 steps.

Step 1. The experimenter assigns each bidder a resale value on his or her record sheet. The resale value is the price at which the bidder can sell the good back to the monitor after the experiment. Each bidder knows nothing about the other bidders' resale value. The resale value is drawn from a uniform distribution. The demand curve is 84; 76; 71; 68; 65; 63; 53; 38; 24 (It is similar to Jacquemet et al. (2013)). It is in Experimental Currency Unit (ECU) and 3 ECU=1 RMB. Each bidder is endowed with each value once during the experiment.

[1] Vickrey (1961)'s second-price auction has been a popular tool in the lab to elicit subjects' preferences for private goods. The Vickrey second-price auction works as follows: each subject submits his/her bid for a private good, and the bids are ranked from highest to lowest. The highest bidder wins the good and pays the second-highest price.

Step 2. Each bidder then submits a bid to buy one unit of the good.

Step 3. The experimenter ranks the bids from highest to lowest. In the event of ties, the ranking is drawn randomly.

Step 4. A random number will be drawn to determine how many participants will win the good. The random number will be somewhere between 2 and the total number of participants. Call this random number N.

Step 5. The $N-1$ highest bidders will win the auction, and all winning bidders will pay the amount of the Nth highest bid for the exchange. For example, if the random number 5 is selected and the 5th highest bid is 40, the 4 highest bidders will win the auction and pay 40 for the good.

Step 6. The winning bidders then sell the unit back to the monitor. The price of this transaction is the resale value given to the subject on his/her record sheet in step 1. The profit that winning bidders earn for that round is the difference between the resale value and the market price: profit = resale value - market price (the Nth highest). Subjects are informed that they can have a negative profit if the market price is higher than their resale values.

Step 7. All bidders at or below the market price buy nothing; they make zero profit for that round.

Step 8. End of the round. The profit in that round appears on the subjects' record sheets.

Step 9. Go to the next round by going back to step 1. A new resale value for this new round will show up on the subjects' record sheets.

Each treatment is composed of two sessions. Each session has 9 bidders participating in 9 rounds. In all sessions, subjects are told that they will get a participation payment of RMB 30 yuan. In both the hypothetical and the promise treatments, subjects are clearly told that they will get a fixed payment of RMB 30 yuan. In the monetary incentive treatment, subjects are told that their payments depend on their decisions. All payments will be made after the experiment. Before the actual auction phase, a nonnumerical example is developed covering all the instructions. However, subjects are not told that bidding one's resale value is the dominant strategy. Subjects are also asked to complete a short questionnaire about the important features of the game before the experiment starts. Subjects' sociodemographic data are collected after the auction. Overall, 72 subjects participated in the experiment. 44 are male and 28 are female. Subjects have different majors and include both undergraduate and graduate students. The experiment lasts around an hour and a half, and the take-home earnings are 30 yuan in the baseline and promise treatments and 48.1 yuan in the real monetary incentive treatment. In Xi'an, a student is paid 8 RMB /hour on campus on average. The high experimental earnings encourage subjects to take the experiment seriously, especially in the monetary incentives treatments.[2]

The promise script. Figure 1 shows the promise script. The promise treatment is identical to the baseline treatment except for the promise script. In the promise treatment, each subject is asked to freely read aloud the promise script and sign it before entering the lab. Subjects are not informed about the nature of the experiment.

[2] Fischbacher et al. (2001) argue a high stake level can make subjects take experiments more seriously. Studies such as Slonim and Roth (1998) find that stakes matter in ultimatum games.

Promise script

I promise upon my honor that, during the whole experiment, I will:

Tell the truth and always provide honest answers.

Xi'an Jiaotong University 签名 _____ 日期 _____

Signature **Date**

Figure 1: Promise script

3 Results

Table 3 provides raw data on observed bids by treatment and round. We see that the subjects in the baseline treatment significantly inflated their bids. The average demand revelation is 137%. In the promise, monetary incentives, and promise + monetary incentive treatments, subjects inflate their bids and the average demand revelations are 118%, 110%, and 110%. I do not find that any treatment is perfectly demand-revealing just by inspecting the summary data.

Table 4 shows that a random nth-price auction can engage off-margin bidders (e.g., IV=24, 38, 53). On-margin bidders usually inflate their bids (e.g., IV=76, 84). In all four treatments, demand revelations are larger than 100% for both the lowest resale value and the highest resale value (except for the promise + monetary incentive treatment).

Table 5 shows the frequency of actual bids relative to private values which are the same as induced values. I find that in all four treatments, most subjects inflate their bids. In the baseline, promise, monetary incentives, and monetary + promise treatments, 61.7%, 51.8%, 56.2%, and 53.1% of bids are higher than the induced value, respectively. I also find that the promise, monetary incentives, and monetary + promise treatments perform relatively well: 57.4%, 55.6%, and 58.6% of bids are within 10% of the induced value, respectively. I now state my first result.

Table 3: Aggregate bidding behavior by treatment and round

	Aggreg. Demand	Round									
		1	2	3	4	5	6	7	8	9	Total
IV-Baseline	1084	2115	1221	1256	1519	1550	1474	1517	1385	1323	13360
		195	113	116	140	143	136	140	128	122	137
IV-Promise	1084	1274	1175	1540	1240	1338	1267	1111	1267	1279	11491
		118	108	142	114	123	117	103	117	118	118
IV-Monetary incentive	1084	1177	1189	1197	1219	1169	1215	1189	1208	1135	10698
		109	110	110	112	108	112	110	111	105	110
IV-Promise +	1084	1300	1281	1090	1172	1126	1207	1223	1171.5	1119	10689.5
Monetary incentives		120	118	101	108	104	111	113	108	103	110

Note: the second column reports the aggregate demand, which is defined as the sum of the resale value attributed to the subjects. For each treatment in row, the upper number represents the sum of observed bids, the lower number represents the percentage of the sum of the bids relative to the aggregate demand in %.

Table 4: Aggregate bidding behavior by treatment and induced value (IV)

	IV	24	38	53	63	65	68	71	76	84
	AD	432	684	954	1134	1170	1224	1278	1368	1512
IV-Baseline	RAD	618	699	1310	2341	1523	1566	1667	1857	1779
	RAD/AD	143	102	137	206	130	128	130	136	118
IV-Promise	RAD	723	756	1082	1308	1343	1363	1466	1674	1776
	RAD/AD	167	111	113	115	115	111	115	122	117
IV-Monetary incentive	RAD	513	743	1045	1256	1253	1338	1363	1522	1665
	RAD/AD	119	109	110	111	107	109	107	111	110
IV-Promise+	RAD	517	768	1054	1257	1297	1374	1429	1514	1481
Monetary incentive	RAD/AD	120	112	110	111	111	112	112	111	98

Note: the first row reports the induced values attributed to buyers. The second row reports the corresponding aggregate demand (AD) in each treatment. For each treatment in row, the upper number represents the revealed aggregate demand (RAD). The lower number represents the percentage of the revealed demand relative to the aggregate demand in %.

Result 1: *Hypothetical bias exists in the random nth-price auction with induced values (IV). Making a truth-telling promise can reduce IV hypothetical bias.*

Support: Hypothetical bias is the difference between the hypothetical bidding and the real money bidding (Jacquemet et al. (2013)). To test whether a difference exists between bidding behavior under the hypothetical and the real money treatments, I use the Wilcoxon rank-sum test to test the null hypothesis that the two treatments' bids are equally distributed. I reject the null hypothesis at the 5% significance level as the test statistics $z = 2.19$ and $p = 0.029$. Also, a median test resulted in a Pearson χ^2 test statistic of 3.1648 ($p = 0.075$); I reject at the 10% significance level the null hypothesis that the two treatments are drawn from populations that have identical medians. Subjects bid more in the hypothetical treatment than in real money treatment. Hypothetical bias exists.

Table 5: Frequency of actual bids relative to private value

	Bids			Bids±10%[b]		
	notation[a]	number	percentage	notation[a]	number	percentage
Baseline	=	27	16.67	=	51	31.48
	>	100	61.73	>	87	53.7
	<	35	21.6	<	24	14.81
Promise	=	48	29.63	=	93	57.41
	>	84	51.85	>	58	35.8
	<	30	18.52	<	11	6.79
Monetary incentives	=	30	18.52	=	90	55.56
	>	91	56.17	>	58	35.8
	<	41	25.31	<	14	8.64
Monetary+Promise	=	46	28.4	=	95	58.64
	>	86	53.09	>	45	27.78
	<	30	18.52	<	22	13.58

a. Notation: =, bid equals resale value; >, bid is larger than resale value, <, bid is less than resale value
b. ±10%: an individual's bid is within 10% of his or her resale value

Table 6 summarizes related work examining hypothetical bias within induced value experiments. Although most literature finds hypothetical bias in homegrown valuation (for a literature survey, see Murphy et al. (2005)), Taylor et al. (2001), Vossler and McKee (2006), Mitani and Flores (2009), and Murphy et al. (2010) find no hypothetical bias in their induced value experiments. These studies use mechanisms such as referendums, dichotomous choices, and BDMs. The goods involved include both public goods and private goods. Cherry et al. (2004) use a second-price auction and find that there is hypothetical bias. The difference between these findings and this experiment can be attributed to differing elicitation mechanisms.

I use the Wilcoxon rank-sum test to test the null hypothesis that the promise treatment's and the real money treatment's bids are distributed equally. I fail to reject the null hypothesis with test statistics $z = 0.315$ ($p = 0.7527$). In addition, a median test resulted in a Pearson χ^2 test statistic of 0.0000 ($p = 1.000$); I fail to reject the null hypothesis that the two treatments are drawn from populations that have identical medians. I use the Wilcoxon rank-sum test to test the null hypothesis that the promise treatment and the hypothetical treatment's bids are distributed equally. I reject the null hypothesis at the 10% significance level with test statistics $z = -1.723$ ($p = 0.0849$). A median test resulted in a Pearson χ^2 test statistic of 3.1648 ($p = 0.075$); I reject at the 10% significance level the null hypothesis that the two treatments are drawn from populations that have identical medians. Subjects in the promise treatment bid lower than in the hypothetical treatment; their bids were closer to the real money treatment, indicating less hypothetical bias.

Result 2: *All treatments are demand-revealing except for the hypothetical baseline.*

Support: To test the hypothesis of perfect demand revelation, I assume that the true bidding function is linear in the induced value (Shogren et al. (2001b)):

$$b_{it} = \alpha + \beta v_{it} + \phi_t + \alpha_i + \varepsilon_{it} \tag{1}$$

Table 6: Hypothetical bias and induced value experiments

	Findings
Taylor et al. (2001)	No hypothetical bias. Eliciting mechanism: closed referendum for a public good Demand curve: 1, 2, 3, 4, 4.5, 4.75,4.9, 4.95, 5.05, 5.10, 5.25, 5.5, 6, 7, 8, 9, 10 in dollar The hypothetical and real induced value referenda perform equally well in eliciting demand The hypothetical bias in homegrown value studies is a value formation problem;
Vossler and Mckee (2006)	No hypothetical bias Eliciting mechanism: dichotomous choice, dichotomous choice with follow-up certainty question, payment card, and multiple-bounded discrete choice. Demand curve: uniformly distributed from \$1.5 to \$9.5, increment in 1 dollar
Mitani and Flores (2009)	No hypothetical bias Eliciting mechanism: a threshold provision public good experiment Demand curve: (3, 5, 7, 9, or 11 tokens), 5 rounds
Murphy et al. (2010)	No hypothetical bias in the induced value experiment; hypothetical bias in the homegrown value experiment Eliciting mechanism: BDM for the private good, and referendum for public good and public provided private good Induced value: \$4.5, \$11.5, and homegrown value 5 rounds
Cherry et al. (2004)	Hypothetical bias Eliciting mechanism: second price auction Demand curve: \$8.4, \$7.6, \$7.1, \$6.8, \$6.5, \$5.3, \$3.8, \$2.4, \$1.8, \$0.9 10 rounds

where b_{it} is the bid of subject i in round t, v_{it} is subject i's induced value at round t, ϕ_t are rounding effects, α_i are subject-specific characteristics, and ε_{it} is bidding error. Assuming individual random effects, I also controlled for round fixed effects in the regression. Table 7 presents the estimation results. I test the following hypothesis for each treatment:

The null hypothesis for the baseline treatment is that the IV baseline treatment is demand revealing H_0:($\beta = 1$ and $\alpha = 0$). The alternative hypothesis is that the IV baseline treatment is not demand revealing $H_1 : (\beta \neq 1$ or $\alpha \neq 0)$. The null hypothesis tests whether subjects bid their exact induced values in a hypothetical setting, i.e., $b_{it} = v_{it}$. Results from chi-squared tests for the four treatments are:

IV baseline : $\chi^2(1) = 12.01, p = 0.0024, H_0$ rejected

IV baseline + promise : $\chi^2(1) = 2.71, p = 0.258, H_0$ not rejected

IV monetary Incentives + promise: $\chi^2 = 5.15, p = 0.076, H_0$ not rejected at the 5% significance level.

IV monetary: $\chi^2(1) = 4.18, p = 0.1238, H_0$ not rejected

The perfect demand revelation in the baseline is rejected. I fail to reject the perfect demand revelation in the baseline + promise, monetary incentives, and monetary incentives + promise treatments. I also control for subjects' age, gender, and party affiliation, the results are qualitatively the same. [3]

[3] The results are available upon request

Table 7: IV bidding behavior - Individual random effect model estimation

Variable	IV Baseline n=162	IV Baseline +Promise n=162	IV-Monetary incentives n=162	IV-Monetary incentives + Promise n=162
v_{it}	1.314	1.047	1.071	0.992
	(0.30)	(0.09)	(0.05)	(0.08)
Constant	38.32	7.7	0.863	12.435
	(24.88)	(8.76)	(4.63)	(7.01)
Round Dummies	Yes	Yes	Yes	Yes
σ_μ	28.36	19.27	8.43	14.24
σ_ε	67.64	21.15	11.8	17.35
Wald chi2(1)	26.4	141.03	428.83	177.24

Standard errors are in parentheses

4 Conclusion

After fifty years of nonmarket valuation work, hypothetical bias is still observed in stated preference studies. In response, Jacquemet et al. (2013) introduced the oath as an ex- ante nonmarket commitment device to get people to commit to telling the truth about their preferences. They found that the oath leads to more sincere bidding in hypothetical induced value and homegrown value experiments in a second-price auction (Jacquemet et al. (2013)). Herein I step back and explore the promise as a commitment device because oaths could be perceived as too powerful and too special to be commonly used in nonmarket valuation work. I focus on the performance of a promise script in a random nth-price auction in an induced value experiment in China. I find that in the induced value experiment, hypothetical bias exists and a promise of truth-telling helps: bidders are more like to bid sincerely.

Although I find some support for the use of a promise script to reduce the hypothetical bias, I recognize my sample size is relatively small. Future research can use a larger and more diversified sample to test the hypothesis. In addition, it is also helpful to test this hypothesis in other cultures context.

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A Appendix

The instructions and questionnaires are based on Jacquemet et al. (2013). We make some changes to fit the random nth price auction. The random nth price auction instruction is based on Lusk and Shogren (2007).

A.1 Instructions

Part 1 Thank you for agreeing to participate in today's session. As you entered the room, you should have been assigned an ID number, which is located on the upper right hand corner of the instruction. You will use this ID number to identify yourself during this research session. We use random numbers in order to ensure confidentiality.

Before we begin, I want to emphasize that your participation in this session is completely voluntary. If you do not wish to participate in the experiment, please say so at any time. Non-participants will not be penalized in any way. I want to assure you that the information you provide will be kept strictly confidential and used only for the purposes of this research.

For obvious scientific reasons, it is mandatory not to speak during the experiment. Unfortunately, we will have to ask any participant not complying with this rule to leave the room without any opportunity to take potential earnings.

It is very important you understand the procedure of the experiment. If you have any questions, please raise your hand, someone will come and answer you. Thank you for following these rules.

PAYMENT OF YOUR EARNINGS

Your earning during the experiment will be expressed in ECU (Experimental Currency Unit). These earnings are converted into RMB according to the rate: 3 ECU=1RMB. A fixed fee equal to 30 yuan is added to this payoff. You will be paid privately the corresponding monetary payoff in cash at the end of the experiment.

Instructions

At the beginning of this part, there are () participants.

Overview. You will be participating in an auction in which you are a buyer. You have to offer, at each round, a price in ECU to buy a good. The experiment monitor will re-acquire this good from you. There will be several rounds of bidding. The outcome of each auction in each round has no influence on how much you will get paid at the end of the experiment (Monetary incentives: The outcome of each auction in each round has directly influence on how much you will get paid at the end of the experiment).

PROCEDURE FOR EACH ROUND

Each round has 8 steps.

Step 1. Each bidder looks at his or her resale value on his or her recording sheet. We term resale value the price in ECU the monitor will pay to buy back a unit of the good that is purchased in the auction. The resale values of different participants can be different.

Step 2. Each bidder then submits a bid in ECU to buy one unit of the good. A monitor will come and collect all the bids.

Step 3. The monitor ranks the bids from highest to lowest. For instance:

#1$a.aa$ ECU Highest bid

#2$b.bb$ ECU

#3$c.cc$ ECU

#4$d.dd$ ECU

#5$e.ee$ ECU

#6$f.ff$ ECU

#7$g.gg$ ECU

#8$h.hh$ ECU

#9$i.ii$ ECU

#10$j.jj$ ECU Lowest bid

Step 4. A random number will be drawn to determine how many participants will win the good. The random number will be somewhere between 2 and the total number of participants. Call this random number N.

Step 5. The $N-1$ highest bidders will win the auction and all winning bidders will pay the Nth highest bid amount for the exchange. In the above example, there were ten participants that submitted bids and the number 4 was randomly drawn by the monitor (i.e. $N=4$). In this case, the 3 $(N-1)$ highest bidders will win the auction and each will pay the 4th highest bid ($\$d.dd$) amount for the good.

Step 6. The winning bidders then sell the unit back to the monitor. The price of this transaction is the resale value listed for that round on his/her recording sheet. The profit in ECU winning bidders earn for that round is the difference between the resale value and the market price:

profit = Resale value - market price (the Nth highest)

Suppose your resale value is 6.50 ECU, the Nth highest price is 5.00 ECU, and you are one of the $(N-1)$ highest bidders. This implies you buy one unit of the good at the Nth highest price 5.00 ECU and sell it to the monitor at your resale value 6.50 ECU. Your profit is positive, 1.50 ECU (=6.50-5.00).

Important note. You can have negative profits: if you buy a unit of the good and the resale value is less than the market price, your profits will be negative. Example: If your resale value was 4.50 ECU and the market price was 5.00 ECU, your profit is negative,

-0.50 ECU (=4.50-5.00).

Step 7. All bidders at or below the market price (buyers #4 to #10) buy nothing, they make zero profit for that round.

Step 8. End of the round. Your profit in ECU in that round is calculated on the recording sheet.

Step 8. The next round starts and the monitor assigns a new resale value for each participant on his/her recording sheet.

EARNINGS FOR THIS PART

Your payoff in ECU for this part is 0 whatever your earnings at each period. [Monetary incentives: Your payoff in ecu for this part is set equal to the sum of your earnings at each period.]

A.2 Pre-experiment questionnaire

1. Groups are reformed in each round.
YES NO
2. Each group is composed of ( ) participants.
3. At the beginning of each round, all participants belonging to my group are attributed the same resale value.
YES NO
4. When I make a bid, I can bid any amount I wish.
YES NO
5. The market price is set by the bid of the highest bidder in my group.
YES NO
6. If my bid is the 3rd highest bid and is equal to RR.U and the random number drawn is 4. The 4th highest bid is GG.K. Then I buy the unit of the good.
YES NO
If yes, I pay: ( ) for the good.
7. If I purchase a unit of the good and my resale value is greater than the market price, I will make positive profits.
YES NO
8. The monetary payoff I will get at the end of the experiment depends on the amount I earned in the auction.
YES NO
If you are surprised by some answers, please ask questions.