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# STATUS IN MARKETS\*

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This project tests for the effect of social status in a laboratory experimental market. We consider a special “box design” market in which a vertical overlap in supply and demand ensure that there are multiple equilibrium prices. We manipulate the relative social status of our subjects by awarding high status to a subset of the group based on one of two procedures. In the first, a subject’s score on a trivia quiz determines his or her status; in another, subjects are assigned randomly to a higher-status or lower-status group. In both treatments we find that average prices are higher in markets where higher-status sellers face lower-status buyers, and lower when buyers have higher status than sellers. Across all sessions, the higher-status side of the market captures a greater share of the surplus, earning significantly more than their lower-status counterparts.

## I. INTRODUCTION

This paper reports laboratory experiments that examine the effects of status in a market setting. We find that status appears to have a significant effect on prices and earnings, even when the assignment of status is completely random, and can be seen to be random by the subjects involved. These results suggest that status may have an important effect on market outcomes in situations in which status has real meaning.

A person’s status is a ranking in a hierarchy that is socially recognized and typically carries with it the expectation of entitlement to certain resources. There are many hierarchies within which a person might be ranked, from those based on specific skills or accomplishments that are only narrowly recognized, to more general societal rankings. In addition, different social groups may value hierarchies differently. Within a given social context, however, a person’s status entitles them to certain privi-

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leges, and affects the way they interact with others.<sup>1</sup> Evidence of the value of status is the effort that is expended by people to attain status, a propensity noted by Adam Smith,<sup>2</sup> deplored by Veblen [1926], and elaborated more recently by Frank and Cook [1995]. The concern with relative ranking is pervasive in virtually all societies. (Gil-White and Henrich [2000] provide examples.)

Economists have investigated the effects of a preference for status. Becker's [1971] examination of discrimination begins with an assumption that people care about the characteristics of those with whom they interact. His negative effect of discrimination against those with an undesirable characteristic can be reinterpreted as favoritism toward those with a desirable characteristic, or a preference for association with high-status persons. Perhaps more closely related to the present discussion is his theory of social interaction [Becker 1974]. He develops a model of the production of professional distinction, which is essentially ranking in a specialized status hierarchy. Again, this model can be reinterpreted as the production of general social distinction, or social status. If status is desirable, individuals are willing to sacrifice consumption to obtain it.

Status is economically important because it affects the allocation of resources among individuals, and over time can affect the pattern and rate of economic growth in a society. Research on status seeking has modeled the economic implications of the desire to win the status contest. See, for example, Robson [1992], Ng and Wang [1993], Congleton [1989], Fershtman and Weiss [1993], and Fershtman, Murphy and Weiss [1996]. What is common about most of this work is that it concludes that status-seeking behavior diverts resources from productive use, and so is welfare-reducing relative to the outcome where individuals do not engage in this behavior. Cole, Mailath, and Postlewaite [1992] develop a model for an economy in which some resources (mates) are allocated on the basis of a status ranking, rather than in the context of a market. They show that such a structure can lead to

1. Sociologists study the way status differentials are formed and perpetuated in social interaction, but rarely use these concepts in incentivized environments or to study questions of interest to economists. See Webster and Foschi [1988] for a survey.

2. Adam Smith [1982] deplored expenditure for the sake of status (which he terms "place"): And thus, place, that great object which divides the wives of aldermen, is the end of half the labours of human life; and is the cause of all the tumult and bustle, and the rapine and injustice, which avarice and ambition have introduced into this world. People of sense, indeed, despise place . . ." [p. 57].

a correlation between status and income, and that different allocation rules can substantially affect the growth rate of an economy.

We investigate the effect of a status differential on the allocation of resources in a laboratory market experiment. We induce a difference in ranking between two groups of subjects. Group members then participate in an auction market with a box design, where a vertical overlap in supply and demand yields multiple equilibria. Members of the higher-status group are assigned to one side of the market (buyers or sellers) facing members of the other group on the other side. We find that, on average, prices are higher in markets where higher-status sellers face lower-status buyers, and lower when the buyers have higher status than sellers. Across all sessions, the higher-status side of the market captures a greater share of the surplus, earning significantly more than their lower-status counterparts.

## II. STATUS AND EXCHANGE

In this section we motivate our hypothesis in a very simple model in which status affects market outcomes. Consider a market in which individuals trade a single divisible numeraire good and a single indivisible good.<sup>3</sup> An individual's utility depends on consumption of the two goods and on the relative status ranking of the other individuals with whom he/she trades. To simplify matters, we assume that utility is separable in the consumption component and the status component, that the consumption component is separable in consumption of the numeraire good and the indivisible good, and that the marginal utilities of consumption are constant. Write  $\sigma_k \in \mathbf{R}^+$  for individual  $k$ 's status, a measure of the amount of status that  $k$  holds. It is natural to assume that individuals prefer to trade with others who have more status than themselves and prefer not to trade with those who have less status than themselves. We further assume that the function that individuals use to compare their status with that of others is linear. We can therefore write the utility to individual  $i$  of negotiating a trade

3. We assume throughout that the numeraire good can be consumed in negative amounts or that individual endowments of the numeraire good are sufficiently large that the nonnegativity constraint never binds.

with individual  $j$  for  $m$  units of the numeraire good and  $x$  units of the indivisible good as

$$(1) \quad u_{ij}(m, x) = m + xr_i + \epsilon_i \cdot (\sigma_j - \sigma_i),$$

where  $\epsilon_i \geq 0$  may be individual specific. Note that  $\epsilon_i \cdot (\sigma_j - \sigma_i) = 0$  when both individuals hold equal amounts of status. Of course, we identify  $r_i$  as individual  $i$ 's *reservation price*. In our design, utility for the indivisible good is satiated at two units, so  $x$  is in the interval  $[-2, +2]$ .

Now consider behavior in a *box design market*. There are  $N$  sellers, each having reservation value  $r_s$  and  $N$  buyers, each having reservation value  $r_b$ , where  $r_b > r_s$ . Sellers are endowed with two units of the indivisible good; buyers are endowed only with the numeraire good. As a benchmark, suppose first that all individuals have identical status, so that the status term  $\epsilon_i \cdot (\sigma_j - \sigma_i)$  vanishes. Normalize the price of the numeraire good to be 1 and write  $p$  for the price of the indivisible good. Buyer  $i$  would be willing to buy the indivisible good at the price  $p$  exactly when  $-p + r_b \geq 0$ , or equivalently, when  $r_b \geq p$ . Similarly, seller  $j$  will be willing to supply the indivisible good at the price  $p$  exactly when  $p - r_s \geq 0$  or equivalently when  $r_s \leq p$ . Hence the market will clear, and all  $2N$  units will be traded, at any equilibrium price  $p^*$  in the interval  $[r_s, r_b]$ .

Now suppose that buyers have uniformly higher status than sellers; buyers have status  $\sigma_b$ , sellers have status  $\sigma_s$ , and  $\sigma_b > \sigma_s$ . Buyer  $i$  will be willing to buy the divisible good at the price  $p$  exactly when  $-p + r_b + \epsilon_i \cdot (\sigma_s - \sigma_b) \geq 0$ , or equivalently, when  $r_b + \epsilon_i \cdot (\sigma_s - \sigma_b) \geq p$ . Since buyers have higher status than sellers, the status term for buyers is negative, so the highest price at which  $i$  is willing to buy in this market is lower than the highest price at which  $i$  would be willing to buy in the absence of status. Similarly, seller  $j$  will be willing to sell one unit of the divisible good at the price  $p$  exactly when  $p - r_s + \epsilon_j \cdot (\sigma_b - \sigma_s) \leq 0$ ; equivalently, when  $r_s - \epsilon_j \cdot (\sigma_b - \sigma_s) \leq p$ . Since buyers have higher status than sellers, the status term for sellers is positive, and minus the status term is negative; the lowest price at which  $j$  is willing to sell in this market is lower than the lowest price at which  $j$  would be willing to sell in the absence of status. Write  $\epsilon_b$  for the maximum of the buyer's coefficients  $\epsilon_i$ , and  $\epsilon_s$  for the minimum of the seller's coefficients  $\epsilon_j$ , and define  $r'_b = r_b - \epsilon_b \cdot (\sigma_b - \sigma_s)$  and  $r'_s = r_s - \epsilon_s \cdot (\sigma_b - \sigma_s)$ . Then the market will clear,

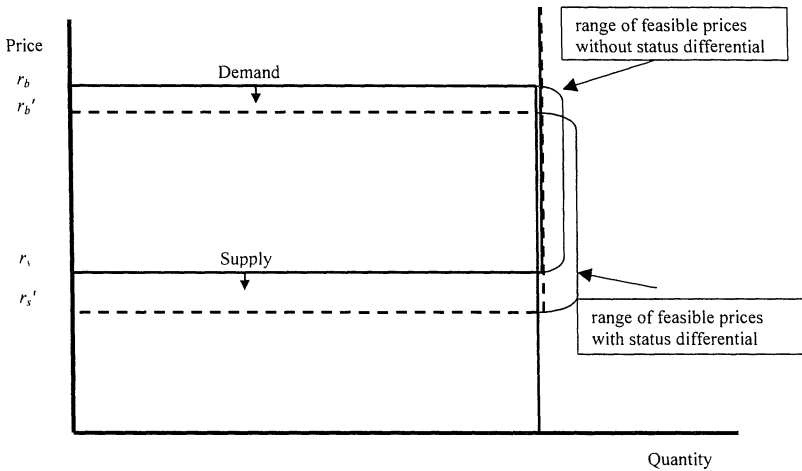


FIGURE I

Supply and Demand in a Box Design Market: Buyer Status > Seller Status

and all  $2N$  units will be traded at any price  $p^*$  in the interval  $[r'_s, r'_b]$ .<sup>4</sup> Thus, the whole range of equilibrium prices shifts *down*, as shown in Figure I. Similarly, when the sellers have uniformly higher status than buyers, the whole range of equilibrium prices shifts *up*.

These results lead us to our experimental hypothesis.

*Hypothesis.* In markets where sellers have higher status, the distribution of equilibrium prices will be higher than in markets where buyers have higher status.

### III. STATUS IN A LABORATORY MARKET

#### A. Box Design Market Institution

We choose the box design market to test for status effects for two reasons. First, its multiple equilibria provide scope for status to affect the market price, even under a highly competitive market institution like the Oral Double Auction (ODA). Second, the market context allows both a degree of anonymity and competi-

4. Assuming of course that  $r_s - \epsilon_s \cdot (\sigma_b - \sigma_s) < r_b - \epsilon_b \cdot (\sigma_b - \sigma_s)$ , which will certainly be the case if status coefficients are not too large.

tion as compared with simple bargaining games such as the ultimatum game.

Economic institutions and environments determine the extent to which social or other-regarding factors can affect outcomes. One can think of a continuum of exchange institutions ranging from highly competitive markets to two-person bargaining games. In competitive markets, only the parameter values matter. For example, in laboratory experiments, the ODA reliably produces the competitive equilibrium outcome with a wide variety of supply and demand curves, regardless of the age, gender, education, or experience level of the subjects, or any of a variety of other factors. Competitive forces discipline agents to behave in accordance with the predictions of the competitive model.<sup>5</sup> At the other extreme are two-person bargaining experiments that are highly sensitive to social factors. Their multiple equilibria may permit subject's characteristics (such as race, gender, height, beauty) and social signals (manner of dressing, verbal and non-verbal cues), as well as other-regarding objectives (fairness), to affect the outcome (e.g., Hoffman, McCabe, and Smith [1996]). We expect that status will not matter in the former cases and will matter significantly in the latter cases.

While the sensitivity of two-person bargaining games makes them attractive for testing the effects of status, the same sensitivity means that individual idiosyncrasies can introduce a considerable amount of noise into the results (as in Ball and Eckel [1996, 1998]). For this reason, we utilize a hybrid institution with characteristics of both institutional extremes: the box design market. The range of equilibria in the box design market introduces scope for social factors such as status to influence the market outcome by affecting which equilibrium is selected. However, the ODA mechanism induces market competition among agents that disciplines the traders and narrows the range of trading prices. This diminishes the role that a single idiosyncratic trader can have on the market, and allows us to assess the aggregate effect of status differentials between buyers and sellers.

5. Market forces induce the participants to behave rationally: in fact, even "zero intelligence traders" appear to behave like economic man under this institution [Gode and Sunder 1993].

### B. Allocating Status

In designing our experiments, we made the decision to induce a status differential instead of using naturally occurring status differences among subjects. Our reluctance to use obvious status differences such as socioeconomic status, race, sex, athletic ability, or academic rank arose from a fear that subjects might not agree about what constituted high status. For example, some students might view members of the football team as higher status, but others might be indifferent to athletic ability or might look down on athletes because of inferior academic performance. Inducing status differences gives subjects a common experience, diminishing the chance that there would be disagreement about who had higher status.

The procedure we developed arose from our interest in a study where elementary school teacher Jane Elliott induced surprisingly severe discrimination among third-graders. Her procedure created (then reversed) a status hierarchy based on the children's eye color.<sup>6</sup> To effect a similar status difference, we adapted a procedure developed by psychologists to form groups, adding a status differential to the procedure [Turner and Brown 1978]. Status is allocated through two variations on the procedure that we term *awarded* and *random* status. In both, status is in fact allocated randomly, although one variation is designed to suggest to the subjects that the high status was deserved. Awarded status involves a minor deception of the subjects that meets American Psychological Association guidelines [<http://www.apa.org/ethics/code.html>] and is of a degree common in other social science experiments. Random status is quite transparent to subjects and involves no deception.

While we appear to go to great lengths to convince subjects of a status difference, we believe the manipulation to be rather weak. This is borne out by the analysis of the postexperiment questionnaire data, presented in Section IV below.

For the awarded status treatment, a quiz is administered to subjects, which consists of five obscure economics questions with numerical answers. (See appendix for a copy of the quiz.) Subjects are told to fill in an answer for each question, even if guessing is necessary. The quizzes are collected and taken out of the room for scoring. To score the quizzes, we simply add up the answers to the

6. This experiment is detailed in Peters [1987] and in the *Frontline* episode, *A Class Divided* [1985].



questions for each subject. Subjects are not told the method by which the quizzes are scored. This scoring method is used as a way of effectively randomizing subject assignment to high- and low-status groups.

Once the quizzes are scored, we hold a ceremony where status is awarded to half of the group. The experimenter calls out the names of the high-status group one at a time, and each member of the group is awarded a gold star. Once all names are called, the experimenters encourage the subjects who did not receive gold stars to applaud the group that did. In some sessions, subjects with low scores receive high status; in others, subjects with high scores receive high status. This is done to ensure that the quiz is not selecting subjects for one group or the other in any systematic way. For example, if more intelligent subjects are chosen to receive stars, then that difference alone could affect the price, producing a spurious effect.

At this point the subjects are seated in separate areas of the room—all those with stars on one side of the room, and those without stars on the other side—such that no subject can observe another's information. Subjects are informed that the group with stars will be either the buyers or the sellers in the market, with the other group of subjects taking the other side. Folders are distributed to all subjects containing cost and reservation values, and the instructions and record sheets for the experiment. The higher-status subjects have stars on themselves, their bidding cards, and the folders. Until the auction begins, the high-status group is treated with a greater respect and consideration by the experimenters; for example, they are called on first during the instruction phase if they have questions. This special treatment is scripted, as indicated in the protocol in the appendix. Once the auction begins, all subjects are treated equally, as explained below.

In the random status treatment, status is allocated in a way that is transparently random. As subjects enter the room, each is asked to write his/her name on a slip of paper and drop it into a basket. Half of the slips are drawn in the presence of all participants, and these subjects become the high-status players. Subjects observe this procedure, and so are clearly aware that status is allocated randomly. Since it is now obvious that the gold stars are absolutely meaningless, we hypothesized that this treatment would lessen or eliminate the effect of status. The rest of the procedure is unchanged, including the

awards ceremony, which is conducted exactly as in the previous treatment.<sup>7</sup>

We sometimes are asked, is this really status? The procedure creates a clear relative ranking or hierarchy, established by the experimenter. In this sense, we have induced what is probably a very minor status differential between the groups of subjects in the experiment. The procedure is consistent with research in other fields. For example, sociologists conduct experimental research, which examines the connections between the characteristics of subjects and their own and others' expectations of their performance, and their resultant behavior in a group task. Results show that any characteristic that allows a differentiation among subjects can become a status characteristic, affecting a participant's influence within the group, and their claim to the common resources of the group. (For a recent example, see Troyer and Younts [1997].) In the context of our experimental design, the stars become a status characteristic. We can be reasonably confident that our procedure induces differential expectations states between groups of subjects. Our experiments show that an induced status characteristic can affect earnings, not just in a group decision-making environment, but in a competitive market.<sup>8</sup>

7. Note that this procedure does not frame the allocation of status in the experiment in a way that suggests entitlement to the role of buyer or seller. The status procedure precedes the allocation of roles in the market. Hoffman and Spitzer [1985] and others have shown that entitlement to a role makes agents more likely to behave in a way that maximizes their own payoff, reducing the tendency to equal-splitting in simple bargaining games. In Ball and Eckel [1996] we report data from ultimatum games, where subjects with and without status are matched in all possible pairings. Here the connection between status and the role in the game is clearly separated. The results are similar to those here, with higher-status players earning more on average.

8. Questions sometimes arise as to whether our result is due to "experimenter demand." As Davis and Holt [1993, p. 26] warn, "Experiments should be conducted in such a manner that does not lead participants to perceive any particular behavioral pattern as being correct or expected, *unless explicit suggestion is a treatment variable*" (italics added). We make three points in this regard. First, the status procedure is a treatment variable, and the suggestion that some subjects are ranked higher than others comes explicitly from the experimenters. It is designed to lead subjects to believe that one group is superior to the other. Since the suggestion comes from the experimenters, it is in a sense due to a demand from the experimenter; but it is a deliberate manipulation, and not an accidental effect of what the experimenter wants the result to be, hence is not an experimenter demand effect in the usual sense. A second point is that the "blind" auctioneer (explained below) coupled with the competitive nature of the market makes it highly unlikely that experimenter demand affected the outcome of the auction itself. Finally, a debriefing questionnaire asked subjects to describe their thought process and strategy for participating in the auction. Not a single subject mentioned the star.

*C. Experimental Procedure*

Eleven market experiments were conducted using the awarded status treatment, and six with the random status treatment. The markets are paired: for a given set of parameters (buyer reservation value, seller cost), one market is conducted where the buyers have higher status, and one where the sellers have higher status.<sup>9</sup> This pairing allows us to control for the fact that different parameter ranges produce different focal points. There are 10–16 subjects in each session, and the surplus to be divided is \$1.70–1.80 per unit traded. Effort is made not to include subjects who are recruited from the same class in a given session. Subjects are paid a \$5 fee for showing up and are told that they will earn additional amounts that depend upon their decisions during the two-hour experiment.

In the awarded-status treatment, participants are first given the quiz, and while the quiz is being scored general instructions for participation in a double oral auction are read (based on Davis and Holt [1993]). In the random-status treatment, instructions for the double auction also are read prior to the awards ceremony. The experiments are not computerized because we believe that it is important for subjects to be able to see whether or not the others are wearing stars. After the stars are distributed, subjects are told whether they will be buyers or sellers and are given their reservation values. All buyers in any given pair of sessions have the same reservation value; all sellers have the same cost. Subjects are seated so they cannot observe the reservation values or costs of other players. They only know their own value or cost. Each subject can trade up to two units per round. Sessions consist of one practice period for which subjects are not paid, and ten subsequent rounds with payment; earnings averaged \$16.76 in addition to the show-up fee.

The cost and reservation values are changed for each pair of experiments by adding or subtracting a constant from all parameters, and are unknown to the auctioneer. This was done to make the auctioneer partially blind to the experimental treatment. The experimental protocol instructs the auctioneer to alternate between calling on a random bidder from the buyer side of the

9. The odd number of sessions is due to one unpaired session, which occurred because of scheduling problems. Results are unchanged whether or not this session is included. It is not included in Figure II (for balance), but is included in the data analysis.

market and one from the seller side, only calling on the same side twice in a row if there are no bidders on the other side of the market. Four additional sessions were conducted with a slightly different protocol. Here buyers and sellers could “call out” prices in any order; the auctioneer did not alternate between buyers and sellers.<sup>10</sup> All other aspects of the protocol were identical.

Following the experiments, a questionnaire is administered. We collect socioeconomic data as well as some information about the experiment itself. Subjects are privately paid the amount they earn in the experiment.

#### IV. RESULTS

A total of 204 subjects were recruited from introductory undergraduate courses in business, social sciences, and statistics at Virginia Tech and at the University of Arizona. Women constituted 39 percent of the subjects, 81 percent were Caucasian, two-thirds were freshmen and sophomores, and the average age was twenty. Seventeen sessions were completed. Sixteen are paired sessions consisting of a buyer-status session and a seller-status session conducted with the same parameters (seller cost and buyer reservation value). Results of the sixteen paired experimental sessions are reported in Figure II (the one unmatched session is dropped for balance). Tables I–IV contain data for all seventeen sessions. Summary results from the exit questionnaire are shown in Table III and the results are included in the data analysis below.

Figure II shows the average price for buyer-status and seller-status sessions. The vertical dimension of Figure II represents the surplus in the market—the difference between buyer valuations and seller costs, scaled from 0 to 1. The horizontal dimension is time, beginning with period 1 and ending with period 10. Within a period, each dot represents an average price for a traded unit. For example, the first dot in period 1 is the price for the first

10. Charles Plott, who was somewhat skeptical of the robustness of our results, suggested this treatment to us. He hypothesized that our results were sensitive to our auction procedure, which effectively “rationed” access to the market by calling on alternating sides of the market. Instructions in these markets were identical; only the behavior of the auctioneer was different. Results from these four sessions are not significantly different from the others, and all sessions were pooled for the analysis that follows. We collected data on the number of bids and asks in these markets. While there were slightly more bids and asks on average by players with stars, the difference was not statistically significant.

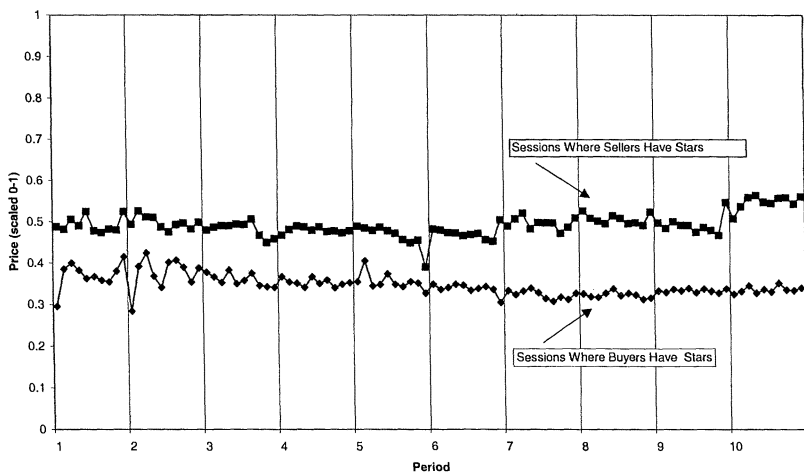


FIGURE II  
Average Prices for Buyer Status and Seller Status Sessions

unit traded averaged over all sessions. The first ten trades in each period are shown; some periods had up to sixteen units traded, but these units were truncated to keep the averages consistent.<sup>11</sup> Average prices in the buyer-status sessions are lower than in seller-status sessions. In addition, prices tend to fall below the midpoint of the surplus range in these experiments, consistent with the “weak seller” effect that Smith and Williams [1990] report.<sup>12</sup>

We analyze the data at three levels of aggregation, with the unit of observation taken to be the session, the trading period, or the subject. At the most aggregate level, using the experimental session as the unit of observation ( $n = 17$ ), we find that the mean earnings for the high-status side of the market exceeds that for the low-status side of the market ( $t = 2.72$ ;  $p < .01$ ). The effect of awarded status is not significantly different from random sta-

11. Since different parameters produce different focal points and convergence to different price levels within the surplus range, including incomplete averages is not appropriate in the figure. (The data analysis that follows includes all trades.)

12. There were slight differences in the patterns of convergence across the status allocation procedures (individual results not shown). For four of the five individual pairs of awarded-status sessions, price in the seller-status market converged to a higher level than the price in the buyer-status market; in one pair of sessions the pattern was reversed. In the random-status sessions, for all pairs the price in the seller-status market reached a higher level than the buyer-status session.

TABLE I  
CONVERGENCE PRICES AS PERCENT OF SURPLUS (0–100)  
(STANDARD ERRORS ARE IN PARENTHESES)

Note: Estimated Starting Points for Each Session Are Suppressed

<b>MODEL 1:</b>				
	<b>Buyers have higher status</b>		<b>Sellers have higher status</b>	
	<b>Awarded:</b>	<b>Random:</b>	<b>Awarded:</b>	<b>Random:</b>
<b>Convergence point:</b>	34.40	32.88	42.09	51.39
(Standard error)*	(0.30)	(1.21)	(1.21)	(1.54)
<b>N</b>	170			
<b>Log likelihood</b>	378.47			
<b>MODEL 2: All sessions</b>				
<b>Convergence point:</b>			38.41	
(Standard error)*			(0.75)	
<b>N</b>			170	
<b>Log likelihood</b>			344.94	
<b>Likelihood ratio test (v. Model 1)</b>			<b>67.06</b>	
<b>P-value</b>			<i>&lt;0.001</i>	
<b>MODEL 3:</b>				
	<b>Buyers have higher status</b>		<b>Sellers have higher status</b>	
<b>Convergence point:</b>			34.03	49.52
(Standard error)*			(0.42)	(1.10)
<b>N</b>			170	
<b>Log likelihood</b>			368.30	
<b>Likelihood ratio test (v. Model 1)</b>			<b>20.34</b>	
<b>P-value</b>			<i>&lt;0.001</i>	

\* Standard errors are corrected for heteroskedasticity and first-order autocorrelation.

tus ( $t = 0.32$ ,  $p = .37$ ). Finally, we can confirm the “weak seller” effect found by Smith and Williams [1990], with buyers earning more on average than sellers ( $t = 2.28$ ,  $p < .01$ ).

We next analyze the data using average price in a trading period as the unit of analysis ( $n = 170$ ). In Table I we report results from regression analysis that models the convergence process of the price path and the impact status has on this process. The average price in a trading period is standardized as a percent of surplus so that prices range from 0 to 100. We use this technique to examine the impact of the experimental treat-

ments (status differentials and status allocation procedures) on the ending point of the price path.<sup>13</sup>

We estimate the starting point for each session, and the ending point (asymptote) for each treatment (Model 1). Starting values (not reported) are highly variable across sessions, but are slightly higher on average for buyer-status than for seller-status sessions. Our analysis focuses on the ending values—the prices that the sessions converge to by the tenth period—shown in the table. Buyer-status sessions converge to lower prices than seller-status sessions. With awarded status, the final price in the buyer-status market is 8.3 percentage points lower; with random status the difference is 18.5 percentage points. A comparison with Model 2, which imposes a common convergence price on all sessions, indicates that these differences are statistically significant. A comparison with Model 3, which constrains allocated and random-status sessions to a common convergence price, indicates that random and awarded status have significantly different effects.

We now turn to the analysis of individual data. Table II gives summary data for the subjects by treatment and by sex. There are no significant socioeconomic differences between the subjects by treatment. Answers to the questionnaire show that people with stars thought the star players were more powerful, clever, aggressive, and deserving than those without stars. Overall, there is no evidence that no-star subjects were aware of a status difference between themselves and the star players. Star subjects thought the procedure was fair and reflected ability; no-star sub-

13. As there is no reason to assume that all experiments will exhibit similar convergence paths, the model is capable of permitting each experiment its own path. In the actual application of the model, however, data limitations require the assumption that experiments of like treatment have a common convergence path.

The model of convergence is suggested by Ashenfelter et al. [1992] and employed by Noussair, Plott, and Riezman [1995] for purposes similar to ours. The model's basic estimating equation is given by

$$(1) \quad y_{it} = B_{1i}D_1\left(\frac{1}{t}\right) + B_{12}D_2\left(\frac{1}{t}\right) + \dots + B_{1n}D_n\left(\frac{1}{t}\right) + B_2\left(\frac{t-1}{t}\right) + u_{it}.$$

The subscripts  $i$  and  $t$  denote the particular experiment and the particular period in the experiment, respectively. The dependent variable  $y_{it}$  is the average percentage of the surplus captured by the seller in trading period  $t$ . The dummy variable  $D_i$  takes a value of 1 for experiment  $i$  and 0 otherwise. The origin of the convergence process is given by  $B_{1i}$ .  $B_2$  is the asymptote of experiment  $i$ 's dependent variable. The estimates reported in Table I were corrected for first-order autocorrelation and heteroskedasticity. The method of correction employed is Kmenta's [1971] cross-sectionally heteroskedastic and time-wise autoregressive model (see pages 618–622). SHAZAM is the statistical package used to estimate the model.

TABLE II  
SUBJECT SUMMARY STATISTICS AND EXIT SURVEY

Question:		No stars	Stars	Male	Female
Earnings		\$14.20	\$19.32***	\$16.21	\$17.63
Female = 1		0.36	0.41	0.00	1.00
Star = 1		0.00	1.00	0.48	0.53
Age		20.52	19.56	20.31	19.59
Ethnic	1 = Asian, 2 = African/Am, 3 = Hisp/Black, 4 = Hisp/White, 5 = Cauc, 6 = Am Indian, 7 = Other	4.55	4.40	4.54	4.37
Income	5 = \$50,000–\$65,000, 6 = \$65,001–\$80,000	5.32	5.78	5.43	5.65
Class	0 = Freshman, 3 = Senior	1.30	1.12	1.31	1.04*
Major	Business = 1	0.44	0.35	0.47	0.27***
<b>The following questions are based on a Likert scale, 1 = disagree, 7 = agree</b>					
Q3	Stars more powerful	3.69	3.97	3.79	3.89
Q4	Stars more clever	3.82	4.13	3.90	4.09
Q5	Stars more aggressive	3.36	4.70***	4.10	3.92
Q6	Stars more deserving	3.60	4.59***	3.95	4.32*
Sum	(Q3–Q6)	14.47	17.38***	15.74	16.22
Q3a	My side more powerful	4.31	3.97	4.08	4.24
Q4a	My side more clever	4.18	4.13	4.11	4.22
Q5a	My side more aggressive	4.64	4.70	4.75	4.53
Q6a	My side more deserving	4.40	4.59	4.48	4.52
Sum	(Q3a–Q6a)	17.53	17.38	17.42	17.51
Q8 <sup>a</sup>	My side generally better	4.15	4.26	4.15	4.35
Q9	My side performed better	4.33	4.21	4.09	4.70*
Q10	Method to allocate stars is fair	3.71	5.00**	4.41	4.26
Q11	Method reflects ability	2.16	3.62***	2.93	2.83
Q12	Stars have unfair advantage	2.37	2.74	2.65	2.35
Q13	Satisfied with my performance	4.82	4.85	4.74	5.04
Q14	Would prefer stars group	3.16	4.97***	3.98	4.30

a. Questions 8–14 were asked on a long questionnaire administered in eight of the seventeen sessions.

\* Difference is significant at  $p < .1$ .

\*\* Difference is significant at  $p < .05$ .

\*\*\* Difference is significant at  $p < .01$ .

jects disagreed. Each group preferred their own to the other. Male and female subjects also do not differ systematically, except that women are less likely to be business majors. Few differences emerge in the questionnaire data, although women appear slightly more likely to accept the status manipulation.

Table III contains regression results with the cumulated



TABLE III  
DEPENDENT VARIABLE = EARNINGS (% OF SURPLUS)  
(STANDARD ERRORS IN PARENTHESES)

Variable	Model:				
	1	2	3	4	5
Buyer	0.162*** (0.021)	0.164*** (0.029)	0.163*** (0.020)	0.153*** (0.020)	0.163*** (0.021)
Star	0.147*** (0.021)				0.148*** (0.021)
Star*		0.144*** (0.021)			
Buyer					
Star*		0.149*** (0.021)			
Seller					
Awarded star			0.122*** (0.023)		
Random star			0.193*** (0.028)		
Star*				0.072*** (0.002)	
Manipulation					
Check					
NoStar*				-0.0003 (-0.003)	
Manipulation					
Check					
Female					0.031 (0.022)
Age					0.002 (0.004)
Minority = 1					-0.011 (-0.028)
Class (0-4)					0.007 (0.011)
Major (Bus = 1)					-0.004 (-0.022)
Constant	0.340*** (0.017)	0.339*** (0.020)	0.340*** (0.017)	0.358*** (0.041)	0.278*** (0.075)
Adjusted $R^2$	.367	.364	.381	.342	.360
Likelihood Fn.	103.7	103.7	106.5	100.14	101.9
N	204	204	204	204	199

\*\*\* Significant at  $p < .01$ .

earnings of a subject as the dependent variable ( $n = 204$ ). The first six variables reported in Table I are dummy variables equal to 1 for the specified condition (e.g., Buyer is equal to 1 when the subject is a buyer). Model 1 shows that subjects with higher status earn 14.7 percent more of the surplus (about \$.26 per

trade) than subjects with lower status. We again observe a significant “weak seller” effect in the sense that buyers earn about 16 percent more than sellers do. In the absence of any status effects, this indicates that the mean price would be below the midpoint of the surplus range.

When buyer and seller status are entered separately (Model 2), no difference emerges in their coefficients—status confers an advantage whether it is granted to buyers or to sellers. The effect of status was slightly stronger when it was randomly allocated than when it was awarded (Model 3).<sup>14</sup> This contradicts Hoffman and Spitzer [1985] who show that an earned advantageous role made subjects more willing to exploit their opponents than a randomly assigned advantageous role.

In Model 4 we substitute an index of answers to the status manipulation questionnaire (the sum of questions 3–6) for the status dummy variable. We allow those with and without stars to have different coefficients on this variable: earnings of higher-status subjects should be enhanced by a stronger perception of the manipulation, while those of lower-status subjects should be reduced. The variables carry the expected signs, although the coefficient is significant only for those with stars.

In Model 5 we include socioeconomic variables; none has a significant effect on the outcome. This is not surprising, since the competitive design of the market tends to minimize individual effects. In the context of the box design market, individual differences in behavior are not likely to have much impact on the overall market price. Trades occur in a very tight range of prices within any given period, reducing the variability in earnings across subjects within a session. To detect the effect of individual differences requires experiments with a common type on a given side of the market.

14. But why might the “weaker” status treatment have a stronger average effect on behavior than the “stronger” status treatment? We speculate that this is because of the way in which we wrote the economics quiz. Most educators have experienced the phenomenon that students consider a test to be “fair” if they can do well on it rather than using the criterion that it was an equal test of all students in the class. Since the economics quiz asks the students questions that we expected them not to know the answers to, they likely considered the test to be unfair. This may have been compounded by the fact that at least some of the subjects were told (in response to their questions) that no prior knowledge of economics was required for participation in the experiment. The status, having been awarded based on a seemingly meaningful but unfair criterion, was thus diminished relative to the random status treatment which was meaningless but fair.

## V. ADDITIONAL EXPERIMENTS

In this section we report the results of two additional experiments designed to answer questions raised by the original treatments. First, while our results show that even a very minor status differential can induce differences in earnings, it does not reveal the process or mechanism by which the status difference translates into earnings differences. In an additional treatment, we address the question of whether status must be publicly revealed in order to have an effect. In other words, is the earnings difference due simply to increased confidence on the part of the higher-status subjects? Here we reveal the status difference privately to the higher-status subjects; lower-status subjects are unaware of the manipulation.

Twenty-four inexperienced subjects were recruited from Principles of Economics classes. At the time of recruitment, they were asked to complete the quiz used in the awarded status treatment above. Subjects were told, "The quiz is part of the experiment, but how well you do on the quiz will not affect whether or not you get to participate in the experiment." Quizzes were collected and scored by the experimenters. Subjects were then contacted by email and invited to sign up for a particular session. Only after they signed up were they divided into two groups based on quiz scores. In one session, high status was privately revealed to buyers only; in the other matched session, high status was revealed to sellers only.

Subjects arrived and were seated in the classroom. Instructions for the auction were read. We then reseated subjects, seating the higher-status side of the market first, and distributed folders containing reservation values and further instructions. Subjects were notified of their status by including a certificate in the folders of those on the higher-status side of the market. The certificate stated that, based on the quiz scores, they had been assigned to the Star Group, just as in the oral awards ceremony held in the previous experiment.

Results for these experiments are shown in Table IV. Most notably, earnings as a fraction of surplus are lower for higher-status subjects in these sessions. The number of bids/offers is higher for the higher-status subjects, indicating greater aggressiveness in bidding. Results of the exit questionnaire indicate that higher-status subjects believed they were more clever, powerful, and deserving, but less aggressive. Only the clever question

TABLE IV  
SESSIONS WITH PRIVATELY REVEALED STATUS

a. Earnings and bid/ask activity				
Earnings (as percent of surplus)				
<i>Higher-status</i>	<i>Lower-status</i>	<i>Difference</i>		
0.31	0.67	-0.36*		
Number of bids/asks per trade				
<i>Higher-status</i>	<i>Lower-status</i>	<i>Difference</i>		
2.47	2.24	0.23*		
* Significant at $p < .10$ .				
b. Answers to exit questionnaire				
Question:	Clever	Powerful	Aggressive	Deserving
Rating of self				
<i>Higher status</i>	3.75*	4.33	3.83	4.25
<i>Lower status</i>	2.83	3.17	4.33	4.00

\* Significant at  $p < .10$ .

\* H-L is significant at  $p < .10$ .

yields a significant difference. In addition, a joint test of equality for clever, powerful, and deserving taken together rejects equality at  $p = .04$ . Although definitive conclusions await further experimentation, this limited evidence implies that status must be publicly revealed to be effective. This suggests that deference by the low-status group is at least as important as confidence on the part of the higher-status group.

In a second treatment, we were curious to know whether a naturally occurring status difference might have a similar effect, and decided to test our setup with women and men as traders. If men are perceived as having higher status, this should increase their earnings relative to women.<sup>15</sup> In order to test for differences in behavior by women and men, we conducted two paired sessions with men on one side of the market facing women on the other.

Twenty-four additional subjects were recruited from introductory social science classes at Virginia Tech. No status manipulation was used; subjects were simply seated with men on one

15. In sociology experiments, sex is considered to be a status characteristic. Male participants generally anticipate and receive a greater share of group resources.

TABLE V  
SESSIONS WITH MALE VERSUS FEMALE TRADERS

a. Earnings and bid/ask activity			
Earnings (as percent of surplus)			
	Male	Female	Male-Female
<i>All periods</i>	0.53	0.47	0.06*
<i>Last 5 periods</i>	0.63	0.37	0.26***
Number of bids/asks per trade			
	Male	Female	Male-Female
<i>All periods</i>	3.03	2.71	0.54**
<i>Last 5 periods</i>	3.19	2.77	0.42*

\* Significant at  $p < .1$ .  
 \*\* Significant at  $p < .05$ .  
 \*\*\* Significant at  $p < .01$ .

b. Answers to exit questionnaire				
Question:	Clever	Powerful	Aggressive	Deserving
Rating of self				
<i>Males</i>	3.73*	4.18*	4.73	4.64
<i>Females</i>	2.50	2.83	4.67	5.08
Rating of males				
<i>Males</i>	3.73**	4.18	4.73*	4.64**
<i>Females</i>	5.50	5.17	3.33	2.92

\* M-F is significant at  $p < .1$ .  
 \*\* M-F is significant at  $p < .05$ .  
 \*\*\* M-F is significant at  $p < .01$ .

side of the room and women on the other, without comment. The results of these sessions are shown in Table V. Men earned 6 percentage points more of the surplus than women overall, and 26 percentage points more in the last five periods of the sessions. This difference is within the range observed in the status sessions. By the last five periods, the price in the market with male sellers exceeded the price in the market with female sellers by a substantial margin. This difference occurred despite the fact that the men made significantly more bids and asks than women throughout the sessions.<sup>16</sup> Results of the exit questionnaire are

16. We discovered in pilot experiments that increased activity generally decreases the share of surplus accruing to that side of the market, as buyers—or sellers—bid against each other.

shown in Part b of Table V. Women rated themselves as significantly less clever and powerful, equally aggressive, and somewhat more deserving than men. Women rated men as more clever and powerful, although less aggressive and deserving, than the men did themselves. This result lends further support to the hypothesis that higher-status participants have higher earnings.

## VI. DISCUSSION

Our results show that in a competitive market environment, status can have an effect on price and the allocation of resources. That a status treatment that is so obviously superficial could have such an effect on behavior strengthens our belief that status plays an important role in real-world economic interactions. Our results indicate a surprisingly robust effect for the status treatment. An observer of the auction would not detect a difference in the behavior of the subjects: they compete vigorously on both sides of the market, as in a typical oral double auction. However, the higher-status side of the market appears to be marginally more “stubborn” than the lower-status side, and lower-status players are marginally more willing to defer to the higher-status players. This impression is bolstered by the fact that we are unable to find a significant difference in the average number of bids and offers per trade in the two treatments. The result of interaction between buyers and sellers of different status is a lower price when buyers have higher status than when sellers have higher status. This result supports the predictions of the example in Section III. Our status results hold up even when we weaken the status treatment by assigning status in an obviously random and meaningless way.

These findings suggest that higher-status persons have greater access to resources, and that it is reasonable to invest resources in order to acquire higher status. In equilibrium the prices paid for high status should just equal participants’ discounted *ex ante* estimates of the value of status. This type of direct purchase of status was observed several hundred years ago, when wealthy French citizens purchased nobility titles to increase their status levels. In today’s markets it explains why products associated with holding high status command a premium over other items. The value of status drives the advertising industry to employ celebrity endorsements, so that consumers will perceive a good as a signal of higher status. It causes the same house to command a higher price in a high-status neigh-

borhood, workers to forgo earnings for rank in the workplace, and ordinary citizens to pay high prices for items that once belonged to celebrities.

## APPENDIX: EXPERIMENTAL INSTRUCTIONS

### Quiz

1. What percentage of the U. S. Federal budget is allocated to national defense? \_\_\_\_\_ .
2. What was the rate of inflation in the U. S. in 1990? \_\_\_\_\_ .
3. What percentage of the homeless in the U. S. are adult males? \_\_\_\_\_ .
4. What percentage of autos sold in the U. S. are imported from Germany? \_\_\_\_\_ .
5. What percentage of immigrants to the U. S. are illegal? \_\_\_\_\_ .

### Instructions

The instructions used for the Double Oral Auction are those in Davis and Holt [1993] with a few minor modifications.

### Script/Protocol

Procedure: Status in Markets

Treatment: Earned Status Allocation

### Setting Up

Note: Stars group has stars on themselves, on their bidding cards and on their folders.

### Entering Room

Experimenter: Please leave your packs and coats at the front (side) of the room. You may bring a pen or pencil with you for use during the exercise. If you do not have a pen or pencil we will provide you with one.

(Hand out pencils and the Consent Form)

Experimenter: Please read the Consent Form carefully and sign it at the bottom, indicating your willingness to participate in the exercise.

### Trivia Quiz (Hand out Trivia Quiz)

Experimenter: The answers you give on this quiz will determine

which of two groups you will be assigned to for this exercise.

(Collect and score trivia quiz)

Experimenter: It will take a few moments to calculate your scores, so please be patient.

### **Instructions**

(Hand Out Instructions)

Experimenter: While the quiz scores are being calculated we will go over the instructions for the rest of the exercise. (Read Instructions)

### **Dividing into Stars and No Stars and Separating into Two Groups** (Stars procedure)

The following people have earned a position in the STAR group. (Call out names). Please come up as we call your name and receive your star. You will wear your star for the rest of the exercise. Please remain standing at the front of the room until all stars are distributed. Let's give the ALL STAR group a round of applause!

### **Procedural Details and Review**

**Full design: 12 subjects, one auctioneer, one recorder:** The experimenter seats the Star subjects first on one side of the room, making the No Stars move. The No Stars are then seated. Then the folders are distributed as above.

In your folder, you will find a sheet, labeled "Buyer Decision Sheet" or "Seller Decision Sheet." It identifies your role as a buyer or seller and will be used to calculate your earnings. **THE INFORMATION ON THIS SHEET IS PRIVATE, PLEASE DO NOT REVEAL IT TO ANYONE.** Others may or may not have the same cost or value numbers that you have. You should now look at your decision sheet to see whether you are a buyer or a seller. Has everyone done this? Also, please note your identification number at the top of this sheet; this is how you will identify yourself during the trading process.

Experimenter: You are the buyers/sellers; you have stars. You are the sellers/buyers; you have no stars.

(Call on whichever group has the stars first.)

Would all of the buyers please raise their bidding cards? Everyone should notice where the buyers are sitting and whether or not they all have stars. Would all of the sellers please raise their bidding cards? Everyone should notice where the sellers are sitting and



whether or not they all have stars. It helps the exercise run smoothly if you hold your bidding card up high and facing the experimenter when you wish to be recognized.

Let's take a moment to review the instructions that you read earlier. We are going to hold a market for "units" in which some of you are buyers and some of you are sellers. I will begin each four-minute trading period with an announcement that the market is open. At any time during the period, any buyer is free to raise his/her bidding card and, when called on, to make a verbal bid to buy a unit at a price specified in the bid. Similarly, any seller is free to raise his/her bidding card and, when called on, to make a verbal offer to sell a unit at the price specified in the offer.

All buyers and sellers have identification numbers which should be used when making a bid or offer. Buyers should use the word "bid," and sellers should use the word "ask." For example, if Buyer 1 wants to make a bid of P120, then this person would raise his/her bidding card and, when recognized, say "buyer 1 bids P120." I will repeat the buyer number and the bid to give the person at the blackboard time to record it. Similarly, if Seller 5 decides to offer a unit for sale at P250, this seller should raise his/her bidding card and, when recognized, say "Seller 5 asks "P250"."

We ask you to help us enforce a bid/ask improvement rule: All bids must be higher than the highest outstanding bid, should one exist, and asking prices must be lower than the lowest outstanding offer, should one exist.

Any seller is free at any time to accept or not accept the bid of any buyer, and any buyer is free to accept or not accept the asking price of any seller. To accept a bid or ask, simply raise your bidding card. After you are recognized, announce your identity and indicate acceptance, e.g., Buyer 2 accepts Seller 3's ask.

If a bid or ask is accepted, a contract has been closed for a single unit, and the buyer and seller involved will immediately record the contract price and earnings for the unit. After each contract is closed, all previous bids and asks will be automatically withdrawn before any new ones can be made.

Now is the time for questions. You may ask questions about any aspect of the market of which you are unsure. However, be careful

not to reveal the private cost or value information that appears on your decision sheet. Are there any questions?

(Questions)

Except for bids, asks, and their acceptances, you are expected not to speak to any other person, even if there are many bids and offers that are not accepted.

We are about to begin trading period 0. Period 0 is a practice period to help everyone become more familiar with the rules of the market. You will not be paid your earnings for this period. Before we begin, buyers should check the redemption values in rows 1 and 4 of the column for period 1. Recall, the only way for a buyer to earn money on a unit is to purchase it for a price that is below its redemption value. Similarly, sellers should check the cost numbers in the column for period 1. Recall, the only way for a seller to earn money on a unit is to sell it for a price that exceeds its cost. Barring any further questions, we will begin trading period 1. Are there any remaining questions?

(Questions)

## **AUCTIONEER INSTRUCTIONS**

### **Beginning the Session**

(The auctioneer will begin each session using the scripts below. The auctioneer will begin the session by calling on the first card that goes up. After that he will look from side to side, always first giving the side which has not spoken most recently a chance to bid or offer. If no card is up on that side after a couple of seconds, he will return to the other side. After a unit trades, he will choose which side to call on first in a nonsystematic way. If more than one card is up, he should make an effort to choose randomly among them, keeping in mind those who have not made many bids or offers.)

The practice market is now open for bids and offers. If you raise your bidding card, please do not speak until I call on you. I will do my best to call on people in the order in which the bidding cards went up, but if many bidding cards go up at the same time I will have to choose between people in a nonsystematic way. The period will last for 6 minutes and will end at \_\_\_\_\_. Are there any bids and asks?

(After the first contract is made, but not after subsequent contracts, read the paragraph that follows.)

At this time the buyer and seller involved in this contract should record the price and calculate their earnings. This buyer and seller now have finished with their first units, and the relevant value or cost for them is that of their second unit for period 0. The rest of you are still considering the sale or purchase of your first unit in the period 0 column. Remember that when you make a contract, you move down the column for the current period to your second unit; you do not move across a row until the beginning of the next period. At this time, the recorder should draw a horizontal line below the final bids and asks. There are \_\_\_\_\_ minutes remaining in period 0, and the market is open for bids and asks.

(Don't forget to make 1 minute and 30 second warnings . . .)

Period 0 has ended, and you should add up the earnings on units traded and enter the total in row 7 of the column for this period. If you did not buy or sell a unit, the earnings for that unit are zero. We will erase the blackboard as soon as all transaction prices are recorded. At this time, one of us will come around to your desk to check your calculations. Please do not talk with each other; if you have a question raise your hand.

(Run Auction. Be sure they record their transactions on their record sheets. Check after first 2 rounds to make certain they are filling out sheets correctly.)

We are now ready to begin period 1. Remember that you will be paid your earnings for period 1 and all other periods which we run. We will run as many periods, up to 5, as we have time to complete. Period 1 is now open for bids and offers. Are there any bids and asks?

### **Ending the Session**

(After the 10th round, the auctioneer will make the following announcement.)

The final period has ended. Please refrain from talking while you finish adding up your cumulative earnings across periods in row 8. One of us will come around to assist you with this if necessary. When you are done, please fill out the receipt for participation you find in your folder. Finally, please answer the questions found on the Subject Information Sheet in your folder. Then remain seated without

talking until you are asked to come outside the classroom to be paid. You will be paid in private, one at a time, outside the room. Please bring your folders with you.

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 VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY  
 ST. CLOUD STATE UNIVERSITY  
 UNIVERSITY OF CALIFORNIA, LOS ANGELES

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