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This study examines laboratory outcomes when there are asymmetric numbers of agents available to bargain over a homogeneous good. When one side of the market is more concentrated than the other side of the market, some agents on one side of the market are unable to trade. For those agents who are matched and the match is confirmed, paired agents proceed into the bargaining rounds. With the data gathered from the market experiments, it is concluded that the concentrated side of the market has more bargaining power; however, the amount of power an agent has is significantly reduced when he makes the initial proposal for a match. By a review of the profits attained from the experiments, market efficiency is significantly lower when the market is asymmetric than when the market is symmetric. Efficiency is significantly different depending on whether the buyer or the seller make the initial proposal for a match.

JEL Codes: C78, C91, C80

Key words: market concentration, matching risk, forward production, private negotiation

**BARGAINING BEHAVIOR WITH NON-STOCHASTIC AGENT MATCHES IN
ASYMMETRIC MARKETS**

By

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DEDICATION PAGE

I would like to dedicate this thesis to my parents, who have always encouraged me to strive for the best. To my father, thank you for the guidance and support at a young age with the insurmountable hours of math homework which opened my eyes to the world of business and economics. To my mother, thank you for the overwhelming inspiration to achieve and conquer what I desire as well as for helping me find the words to express the person I have become.

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INTRODUCTION

Repeated private negotiation between a buyer and a seller over the price of a homogeneous good, tends to converge towards a competitive equilibrium at which the marginal return to the buyer and the marginal return to the seller are equal. The same buyer and seller need not be matched to achieve this equilibrium. A stochastic matching process of agents and a one-hundred percent probability of being matched achieve this equilibrium. An equilibrium at the intersection of supply and demand is not achieved when a non-stochastic matching process is introduced and there are asymmetric numbers of agents. When individuals are able to choose with whom they wish to be matched they are able to obtain more favorable prices. This analysis documents what happens when there are relatively few buyers willing to bargain, so the number of sellers is greater than the number of buyers, or vice versa. Through market experiments, agents choose with whom they wish to bargain and then negotiations commence. This analysis determines how bargaining behavior is altered when there is asymmetry among matching partners and at what point during the bargaining process agents are indifferent to switching partners.

LITERATURE REVIEW

Crawford and Rochford (1986) analyze the matching problem similar to this in their work on “marriage markets.” Using a Nash bargaining solution, they extend Gale and Shapley’s (1962) analysis of marriage markets. The prices in the matching market reflect the differences between matches and make the equilibrium competitive because there is always a possibility that a different match is more profitable. In the marriage market, there are an unequal number of men and women; men make proposals and women reject or accept until a better proposal comes along.

Crawford and Rochford argue that a higher productivity in a single match can lead to an agent’s threat in another match “increasing in such a way that he loses his original partner” with a lower payoff being the result. In many cases, matches would be better off if joint productivity were zero; in this situation there would be no incentive to switch partners. Joint productivity can be translated into the level of impatience for each player. When both players are relatively impatient, there is no incentive to switch partners because there is higher productivity—equating to a larger number of units being traded and an increase in profit for both agents.

Samuelson’s (1992) study helps analyze the termination of profitable matches—players believe there is always a potentially more profitable match available. As the periods progress in the experiments, players learn with what type of player they like to be matched or set a strategy of what match is best. This sort of procedure determines possible reasons for rejections of matches and more specifically final price acceptances. Samuelson’s findings are supported by Merlo *et al.* (2004) who observe that in the housing market one-third of all matches end up unsuccessful.

Sellers who have an unsuccessful first match typically end up selling at a higher price. The more matches made between buyers and sellers the higher the sale price.

De Fraja and Muthoo (2000) set up a scenario where one seller matches with one of two buyers in a repeated bargaining game. If the seller thinks he may get a better response from a different buyer, or rather the seller is “optimistic” about the buyers’ valuation, he will switch buyers. They analyze situations where there are no transaction costs for switching. Included in the model is also a discount factor and a one sided matching process where only the seller may choose his partner. Sellers are defined by their behavior and are identified as one of two types— a soft seller or a tough seller. The soft seller’s payoff increases relative to the equilibrium payoff in a single-buyer model when a second buyer is added to the matching process.

In the model including switching costs, De Fraja and Muthoo prove that switching costs do not change the equilibrium outcomes if the buyer is pessimistic about finding a match. In this situation, the buyer will accept most offers causing the transaction costs as well as the second player to be of no importance. However, if the buyer is optimistic about finding a compatible match, the second buyer increases the seller’s expected payoff if and only if the switching cost is not too high, which implies the cost of switching must be less than the discount factor (the cost of waiting one period).

Calvo-Armengol (2003) constructs a model within a decentralized market where agents meet and bargain over the terms of trade. The structure of personal connections is a stochastic matching process. The analysis concerns the idea of how those who wish to buy are matched with those who wish to sell and how these matches as well as transactions evolve through time.

The price is determined through negotiations between buyers and sellers. The main focus of the analysis is on the impacts and patterns in trading links on equilibrium outcomes.

The game proceeds through a stochastic matching process, after which a player makes an offer to a respondent. If the respondent accepts the offer, the game ends; if the respondent rejects the offer, both players are randomly matched again until an agreement is made. In the article, it is realized that through bargaining, the surplus to the buyer is greater than the surplus to the seller when the number of buyers is less than the number of sellers. The same relationship is true when the number of sellers is less than the number of buyers. In either case, market concentration improves the bargaining process for the side of the market that contains the least amount of agents which holds true for the following experimental analysis with market concentration and a non-stochastic matching process.

This review of the literature suggests that choice of bargaining partner can substantially impact bargaining outcomes. Further, if an uneven number of buyers and sellers who seek bargaining partners can impact relative earnings and bargaining power. The following experimental design increases overall market size in which there are four buyers bargaining over the price of a homogeneous good with three sellers or vice versa. There is a time constraint introduced into the bargaining process which limits trading for all players and forces players to choose a partner under pressure. For simplicity there are no discount factors, however, haggling over prices does limit the number of trades which can be made during a bargaining round and can be considered as a factor which limits gains from trading.

EXPERIMENTAL DESIGN

The experiment creates a market environment in which buyers and sellers can repeatedly negotiate the sale of a homogeneous good. In the treatments of interest there are more buyers than sellers and more sellers than buyers, and agents may choose with whom they wish to bargain. The baseline treatment for data analysis has an equal number of buyers and sellers choosing with whom to be matched in every bargaining round. The treatments are designed to study the matching problem as agents develop different bargaining behaviors. The data analyzed are the number of trades, trade prices, and buyer and seller earnings when an asymmetric number of buyers and sellers choose their bargaining partners. The treatments are defined by acronyms as seen in table 1.

In each experimental session as many as eight participants were randomly assigned to be either buyers or sellers. After the assignment, buyers chose an available seller with whom to begin the bargaining. Buyers were labeled with numbers which remained the same throughout the entire experiment, allowing players to develop reputations with their partners. Several treatments were conducted in which three buyers chose among a list of four sellers and vice versa, four buyers chose among a list of three sellers. The side of the market that contained three players had one player who was labeled “big” due to the double trading schedule made available. The big player was given the opportunity to trade 16 units while the other players were given the opportunity to trade 8 units. The addition of the big player was used to keep the supply and demand schedule equal to the competitive supply and demand. Once buyers had chosen a

trading partner, a one-minute bargaining round began in which multiple trades could be made one unit at a time.

For each treatment, three experimental sessions were conducted and the averages of the sessions were used for analysis. Both matching scenarios are used to analyze who has more bargaining power in each situation, buyers or sellers, and if the relative number of available agents impacts market efficiency, number of trades, and trade prices.

Subjects were recruited from undergraduate business classes at the University of Wyoming via email. Participants were not allowed to participate in an experiment more than once. After participants arrived at the experiment room the instructions were read aloud. The reading of the instructions was followed by a practice session of trading periods. When the participants felt comfortable with the computer software and the procedure, the actual experiment began.

The baseline treatment for this experiment is based on a matching process with an equal number of agents; the number of buyers equals the number of sellers. As treatments, either sellers or buyers had an opportunity to choose his/her bargaining partner. The total units available for trading in each treatment were 32 with each seller having an allotment of 8 units to sell in the forward market to a buyer. In this particular market, there were four sellers and four buyers with three experimental sessions giving the seller the opportunity to choose his bargaining partner and three experimental sessions giving the buyer the opportunity to choose his bargaining partner.

Despite the fact that the number of units traded in each treatment stayed the same, the prices at which these units were traded were significantly different based on whether the “seller chose” or “buyer chose” his bargaining partner (Menkhaus *et al.* 2010). These experiments found a convergence price, through the bargaining process, significantly lower when the seller chose his trading partner than when the buyer chose his trading partner. This may be explained by the fact that the buyer, also known as the acceptor/rejecter, has relatively more bargaining power than the seller, also known as the proposer. Figure 1 displays the supply and demand schedule of a perfectly competitive market for four buyers and four sellers. In the competitive market, each buyer and seller pair trade no more than 6 units and trade at the price of 80 tokens for each unit. However, the trading price of 80 tokens is significantly higher than the trading prices in the experimental treatments containing both four buyers and four sellers.

Buyers made bids to sellers and sellers made offers to buyers with a fictitious currency called tokens with an exchange rate of 1 token = 1 cent. Participants bargained over as many units as they could to make money. By using the computer as the means for negotiations, an agreement on price was made when the buyer and seller accepted the existing bid or offer. Buyers earned the difference between the redemption value of the unit and the price (P_j) paid for all units

where j is the number of units purchased. Sellers earned the difference between the unit price (P_j) and the unit cost for all units sold

where k is the number of units sold. If a seller or buyer was not matched during a trading round, then that participant earned zero for that specific period.

Trading history was available for all participants on the computer screens in order to build reputations among trading partners. There were three one-minute trading periods in which buyers and sellers could negotiate prices for up to eight units. After one minute elapsed, the player with the ability to choose was able to choose a bargaining partner again. He/she could choose the same partner or a different partner and the player without the choosing ability either accepted or rejected the match proposal. Once these three one-minute periods were terminated, all players received a new set of eight trading units and the process repeated for up to twenty periods. By round twenty, there was a 20% chance the session would be terminated and an 80% chance the session would have another round. Each participant was given an initial endowment of \$10.00 or 1000 tokens at the beginning of the experiment. Refer to Table 1 for the breakdown of the experimental treatments. The average buyer and seller earnings according to the last ten periods of the experimental treatments are calculated in table 1.

THEORETICAL ANALYSIS

A general analysis for this matching problem is explained by Muthoo (1999). He shows that the outcome in a repeated bargaining situation (RBS) is dependent on the players' discount rates. If the number of bargaining situations is large then it may be that a player's share from the negotiations is increasing in her discount rate. This predicted result is the opposite of what occurs in Rubinstein's bargaining model when the players negotiate only once. In an RBS players have incentives to build a reputation of being a particular type of bargainer, in this instance it is a reputation of being patient or impatient. In Muthoo's framework, players are in a RBS in which they bargain over the partition of n number of cakes where $n=1, 2, 3 \dots$. Players bargain over the $(n+1)$ th cake if and only if they reach an agreement on the n th cake. For the n th cake, two players, A and B bargain over the partition of a cake of size π ($\pi > 0$) according to the alternating offers procedure. The first agreement is reached at time t_1 where $t_1 = \frac{\pi}{\delta_A - \delta_B}$ and δ is the time interval between two consecutive offers. When agreement is made, both players consume their respective shares. Then τ time units after an agreement at time t_1 players bargain over the partition of the second cake of size π . Agreement is reached at time t_2 where $t_2 = \frac{\pi}{\delta_A - \delta_B}$ and players consume their respective shares. The same procedure occurs for all consecutive units.

The payoffs to each player is

(1)

is player i 's share of the cake, t_i is the time at which agreement over the partition of the cake is made, and r_i is player i 's discount rate. If $N=0$ then the players never agree on a partition of the first cake and each player's payoff is zero. If $N > 0$ then players partition N cakes and perpetually disagree over the partition of the cake.

Since t_i is known as the amount of time between each offer, it can be proven that the price of haggling per player is $\frac{1}{1+r_i}$ and the value of future bargaining situations for player i is $\frac{1}{1+r_i}$. These results are dependent on the discount rate, r_i , for each player. Assume $r_i < r_j$, this implies that the amount of time elapsed from the trade of unit n to the first offer of unit $n+1$ must be greater than the amount of time elapsed between offers. If this is true, then every cake is strictly increasing in r_i and strictly decreasing in r_j . As r_i decreases, both t_i and v_i increase. Under some plausible conditions, the effect through t_i dominates that through v_i thus implying as player i becomes more patient her equilibrium share of each and every cake decreases; therefore, it pays to be impatient.

In this experimental analysis with asymmetric numbers of players, choosing agents are choosing their negotiating partners based on bargaining compatibility. This compatibility can be explained by the level of patience players have. Generally players choose to make bargaining matches based on their bargaining history. Although not a focus of this paper, how quickly players move toward a transaction is likely an important part of this history.

¹ can also be interpreted as player i 's probabilistic belief that he/she can partition another cake after consuming the current cake.

To analyze the asymmetry in the market, a working paper by Jackson and Watts (2005) is discussed. The outcomes differ depending on which side of the market is more concentrated. When the number of buyers, n_b , is less than the number of sellers, n_s , then it is such that all buyers are matched and all players play the equilibrium which maximizes the buyer's payoff. Jackson and Watts (2005) state that the equilibrium is where $p = \frac{n_b}{n_s}$, where p is the strategy for the buyer and $1-p$ is the strategy for the seller. This equilibrium is most advantageous to the buyer. When the number of sellers, n_s , is less than the number of buyers, n_b , all sellers are matched and all players play the equilibrium which maximizes the seller's payoff. This particular equilibrium is where $p = \frac{n_s}{n_b}$, which is the most advantageous to the seller, given that players may only announce a price in $[0,1]$. Assuming there are infinite periods in which buyers and sellers may bargain, the equilibrium trading price is increasingly advantageous to the concentrated players.

This relates directly to the empirical analysis to follow as well as the experimental design. Both the concentrated and non-concentrated players have the opportunity to choose their trading partners in separate treatments creating advantageous matching opportunities for players. However, assume there was a stochastic matching process; the theory would still follow the empirics as cited in Menkhaus *et al.* (2007). Despite the fact that Menkhaus *et al.* (2007) had concentration of two buyers (sellers) randomly matched with two out of four sellers (buyers), the results from trading prices were advantageous to the concentrated players. Especially in the buyer concentrated market where trading prices exhibited convergence levels of about 65 tokens as opposed to the seller concentrated market where prices varied about the competitive equilibrium level of 80 tokens as shown in Table 2 and Figure 1. The intuition behind the price

of about 80 tokens in the seller concentrated market is that the acceptor/rejecter, also known as the buyer, has just as much bargaining power as the seller when the sellers choose.

EMPIRICAL ANALYSIS

Data collected from the market experiments include trade prices, quantities traded, and buyer and seller earnings. Data are analyzed by a convergence model described by Noussair et al. (1995) as well as Menkhaus *et al.* (2003, 2007). The convergence model is stated as

$$(2) \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---}$$

is average sale price, units traded or earnings across the sessions of the treatments and all trades for each of the t trading periods in cross-section treatment ; is the predicted convergence level of the dependent variable for the base category (Buyers Choose (BC) with four buyers and four sellers (BC 4v4)); is the predicted convergence level for the starting level of the data for the base treatment; is the trading periods (1,..., 20); is the dummy variable separating the j treatments (Base—BC 4v4, SC 4v4, BC-BB, SC-BS, SC-BB, BC-BS); and is the error term. This analysis provides a means to determine the effect of trading periods (t) on outcome variables (number of units traded, trade prices, buyer/seller earnings) for each experimental treatment.

Separate equations were estimated for each dependent variable . The base treatment is the market scenario where buyers choose their trading partners with equal numbers of buyers and sellers, or no market concentration. The outcomes are 18.6, 76.9, 1141.6, 155.10, and 130.2 for units traded, price, total surplus, buyer earnings and seller earnings, respectively.

The dummy variable takes on the value one when the dependent variable is from the j th treatment (SC-4v4, BC BB, BC BS, SC BB, SC BS) and takes on the value zero otherwise. The base coefficients β_j and α_j are adjusted according to treatments by γ_j and δ_j (adjustment coefficients).

The Parks Method is used to generate the coefficients for equation (2) to adjust for first-order autocorrelation, heteroscedasticity, and contemporaneous correlation that results in the panel data with time series observations on each of the cross-sectional units from the experiments. The estimated base and adjustment coefficients for the convergence analysis are reported in Table 3 and Table 4. The competitive equilibrium calculated from the supply and demand schedules is shown in Figure 1 along with the given unit costs and redemption values, shown in Table 2, for each of the eight units available for trading. The competitive trading price is 80 tokens per unit and the competitive number of units traded is 20 for each period. For this equilibrium, it is assumed that there are four buyers matched with four sellers and trading partner matching is purely random. As represented in table 2, the redemption values for each unit for the buyers are decreasing in price and the unit costs for each unit are increasing in price. The quantity (6 units) at which the price demanded by the buyers (80 tokens) is equal to the price supplied by the sellers (80 tokens) is where the equilibrium is determined for each buyer and seller pair. The competitive equilibrium is shown in comparison with each session and each treatment for all figures. Total earnings for the competitive equilibrium are 1200 tokens with each player, buyer or seller, receiving 150 each and relative earnings being 0. The addition of the competitive analysis is used to compare efficiency of the experimental markets: non-stochastic choice along with market concentration alters the relative equilibrium in every treatment.

Quantities Traded

The average number of units traded is about 16 when the seller chooses his trading partner in the seller concentrated market, as displayed in Figure 2. The figure shows the average number of trades by period for each treatment in the seller concentrated market. The competitive equilibrium is 20 units for each period; however, in the SC-BS treatment, there is a difference of about 20 percent less than the competitive number of trades.

A similar observation is made in Figure 8 which is a diagram of the average number of trades by period for each treatment in the buyer concentrated market. When the buyer chooses his trading partner, the average number of units traded is about 15.5 units, a 22.5 percent decrease in trades from the competitive equilibrium of 20 units.

The convergence model significantly predicts trades less than the base when the choosing player has market concentration or rather the SC-BS and BC-BB treatments with significant adjustment coefficients of -1.69 stated in table 2 and -3.15 stated in table 3, respectively. All other observational adjustment coefficients are not significantly different from the base.

The lower number of trades is explained by the choosing player being more patient than his opponent. As described by the theory, patient players tend to trade fewer units than impatient players. When the choosing player has market concentration, he can determine how his future opponents will behave. Knowing there is a possibility that the non-concentrated agents may have to sit out in future periods, concentrated agents can take advantage of their bargaining power by patiently waiting for a proposal which contains a highly profitable price. Since achieving the profitable price takes time, fewer units are traded overall. A pair wise

comparison between coefficients proves that the number of trades for SC-BS and BC-BB are significantly different from all other trade coefficients.

Trade Prices

Intuitively trade prices should be higher than base prices when there is seller concentration and lower than base prices when there is buyer concentration. When there are fewer numbers of agents on one side of the market, bargaining power increases for those agents. When one thinks of a monopoly or oligopoly, prices tend to be high because there is little competition between the sellers. This is an example of a seller concentrated market. Conversely, when there is a large number of firms, or sellers, prices tend to be low and towards the buyer's advantage due to relatively intense competition among sellers. This gives buyers more bargaining power because buyers are more concentrated than the sellers.

The intuition proves to be true in a seller concentrated market when buyers choose their trading partners (BC-BS treatment) with a statistically significant adjustment coefficient of 4.34, and, when sellers have the opportunity to choose their trading partner in a seller concentrated market (SC-BS treatment), the adjustment coefficient is 4.44 and statistically significant. Comparatively in a non-concentrated market where sellers choose the adjustment coefficient is -6.45.

The intuition proves to be true as well in a buyer concentrated market. Adjustment coefficients for the BC-BB and SC-BB treatments converge to the buyer's advantage with statistically significant coefficients of -12.44 and -1.99, respectively. The price increases according to the seller's advantage when the sellers choose their trading partners. Similar to Menkhaus *et al.* (2007) (in which there is market concentration and a stochastic matching process), in the seller

concentrated market, prices vary around the competitive equilibrium of 80 tokens (figure 3). Comparatively, in the buyer concentrated market prices vary around 65 tokens only when the buyer chooses his trading partner (figure 9) but vary around 75 tokens when the seller chooses his trading partner.

Total Earnings

Total earnings, according to Menkhaus *et al.* (2003), provide a measure of market efficiency. The concentrated markets SC-BB and BC-BS have the most efficiency with adjustment coefficients of -43.49 and -44.16 respectively. The least concentrated agents are not as greedy as the concentrated agents and can choose a more productive bargaining partner. Comparatively, when the concentrated agents choose their bargaining partners, the market is not as efficient with SC-BS and BC-BB adjustment coefficients of -110.56 and -164.02. Figure 4 represents the average total earnings by period and treatment for the seller concentrated market. The earnings for the SC BS treatment are lower than any other treatment in twelve out of the twenty periods which is represented by the significantly lower convergence level. Whereas, the BC BS treatment reaches the competitive equilibrium total earnings of 1200 four out of twenty periods indicating that it is a more efficient market, even more efficient than the base and the SC 4v4 treatments. The SC BS treatment total earnings vary around 1030 which represents about 14 percent of total earnings are lost through this type of negotiation.

Figure 10 represents the average total earnings by period and treatment for buyer concentrated markets. Not one treatment in the buyer concentrated market reaches the competitive equilibrium of 1200 tokens indicating that these markets are not as efficient as the

seller concentrated markets. Total earnings for the BC BB treatment vary around 980 tokens which represents 18.3 percent of lost earnings.

Relative Earnings

The competitive equilibrium model defines an equal distribution of buyer and seller earnings at 150 tokens each. Intuitively, the concentrated players are likely to perform better than non-concentrated players, as represented by the results from the experiment.

The buyer earning and seller earning adjustment coefficients for a seller concentrated market when sellers choose is -32.00 and 49.87 respectively, and increases for each when buyers choose their trading partners to -24.99 and 63.72. The increase in earnings for buyers and sellers is compatible with the earnings in the base treatment. When buyers choose their trading partners with equal numbers of agents, sellers perform less efficiently with total earnings of 130.28 and buyers perform more efficiently with total earnings of 155.10. Indicated by Figure 5 average buyer earnings per period are greater than the competitive equilibrium earnings for each 4v4 treatment and less than competitive earnings for each big seller treatment. However, average earnings for sellers (Figure 6) are higher than the competitive equilibrium. More equality among trading partners is evident in the base treatment, as shown in Figure 7, when buyers choose among equal numbers of agents corresponding to a difference in buyer and seller earnings of 24.30. Whereas the least equality is apparent in the seller concentrated market corresponding to greatest estimated difference in buyer and seller earnings of 80 tokens to the seller's advantage.

The buyer earning and seller earning adjustment coefficients for a buyer concentrated market when sellers choose is 52.62 and -12.30, respectively. Buyer earnings increase when buyers choose to 83.24 and seller earnings decrease to -64.27. Indicated by Figure 11 average

buyer earnings per period are greater than the competitive equilibrium earnings for each big buyer treatment. However, average earnings for sellers (Figure 12) are less than the competitive equilibrium. As stated previously equality is strong among trading partners in the base treatment, as shown in Figure 13, when buyers choose among equal numbers of agents corresponding to a difference in buyer and seller earnings of 24.30. Whereas, the least equality is apparent in the buyer concentrated market when buyers choose; this corresponds to the greatest estimated difference in buyer and seller earnings of 172.46 tokens to the buyer's advantage. All coefficients are statistically significant. The decrease in seller earnings is explained by the decrease in market efficiency. The increase in buyer earnings is explained by the significant decrease in trade price which is advantageous for the buyers.

DISCUSSION

To explain the behavior and outcomes of the buyers and sellers in the experiments the theory and the empirics are combined. Asymmetry in the market gives the least populated side of the market more bargaining power, *ceteris paribus*. This bargaining power is represented by the relative earnings being positive in the BC-BB and SC-BB treatments and the relative earnings being negative in the BC-BS and SC-BS treatments. A previous study finds that relatively few buyers weaken the seller's bargaining position and reduces the maximum price the seller can extract from buyers (Arnold 1999). However, the ability to choose also affects bargaining power. Table 5 breaks down the average earnings for both buyers and sellers for each experimental treatment. The percent change in earnings between the total earnings between the buyer choosing treatments and the seller choosing treatments further explain the division of bargaining power between players. In the treatments which have equal numbers of buyers and sellers, buyers gain bargaining power when they have the opportunity to choose a partner—represented by a 15.36 percent gain in profits between the base treatment and the SC-4v4 treatment. This implies sellers lose bargaining power represented by a 20.12 percent loss in profits between the base treatment and the SC-4v4 treatment. In the treatments which have fewer sellers than buyers, or seller concentration, both the buyers and the sellers lose profits from when the buyer chooses the bargaining partner to when the seller chooses the bargaining partner. This is represented by a loss in buyer earnings of 5.74 percent and a loss in seller earnings of 6.80 percent. Since the percent change in seller earnings is less than the percent change in buyer earnings, buyers have more to gain than the sellers when the seller chooses a bargaining partner.

Therefore, it may be observed that holding market concentration constant buyers gain when sellers choose and sellers gain when buyers choose bargaining partners. However, this relationship does not hold constant for the buyer concentrated markets. Buyers lose 12.77 percent of profits when sellers choose and sellers gain 70.71 percent profits when sellers choose. Observations suggest that buyer concentration works against the ability to reject bargaining partners and works with the ability to choose. Represented by figures 14 and 15—big players typically trade a less than equilibrium number of units explained by a high probability he/she will have profitable match for every negotiation period.

Asymmetric markets are observed in the labor market for superstars. The “superstar phenomenon” is defined by Hamlen (1991) in which small numbers of people earn enormous amounts of money and dominate the markets they occupy. In Major League Baseball (MLB) a player with at least six years experience has that right to sell himself to other teams. There are two types of labor mobility—voluntary mobility and involuntary mobility. Voluntary mobility is an example of the experimental treatment SC-BS. The seller is the baseball player and he is offering his talent to all teams in the MLB. A player may decide to change teams to attain a better offer than he currently possesses. Involuntary mobility is an example of both BC-BS and BC-BB. Again in this example the player is the seller and he is offering his talent as a good. The owner of the team (the buyer) may layoff players for better opportunities or better players² (Hylan *et al.* 1996). Up-and-coming baseball players are chosen by owners, and, as players

² Big sellers, in the scenarios, are the superstar players who are typically demanded by most teams to play, and small sellers would be the players who are deemed as mediocre. Players who would fall in the small seller category would be the players whose talent is easily replaceable by another player.

mature, the role switches—players (sellers) choose the teams (buyers) for which they would like to play (Sanderson and Siegfried 2006).

This analysis does not only have to hold for MLB but also for any industry that contains superstars—that being the film industry, any major sports industry, the music industry, and the search for competent CEOs (Hamlen 1991), (Rosen 1981), (Tervio 2009), (Hylan *et al.* 1992), (Sanderson and Siegfried 2006), (Hausman and Leonard 1997). When choosing talented individuals for positions, the choosing industry must decide what it is willing to forgo for profits. A trade off of talent and quantity is observed among these industries. The industry may face larger direct costs of greater talent versus larger indirect costs of greater quantity and lesser talent (Rosen 1981). In the experimental analysis of concentrated markets, individuals who are patient are willing to forgo quantity in the fact that they are more likely to get an advantageous offer in the exchange of the unit the longer they wait. Whereas, impatient players are more interested in quantity of units exchanged and are willing to accept an offer that may not be the most profitable.

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TABLES AND FIGURES

Table 1 Treatment Acronym Definitions & Average Buyer/Seller Earnings

Treatment	Acronym	# of Sellers	Average SE³	# of Buyers	Average BE
Buyer Choose	Base	4	129.60	4	156.47
Seller Choose	SC-4v4	4	103.53	4	180.50
Buyer Choose- Big Buyer	BC-BB	4	67.23	3	236.53
Seller Choose- Big Buyer	SC-BB	4	114.77	3	206.33
Buyer Choose- Big Seller	BC-BS	3	192.30	4	131.80
Seller Choose- Big Seller	SC-BS	3	179.23	4	124.23

³ The earnings are calculated by finding the mean from the last ten periods in the experimental treatment.

Table 2 Buyer Redemption Values and Seller Costs (Tokens) per Unit Used in the Experiments

Unit	Small Buyer Redemption Value	Big Buyer Redemption Value	Small Seller Unit Cost	Big Seller Unit Cost
1	130	130	30	30
2	120	130	40	30
3	110	120	50	40
4	100	120	60	40
5	90	110	70	50
6	80	110	80	50
7	70	100	90	60
8	60	100	100	60
9	N/A	90	N/A	70
10	N/A	90	N/A	70
11	N/A	80	N/A	80
12	N/A	80	N/A	80
13	N/A	70	N/A	90
14	N/A	70	N/A	90
15	N/A	60	N/A	100
16	N/A	60	N/A	100

Figure 1 Market Demand and Supply

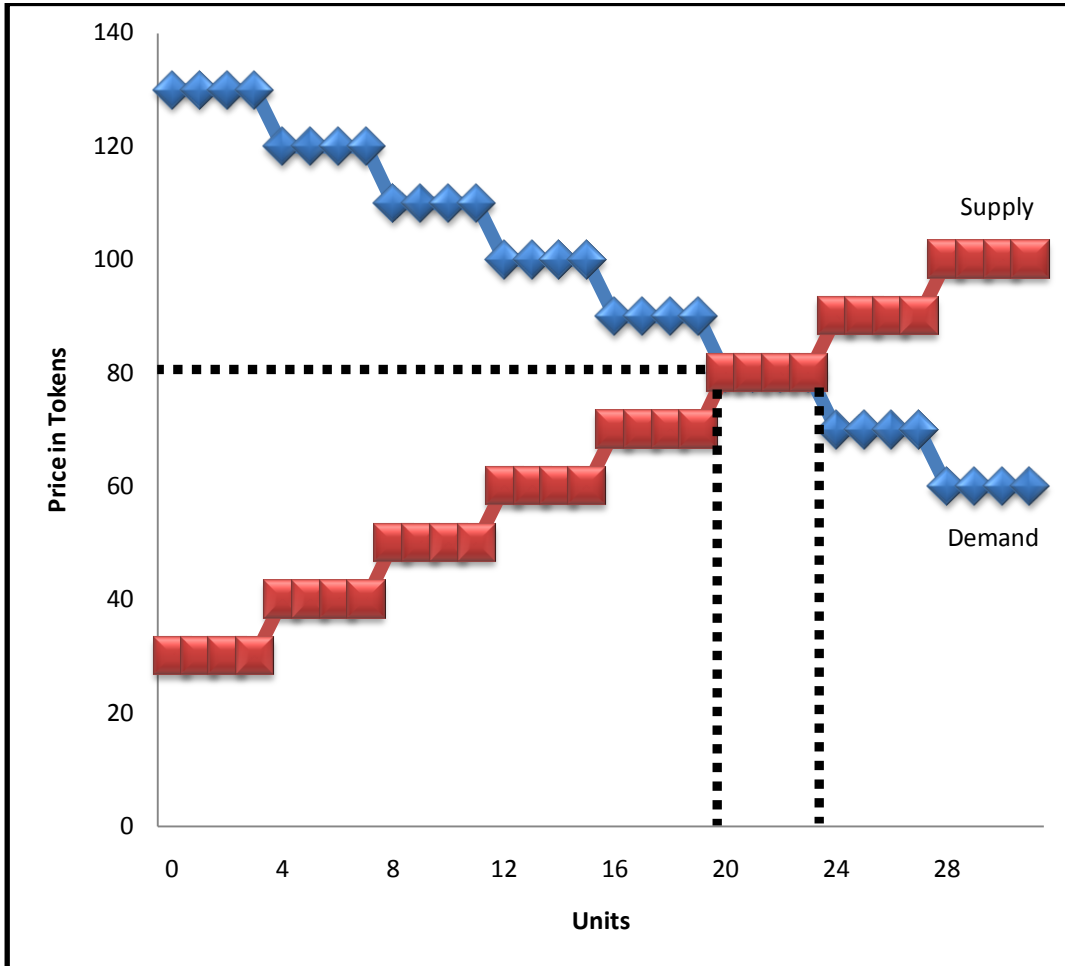


Table 3 Estimated Base Convergence Levels and Treatment Adjustment Coefficients for Seller Concentrated Markets

Treatment	Trades	Prices	Total Surplus	Buyer Earnings	Seller Earnings	Buyer-Seller Earnings
Base	18.6 ^a	76.94 ^a (0.505)	1141.60 ^a (10.15)	155.10 ^a (3.01)	130.28 ^a (2.193)	24.30 ^a (4.652)
SC 4v4	-0.038 ^b (0.460)	-6.45 ^{*b} (0.737)	-16.86 ^b (16.44)	25.84 ^{*b} (3.45)	-30.50 ^{*b} (3.126)	55.60 ^{*b} (4.964)
BC BS	0.549 ^{cb} (0.449)	4.34 ^{*c} (0.794)	-44.16 ^{*cb} (17.38)	-24.99 ^{*c} (3.340)	63.72 ^{*c} (5.760)	-90.48 ^{*c} (7.864)
SC BS	-1.69 ^{*d} (0.453)	4.44 ^{*dc} (0.957)	-110.56 ^{*d} (19.90)	-32.00 ^{*dc} (4.095)	49.87 ^{*d} (4.156)	-81.76 ^{*dc} (6.52)

Note: Single asterisk (*) represents estimated convergence level significantly different from the base value at .

Note: a, b, c, d—same letter indicates no significant difference between estimated convergence levels in the respective equations. Different letters indicate a significant difference between estimated asymptotes at .

Note: The value in the parentheses is standard error

Figure 2 Average number of trades by period and treatment for seller concentrated market

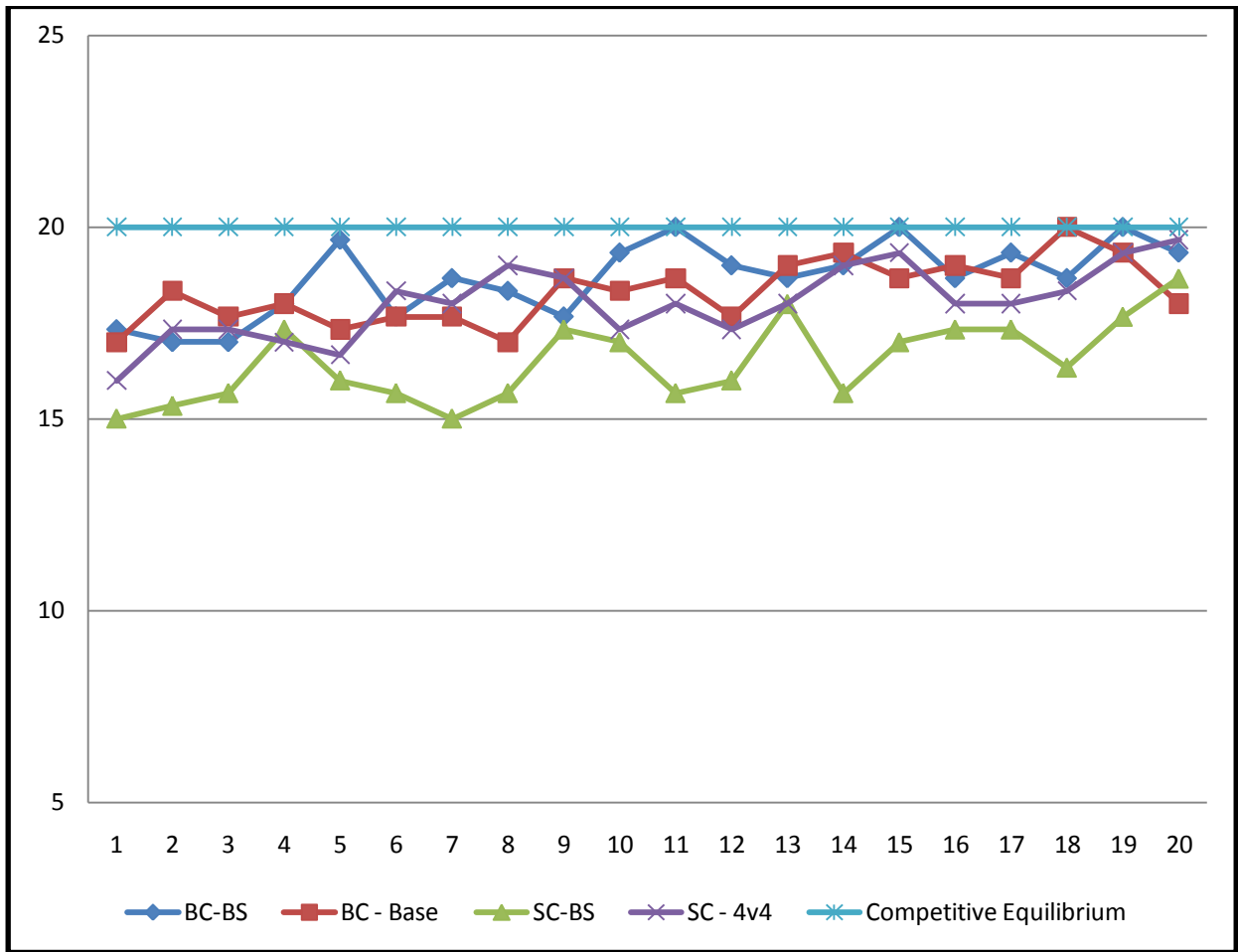


Figure 3 Average trade prices by period and treatment for seller concentrated market

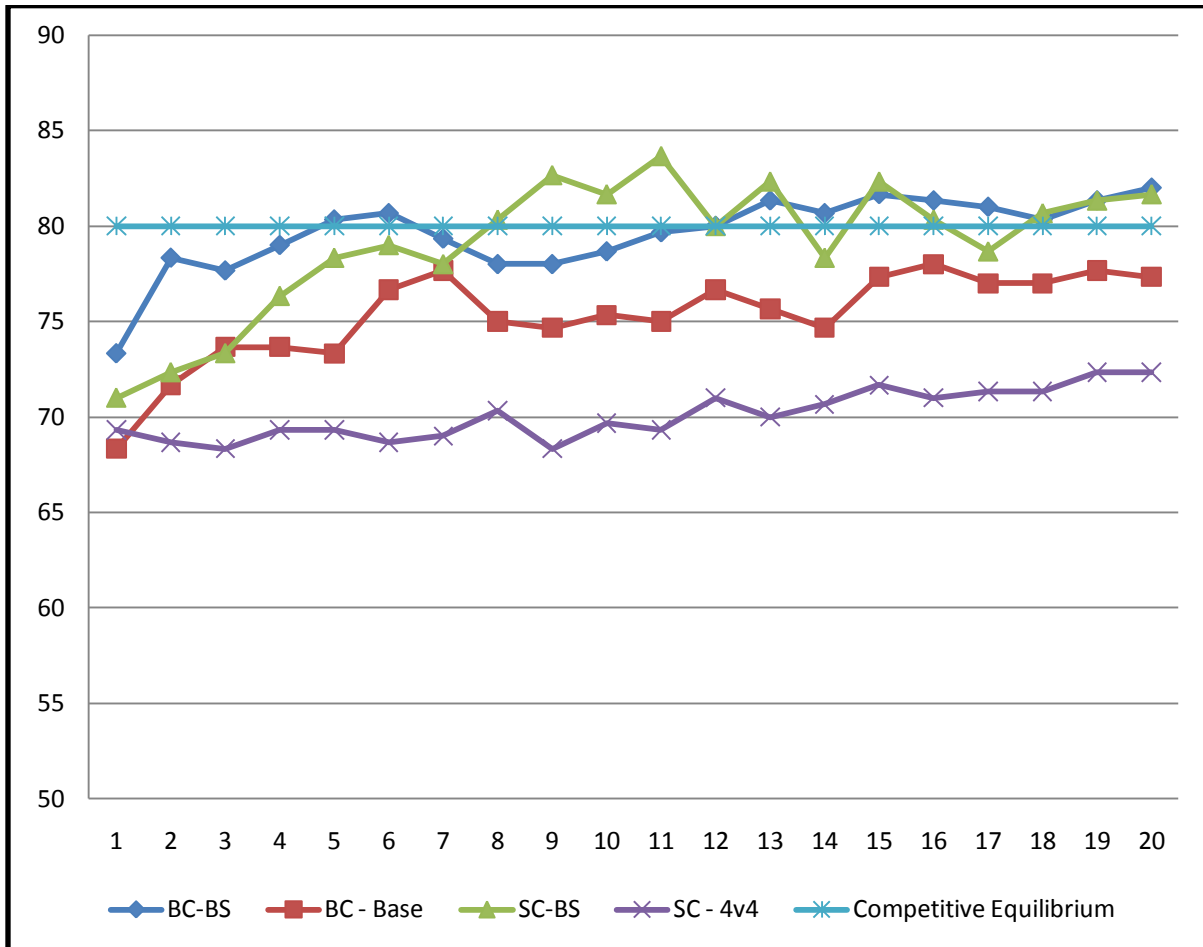


Figure 4 Average total earnings by period and treatment for seller concentrated market

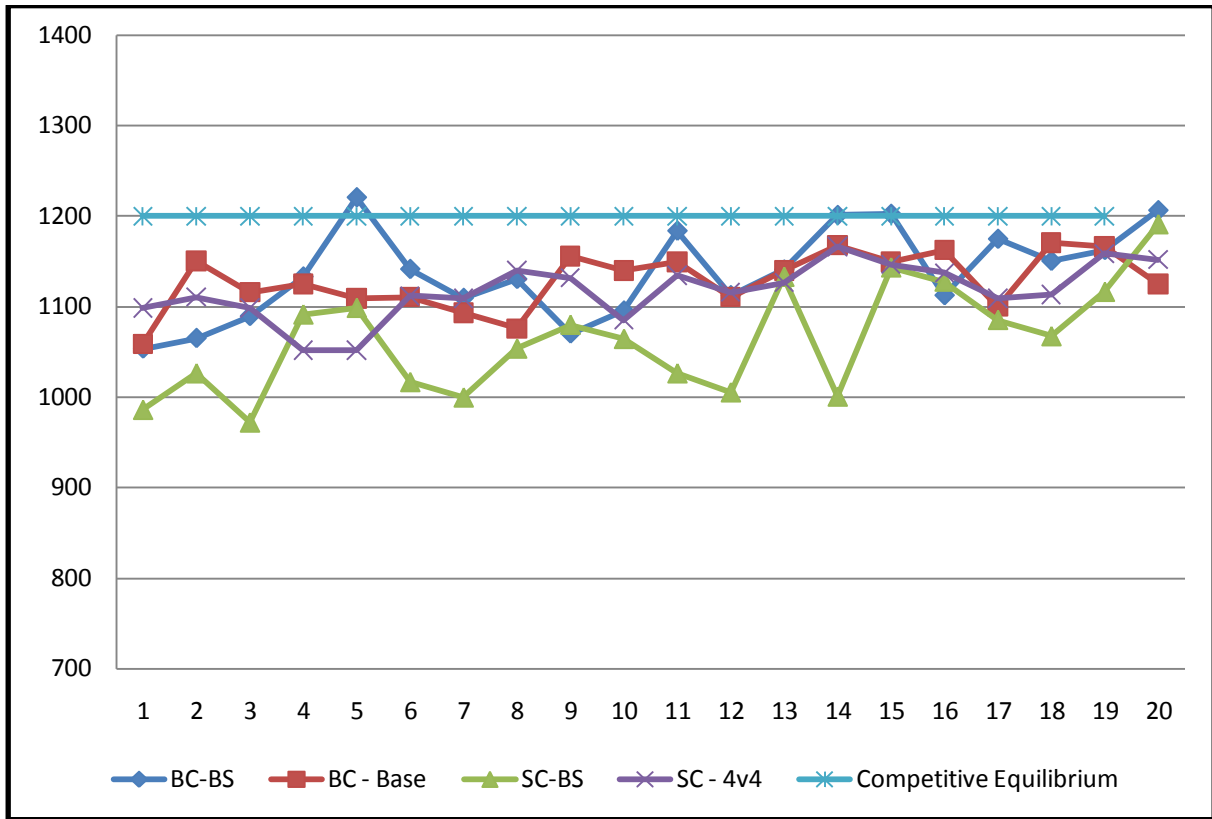


Figure 5 Average buyer earnings by period and treatment for seller concentrated market

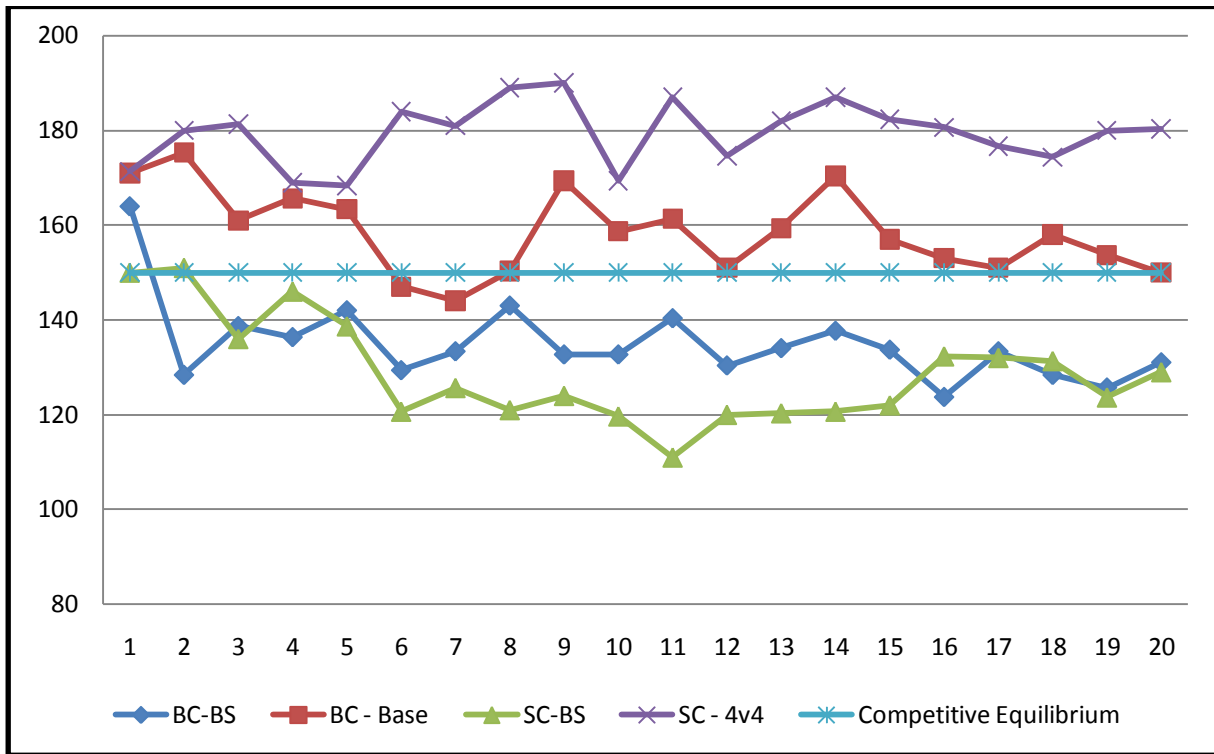


Figure 6 Average seller earnings by period and treatment for seller concentrated market

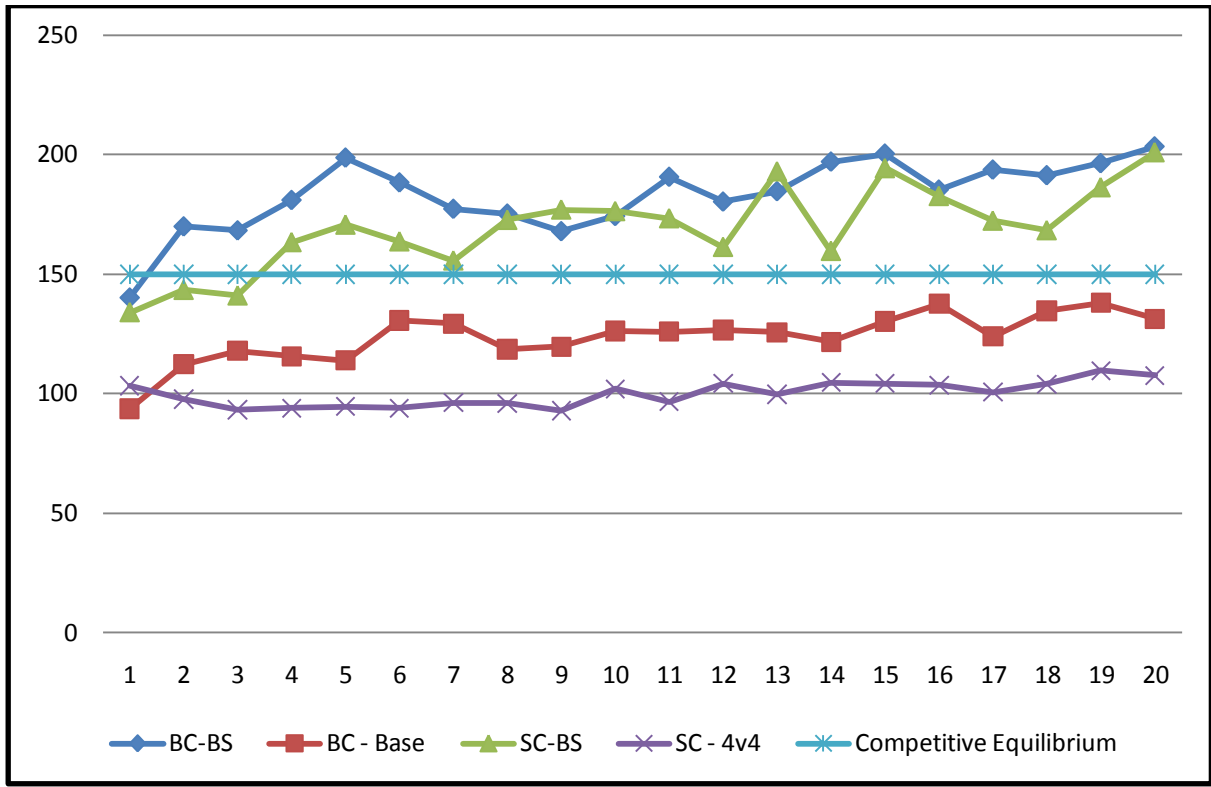


Figure 7 Average relative earnings by period and treatment for seller concentrated market

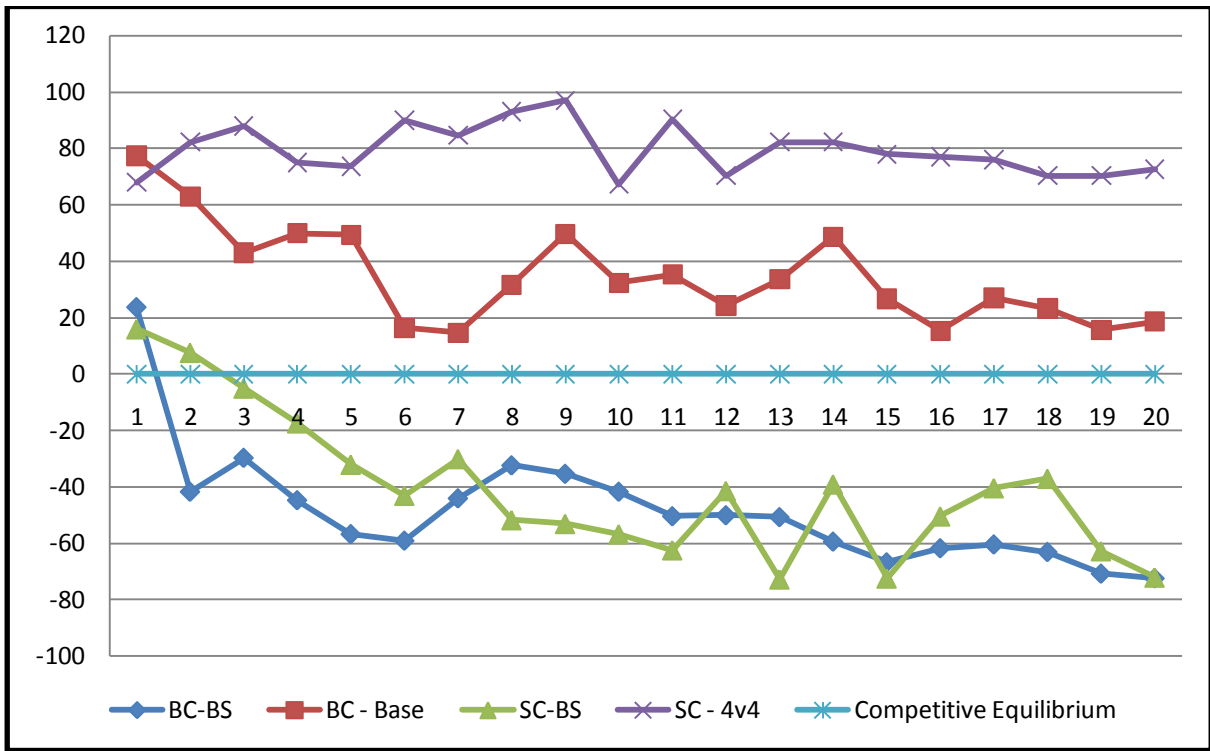


Table 4 Estimated Base Convergence Levels and Treatment Adjustment Coefficients for Buyer Concentrated Markets

Treatment	Trades	Prices	Total Surplus	Buyer Earnings	Seller Earnings	Buyer-Seller Earnings
Base	18.6 ^a (0.333)	76.93 ^a (0.505)	1141.60 ^a (10.15)	155.08 ^a (3.01)	130.24 ^a (2.193)	24.46 ^a (4.65)
SC 4v4	-0.038 ^b (0.460)	-6.45 ^{*b} (0.737)	-16.86 ^b (16.44)	26.00 ^{*b} (3.47)	-30.47 ^{*b} (3.124)	56.04 ^{*b} (4.985)
BC BB	-3.15 ^{*c} (0.521)	-12.44 ^{*c} (0.631)	-164.02 ^{*c} (13.82)	83.24 ^{*c} (4.124)	-64.27 ^{*c} (2.724)	148.00 ^{*c} (5.86)
SC BB	-0.655 ^{db} (0.608)	-1.99 ^{**d} (0.848)	-43.49 ^{**db} (21.58)	52.62 ^{*d} (5.575)	-12.30 ^{*d} (4.270)	64.84 ^{*db} (7.901)

Note: Single asterisk (*) represents estimated convergence level significantly different from the base value at .

Double asterisk (**) represents estimated convergence level significantly different from the base value at .

Note: a, b, c, d—same letter indicates no significant difference between estimated convergence levels in the respective equations. Different letters indicate a significant difference between estimated asymptotes at .

Note: The value in the parentheses is standard error.

Figure 8 Average number of trades by period and treatment for buyer concentrated market

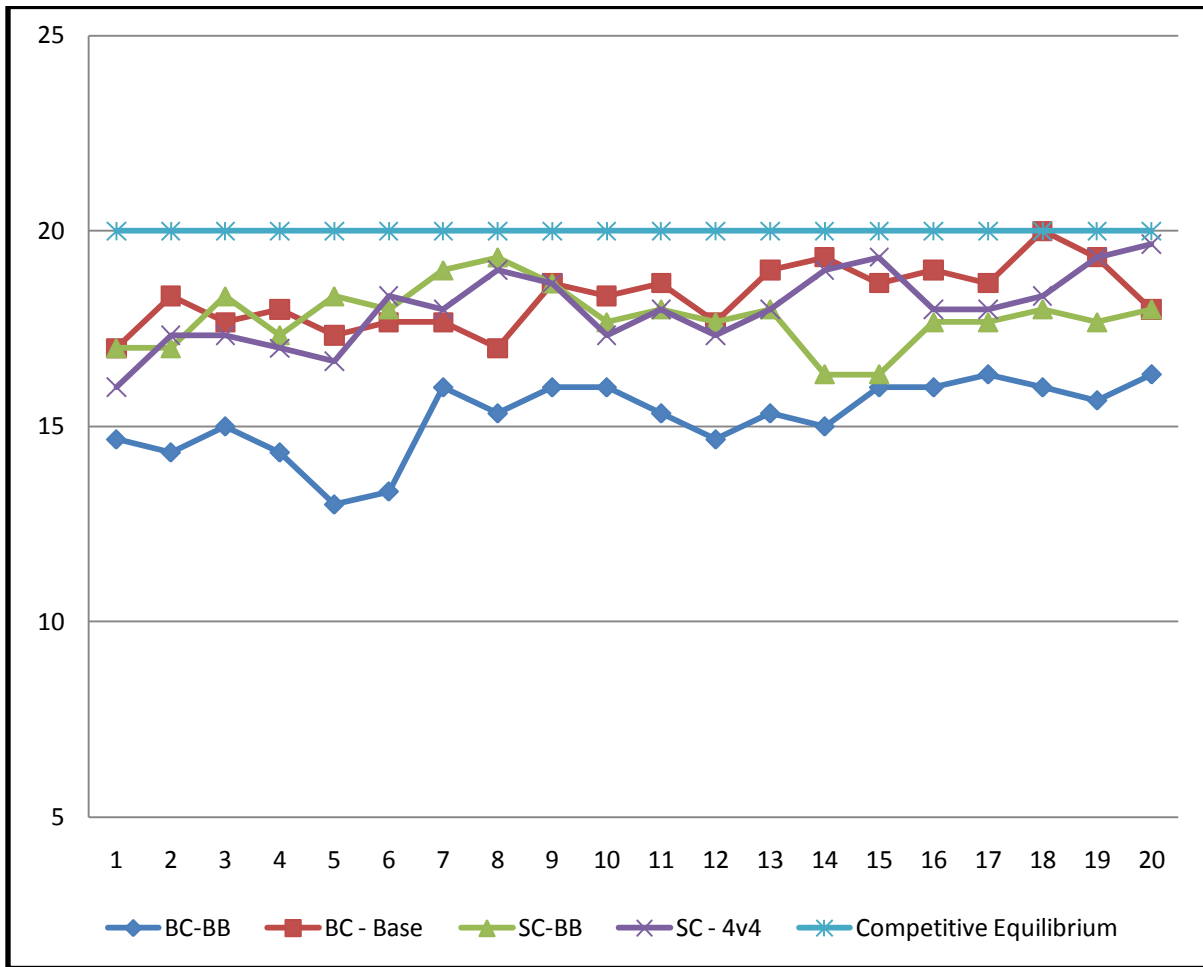


Figure 9 Average trade prices by period and treatment for buyer concentrated market

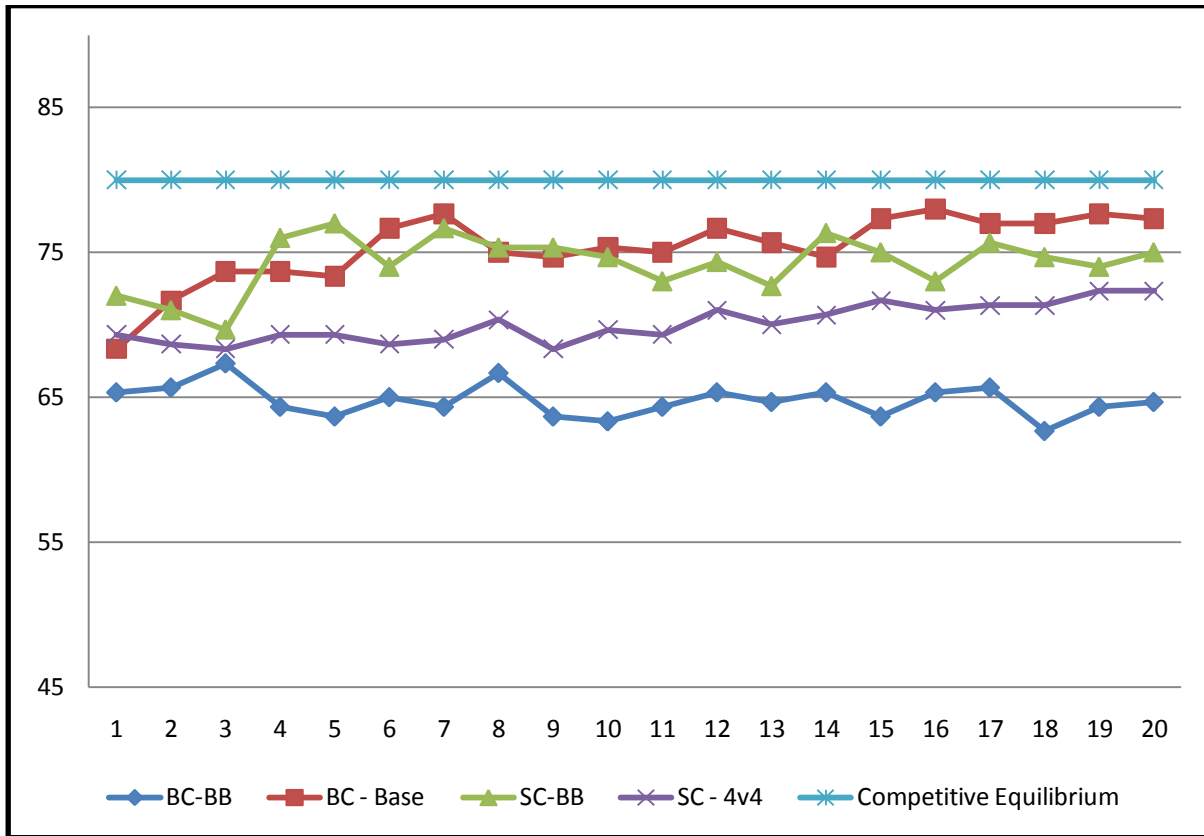


Figure 10 Average total earnings by period and treatment for buyer concentrated market

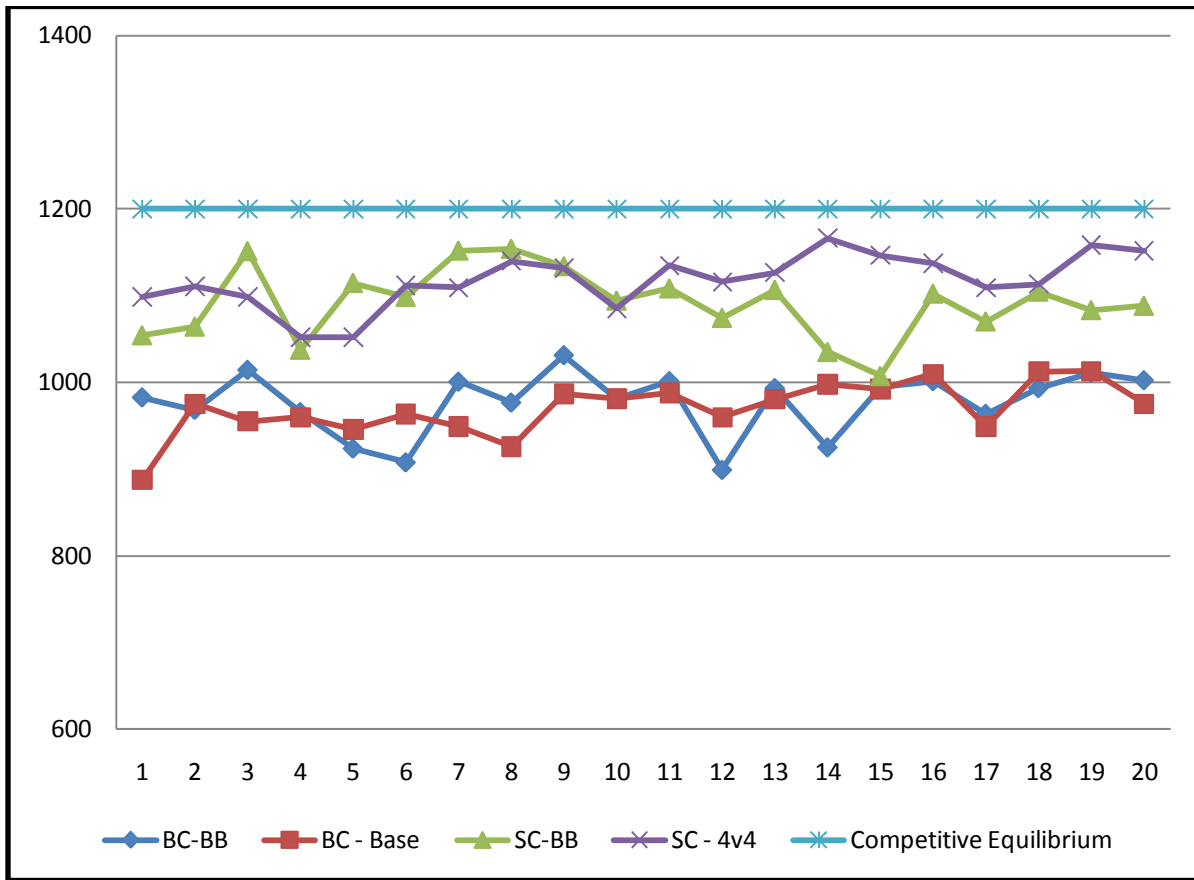


Figure 11 Average buyer earnings by period and treatment for buyer concentrated market

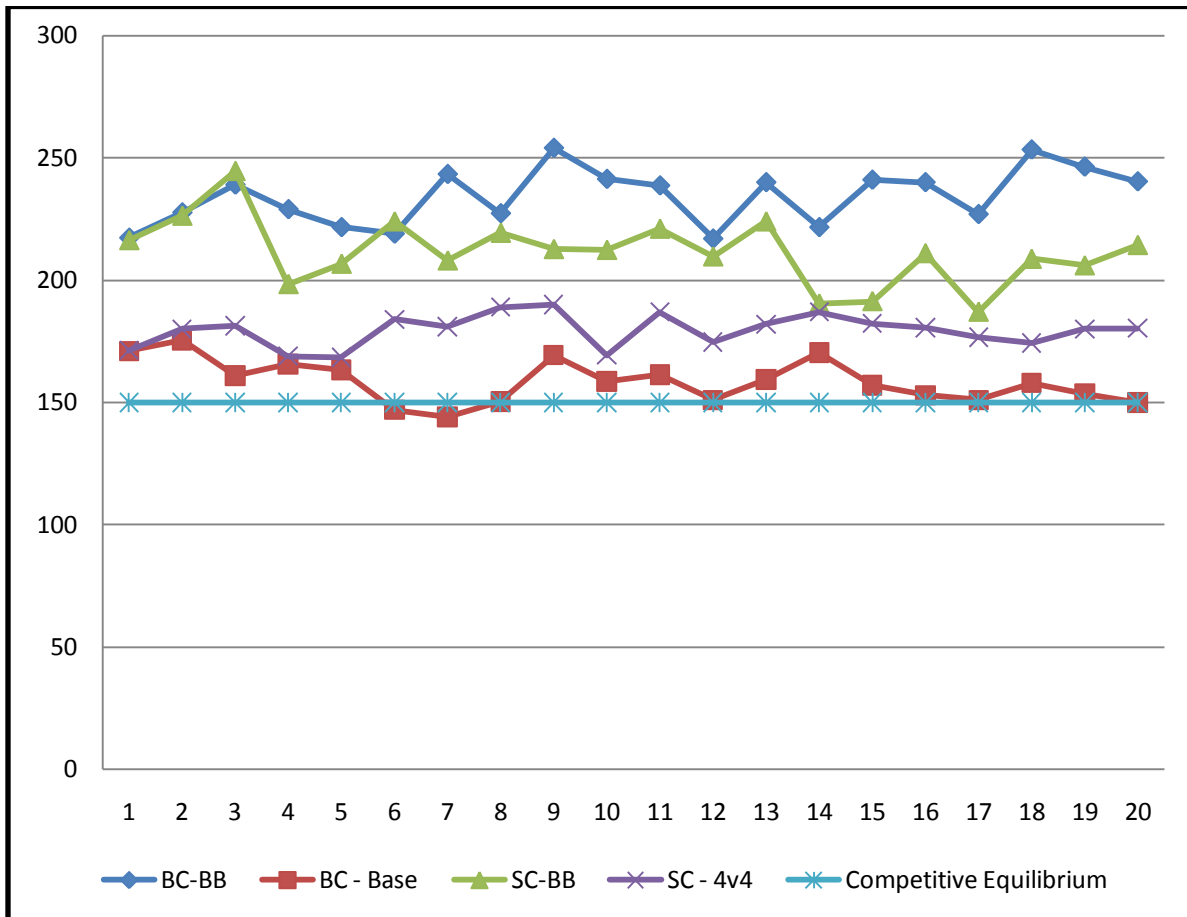


Figure 12 Average seller earnings by period and treatment for buyer concentrated market

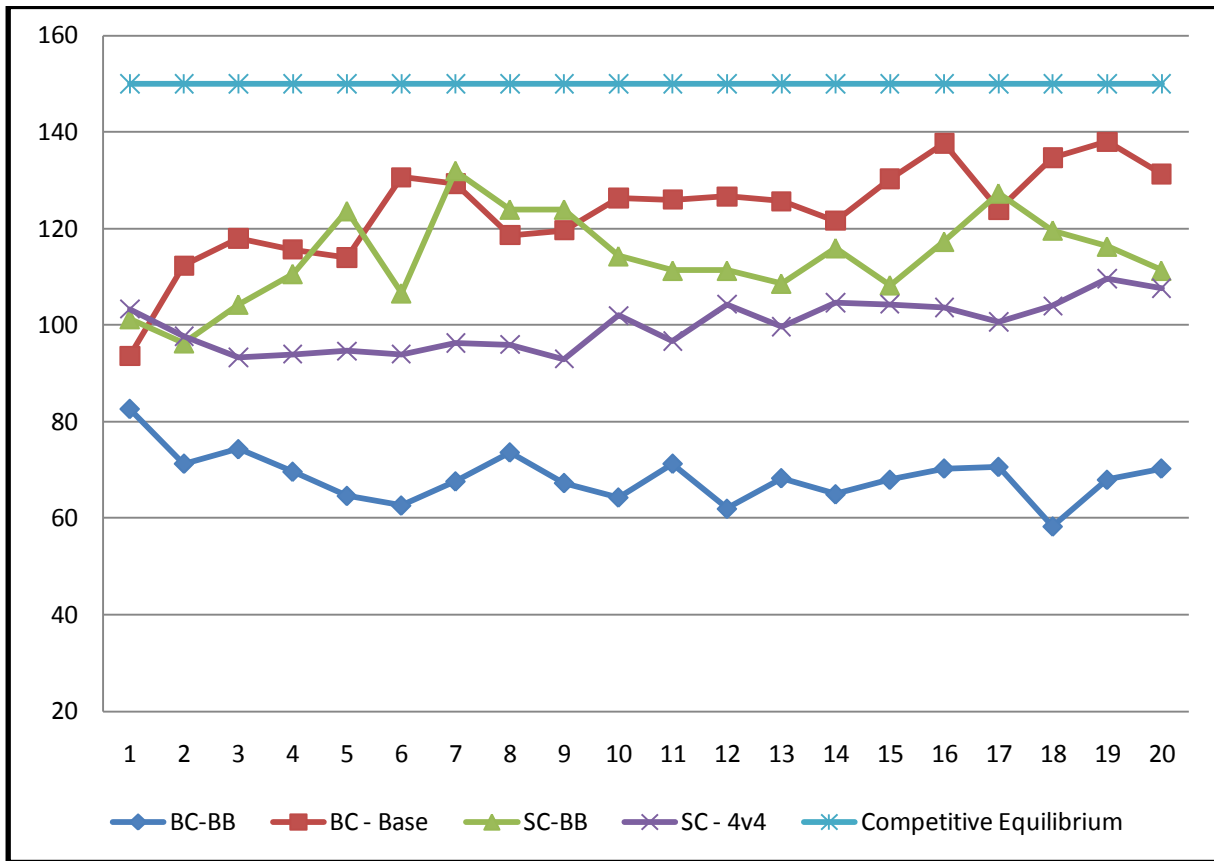


Figure 13 Average relative earnings by period and treatment for buyer concentrated market

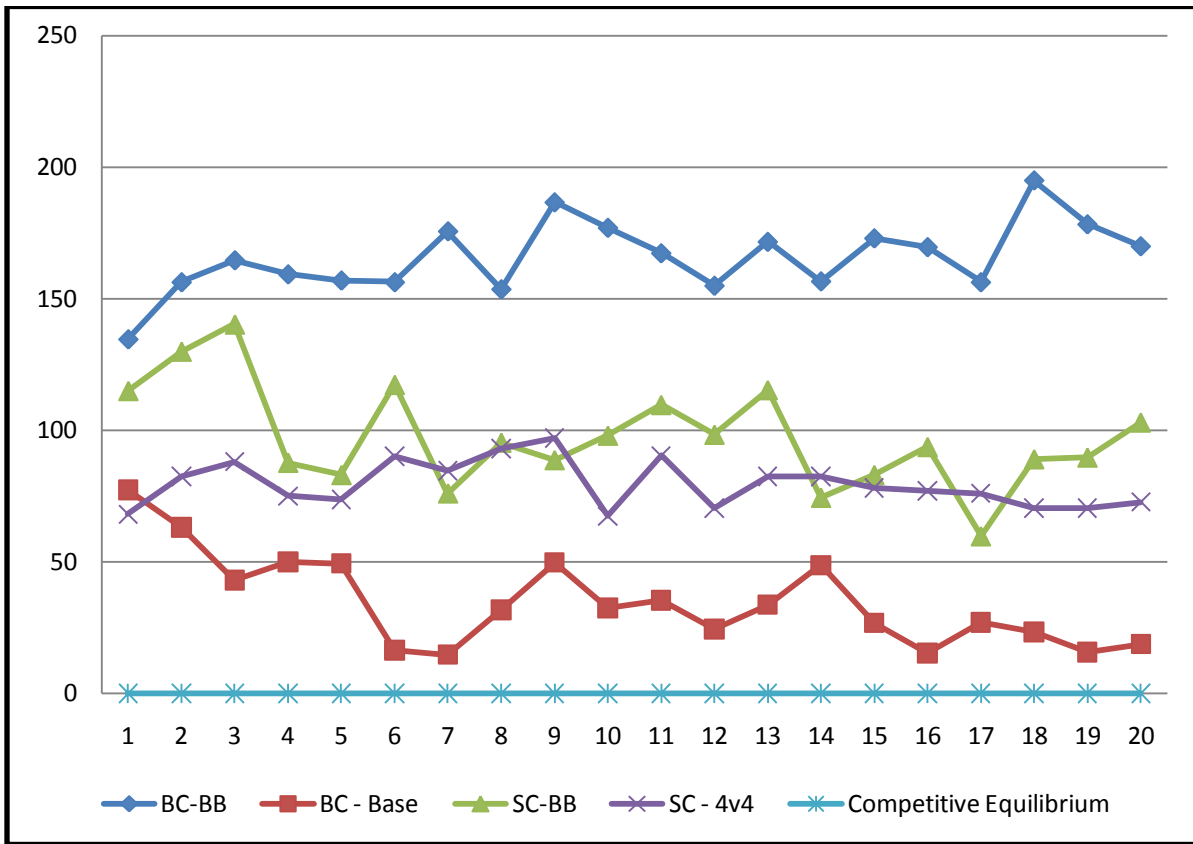
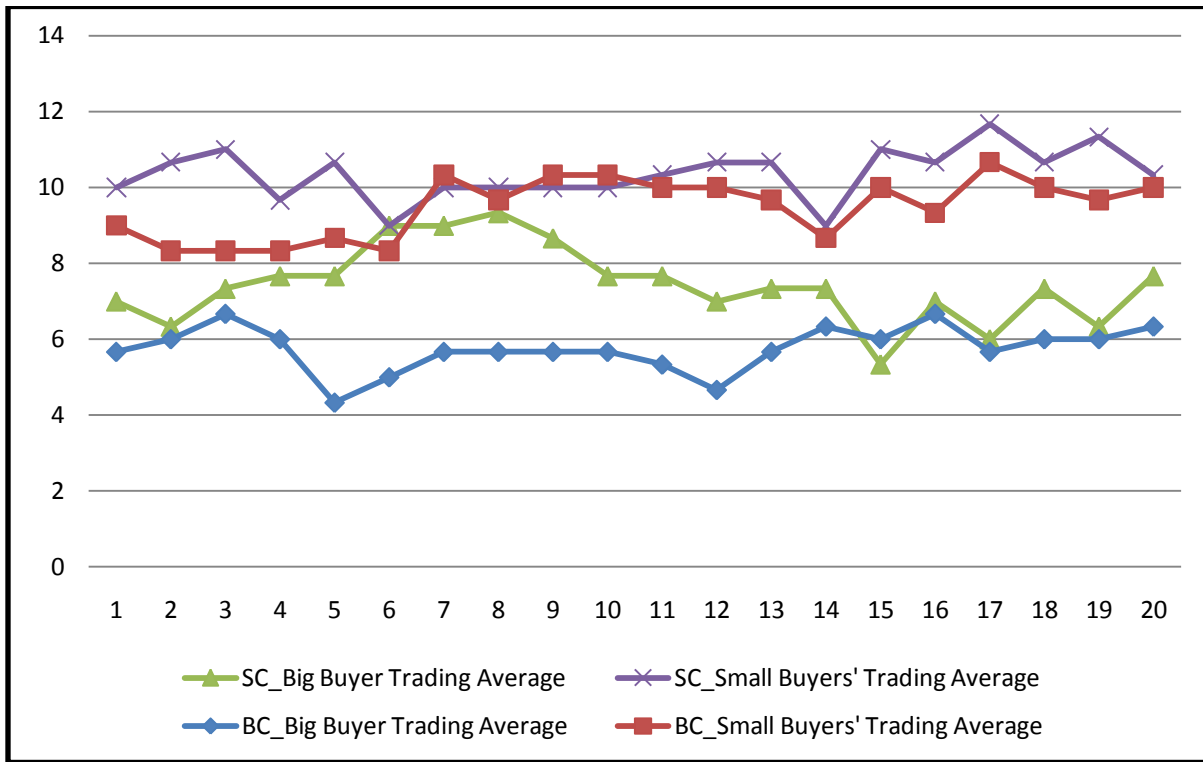


Figure 14 Individual buyer trading average by period and treatment for buyer concentrated markets⁴



⁴ These trades are analyzed by summing the two small players' number of trades to compare with the one big player. The total units allocated to the big player (16) equal the sum of the units allocated to each small player (8+8).

Figure 15 Individual seller trading average by period and treatment for seller concentrated markets

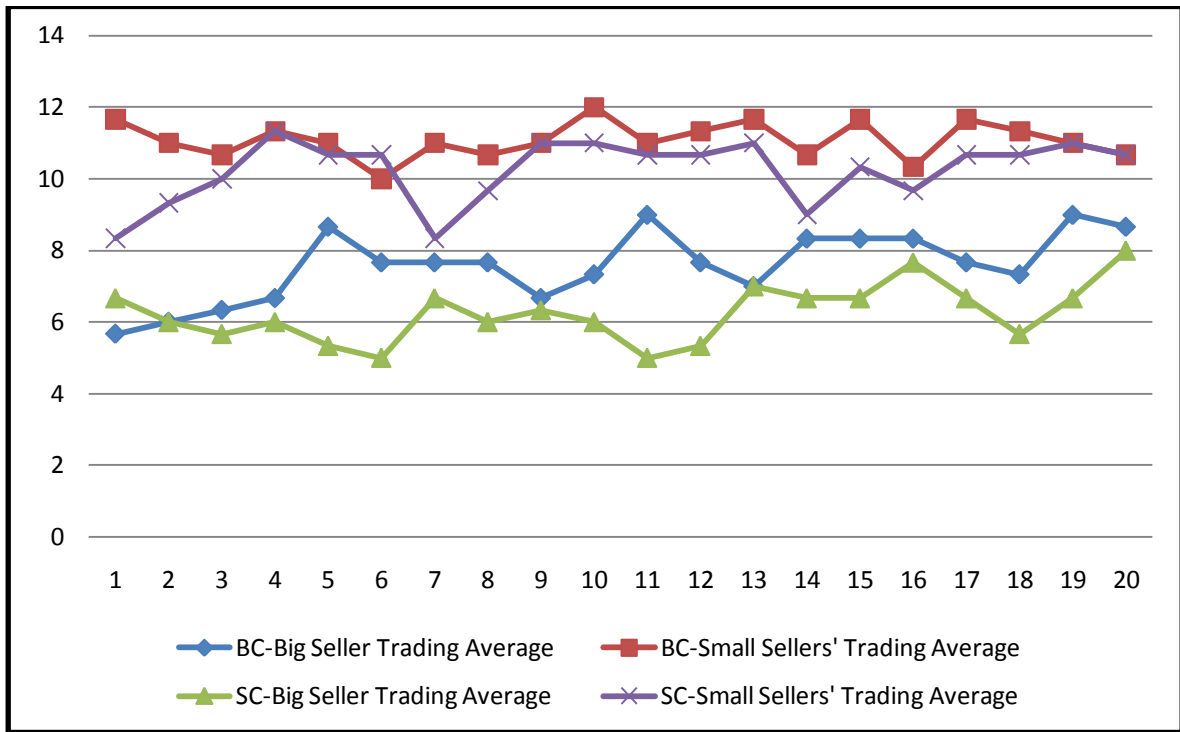


Table 5

Treatment	Buyer Choose	Seller Choose	Buyer Earnings (BE)	% Change in BE	Seller Earnings (SE)	% Change in SE
Base	X		156.47		129.60	
SC-4v4		X	180.50	+ 15.36%	103.53	- 20.12%
BC-BB	X		236.53		67.23	
SC-BB		X	206.33	- 12.77%	114.77	+ 70.71%
BC-BS	X		131.80		192.30	
SC-BS		X	124.23	- 5.74%	179.23	- 6.80% ⁵

⁵ Since the percent change in seller earnings is less than the percent change in the buyer earnings, buyers have more to gain than the sellers when the seller chooses a bargaining partner.

APPENDIX 1

INSTRUCTION SET 1

Buyer choose/4 Sellers, 3 Buyers

Introduction

This is an experiment in the economics of market decision making. In this experiment, we will set up a market in which some of you will be BUYERS and some of you will be SELLERS.

The commodity you are trading is referred to as a "unit". Sellers make earnings by producing units at a cost and selling these units to buyers. Buyers make earnings by purchasing units from sellers and then redeeming (or reselling) these units to the experimenter. Earnings are recorded in a fictitious currency called tokens. Tokens are exchanged for cash at the rate of **100 tokens = \$1.00**. Your earnings will be paid to you in CASH at the end of the experiment. To begin, every seller and buyer will be given an initial balance of **1000 tokens (\$10.00)**. You may keep this money PLUS any you earn.

Buyers will **choose** and be accepted by sellers with whom they will trade. In trading, buyers and sellers will exchange units for tokens in computerized markets over a sequence of trading cycles. Each trading cycle consists of three trading sessions or bargaining rounds during which pairs of buyers and sellers negotiate trading prices. Each trading cycle consists of what is commonly referred to as a **forward market**. The forward market occurs before sellers have produced units. A trade in the forward market is a binding agreement between a buyer and a seller. In other words, the seller agrees to produce a unit for the buyer and the buyer agrees to pay the seller for that unit.

All trading is conducted over the computer network. At the end of each trading cycle, any unit sold is automatically produced, and the cost of production is deducted from the seller's token balance. In addition, the computer will automatically account for sales or purchases that you have made and adjust your token balance accordingly. A listing of sales or purchases you have made and your adjusted token balance will be displayed on the computer screen at the end of every trading cycle. After you have viewed this information and clicked on OK, a new trading cycle with three

bargaining rounds will begin. This experiment will consist of several trading cycles. We will conduct a practice cycle to familiarize you with the mechanics of the computerized market before the actual experiment begins. **During the practice cycle, the information you see will be different than that in the actual experiment.**

Trading Partner Selection

At the beginning of each bargaining round, buyers will be given a list of sellers from which to choose a trading partner. Sellers are then given the option to accept or reject the buyer's choice. In this experiment there are 3 buyers and 4 sellers. One seller will not get paired and will earn zero for the trading session. At the beginning of the next bargaining round a new selection process will begin. Once matches are made, the experiment proceeds to the bargaining round. The trading partner you have been paired with will be noted on the trading screen.

Specific Instructions to Buyers

During each trading cycle you are free to purchase up to 8 units while one person is free to purchase up to 16 units. For the first unit that you buy during a trading cycle, you will receive the amount listed under UNIT VALUE for Unit 1. In this example, this amount, known as the redemption value, is 80 tokens. For the second unit that you buy you will receive the amount listed under UNIT VALUE for Unit 2, which is 70 tokens. The redemption values for these and subsequent units will be displayed on your computer screen.

The earnings from each unit that you purchase (which are yours to keep) are computed by taking the difference between the redemption value and purchase price of the unit bought. That is,

$$\text{Your Earnings} = \text{Redemption Value} - \text{Purchase Price}$$

Suppose, for example, that you buy 2 units in a trading cycle. If you pay 60 tokens for the first unit and 45 tokens for the second unit, your earnings are:

$$\text{earnings for Unit 1} = 80 - 60 = 20$$

$$\text{earnings for Unit 2} = 70 - 45 = 25$$

$$\text{total earnings} = 20 + 25 = 45 \text{ tokens}$$

46

During the experiment, this trading information will be summarized on the computer screen at the end of each trading cycle. Buyers also should be aware that they will not be allowed to spend more tokens buying units than what they have in their beginning balance in any one cycle.

Specific Instructions to Sellers

During each trading cycle you are free to sell up to 8 units. Remember, any units that you sell will automatically be produced once trading in the forward market is complete. The first unit that you sell during a trading cycle will cost you the amount listed under UNIT COST for Unit 1. In this example, this cost is 20 tokens. Unit 1's unit cost is 20 tokens. The second unit that you sell will cost you the amount listed under UNIT COST for Unit 2, which is 30 tokens and unit 3 is 40 tokens. The unit costs for these and subsequent units will be displayed on your computer screens.

The earnings from each unit that you sell (which are yours to keep) are computed by taking the difference between the sale price and unit cost of the unit sold. That is,

$$\text{Your Earnings} = \text{Sale Price} - \text{Unit Cost}$$

Let's suppose that in the forward market you sell Unit 1 for 50 tokens, Unit 2 for 45 tokens and Unit 3 for 45 tokens. Your earnings would then be:

$$\text{earnings for Unit 1} = 50 - 20 = 30$$

$$\text{earnings for Unit 2} = 45 - 30 = 15$$

$$\text{earnings for Unit 3} = 45 - 40 = 5$$

$$\text{total earnings} = 30 + 15 + 5 = 50 \text{ tokens}$$

During the experiment this trading information will be summarized on the computer screen at the end of each trading cycle. Sellers also should be aware that they will not be allowed to incur a production cost greater than the amount in their beginning token balance in any one cycle.

Trading Rules for the Forward Market

Only one unit may be bought and sold at a time. A buyer makes bids to the seller to purchase a unit. A "bid" is a proposed price at which a buyer is willing to purchase a unit. Bids must become progressively higher. In other words, if the first bid for a unit is 50 tokens, then the second bid must be higher than 50. Suppose the second bid is 55 tokens, then the third bid must be higher than 55, and so on.

A seller makes offers to the buyer to sell a unit. An "offer" is a proposed price at which a seller is willing to sell a unit. Offers must become progressively lower. In other words, if the first offer to sell a unit is for 60 tokens, then the second offer must be lower than 60. Suppose the second offer is 55 tokens, then the third offer must be less than 55, and so on.

There is one further set of restrictions on bids and offers. A buyer's bid cannot be higher than what is labeled on the computer screen as the SELLER'S CURRENT OFFER. In other words, a buyer cannot attempt to pay a price that is higher than that for which the seller is willing to sell. Similarly, a seller's offer cannot be lower than what is labeled as the BUYER'S CURRENT BID. In other words, a seller cannot attempt to sell at a price below that which the buyer is willing to pay. In fact, the computer will not allow such bids and offers.

A bid is made by typing the bid and pressing the ENTER key. Similarly, an offer is made by typing the offer, and pressing the ENTER key. During a market, a buyer will be making bids at the same time that a seller is making offers.

It should be apparent that the difference between the BUYER'S CURRENT BID and the SELLER'S CURRENT OFFER gradually decreases. A trade is made when the BUYER'S CURRENT BID equals the SELLER'S CURRENT OFFER. Suppose the BUYER'S CURRENT BID is 55 tokens and the SELLER'S CURRENT OFFER is 60 tokens. If a buyer decided that he or she was willing to purchase the unit for 60 tokens, he or she could type the number 60 and then press ENTER. There is, however, a quicker method to do this. As soon as the buyer saw the SELLER'S CURRENT OFFER was 60, he or she could simply click on "Accept." Whenever a buyer "Accepts", he or she automatically makes a bid which equals the SELLER'S CURRENT OFFER or, in other words, "accepts" the SELLER'S CURRENT OFFER.

As another example for sellers, suppose again that the BUYER'S CURRENT BID is 55 and the SELLER'S CURRENT OFFER is 60. If a seller decided that he or she was willing to sell the unit for 55 tokens, he or she could type the number 55 and then press ENTER. Again, there is a quicker method to do this. As soon as the seller saw the BUYER'S CURRENT BID was 55, he or she could click on "Accept." Whenever a seller "Accepts", he or she automatically makes an offer which equals the BUYER'S CURRENT BID or, in other words, "accepts" the BUYER'S CURRENT BID.

After a seller and buyer have made a trade, the trading price will be listed on both the buyer's and seller's screens. After a trade has been made, bid and offer values are cleared from the screen. A buyer and seller pair may then resume entering bids and offers for additional units. Trades are made between buyer and seller pairs for one minute. After a minute has elapsed, buyers choose sellers again and the next trading session begins.

Each forward market or trading cycle has a maximum time limit of 3 minutes or three one-minute trading sessions. A market will be terminated automatically if profitable trades cannot be made by the matched buyer and seller.

Random stop. No one knows when the experiment will end. Decisions will be made through 20 periods in the experiment. After period 20, the computer will randomly generate a number between 1 and 100. If the number falls between 1 and 20 the experiment will end. If the number is higher than 20, it will continue. Hence, the probability of stopping in a given period after period 20 is 1 in 5 and the probability of continuing for another period is 4 in 5. Are there any questions about this procedure?

Your Name and Identification

Before the practice session, the computer will ask for your name and W number which is your 9-digit student number. This information is kept confidential, but it is important to the funding agency as proof of your participation. The bids and earnings of people in the experiment are confidential. Please do not look at someone else's screen and do not speak to another participant once the experiment begins. You may ask the experimenter questions at any time during the experiment. Are there any questions before we conduct the practice session?

Private Negotiations

Full Name:	<input type="text"/>	
W Number:	<input type="text"/>	
Server:	10.241.7.26	
Port:	9000	<input type="button" value="Connect"/>

To begin the experiment you will be asked to type in your full name along with your W number.
Please type the “W” along with the number.

BUYER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, worth _____, was purchased for _____ (Profit: _____)

Unit 2 is worth _____ tokens.

Unit 3 is worth _____ tokens.

Unit 4 is worth _____ tokens.

Unit 5 is worth _____ tokens.

Unit 6 is worth _____ tokens.

Unit 7 is worth _____ tokens.

Unit 8 is worth _____ tokens.

Unit 9 is worth _____ tokens.

Unit 10 is worth _____ tokens.

Unit 11 is worth _____ tokens.

Unit 12 is worth _____ tokens.

Unit 13 is worth _____ tokens.

Unit 14 is worth _____ tokens.

Unit 15 is worth _____ tokens.

Unit 16 is worth _____ tokens.

Seller's Current Offer: 0

Your Current Bid: 0

Place a new bid:
Next Bid:
Enter Any New Bid Amount:

Place Bid

Accept Offer

Tokens: _____

One buyer will receive this screen with redemption values. This screen displays the seller number with whom you are matched. Enter bids by typing them in the “enter any new bid amount” box and hitting enter or clicking “enter bid.” By clicking on the “accept offer” button with the mouse, a buyer has agreed to purchase the unit at the seller’s current offer.

BUYER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, worth _____, was purchased for _____ (Profit: _____)

Unit 2 is worth _____ tokens.

Unit 3 is worth _____ tokens.

Unit 4 is worth _____ tokens.

Unit 5 is worth _____ tokens.

Unit 6 is worth _____ tokens.

Unit 7 is worth _____ tokens.

Unit 8 is worth _____ tokens.

Seller's Current Offer: 0

Your Current Bid: 0

Place a new bid:
Next Bid:
Enter Any New Bid Amount:

Place Bid

Accept Offer

Tokens: _____

All other buyers will receive this screen with redemption values. This screen displays the seller number with whom you are matched. Enter bids by typing them in the “enter any new bid amount” box and hitting enter or clicking “enter bid.” By clicking on the “accept offer” button with the mouse, a buyer has agreed to purchase the unit at the seller’s current offer.

SELLER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, which cost _____ to produce, sold for _____ (Profit: _____)

Unit 2, will cost _____ to produce, and will be next to sell.

Unit 3 will cost _____ to produce and has not yet been sold.

Unit 4 will cost _____ to produce and has not yet been sold.

Unit 5 will cost _____ to produce and has not yet been sold.

Unit 6 will cost _____ to produce and has not yet been sold.

Unit 7 will cost _____ to produce and has not yet been sold.

Unit 8 will cost _____ to produce and has not yet been sold.

Buyer's Current Bid: 0

Your Current Offer: 0

Enter a new offer:

Next Offer:

Enter Any New Offer Amount:

Enter Offer

Accept Bid

Tokens: _____

All sellers will receive this bargaining screen with unit costs. This screen displays the buyer number with whom you are matched. Enter offers by typing them in the “enter any new offer amount” box and hitting enter or clicking “enter offer.” By clicking on the “accept bid” button with the mouse, a seller has agreed to sell the unit at the buyer’s current bid.

BUYER : Partner Selection

Click the player number you wish to be matched with and press OK

OK

A buyer will get a list of available sellers. Each seller corresponds to a number. Click the player number you wish to be matched with and press OK to continue.

SELLER : Partner Selection

You have been selected by the following players. Click a player number and press accept, or choose to reject all matches



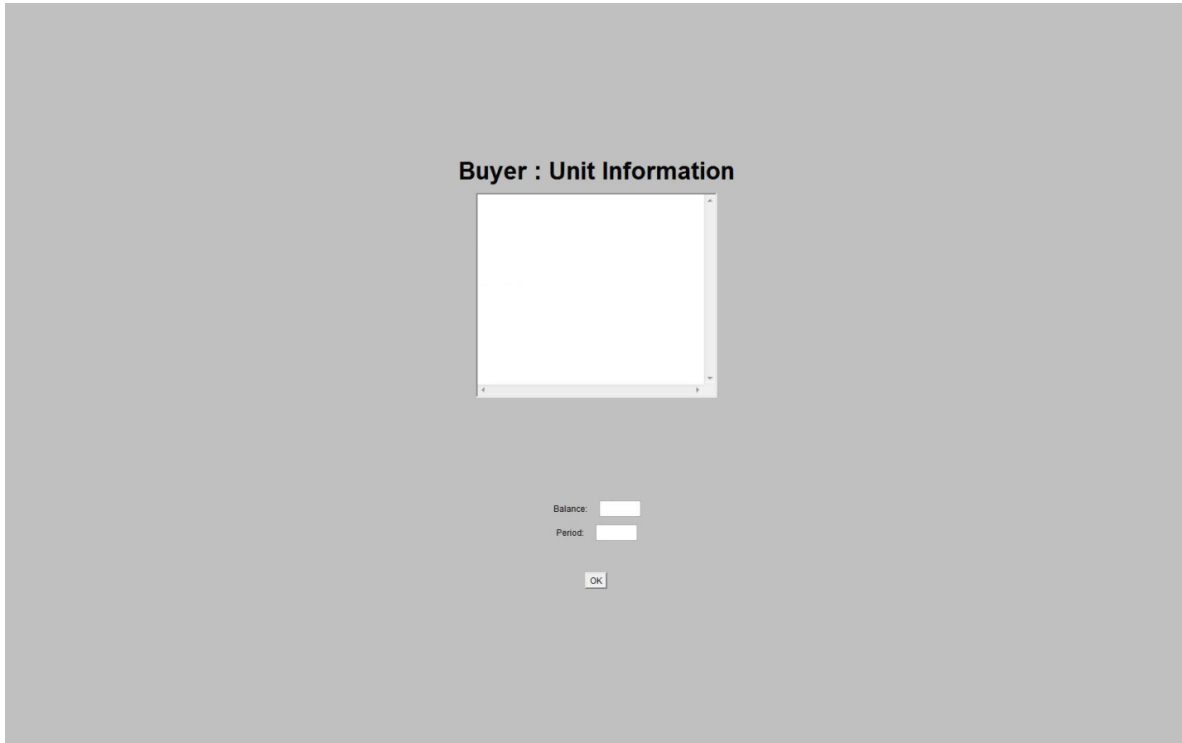
Accept Reject

If you are a seller who has been selected by more than one buyer, you will see the top screen with a list of numbered buyers. Simply click on a buyer and click accept or click reject to reject all proposed matches.

SELLER : Partner Selection

You have been chosen by player number .
You may accept or reject this match.

A seller who has been selected by one buyer will receive this screen. Please click accept or reject to continue.



After matches are made, the experiment continues with the bargaining rounds beginning this with a market recap screen. After reviewing the screen, click OK to continue.

Seller : Production Information

An empty rectangular window with a thin border and a small 'x' icon in the top right corner, intended for displaying production information.

Initial Balance:

Period:

INSTRUCTION SET 2

Buyer choose/4 Buyers, 3 Sellers/

Introduction

This is an experiment in the economics of market decision making. In this experiment, we will set up a market in which some of you will be BUYERS and some of you will be SELLERS.

The commodity you are trading is referred to as a "unit". Sellers make earnings by producing units at a cost and selling these units to buyers. Buyers make earnings by purchasing units from sellers and then redeeming (or reselling) these units to the experimenter. Earnings are recorded in a fictitious currency called tokens. Tokens are exchanged for cash at the rate of **100 tokens = \$1.00**. Your earnings will be paid to you in CASH at the end of the experiment. To begin, every seller and buyer will be given an initial balance of **1000 tokens (\$10.00)**. You may keep this money PLUS any you earn.

Buyers will **choose** and be accepted by sellers with whom they will trade. In trading, buyers and sellers will exchange units for tokens in computerized markets over a sequence of trading cycles. Each trading cycle consists of three trading sessions or bargaining rounds during which pairs of buyers and sellers negotiate trading prices. Each trading cycle consists of what is commonly referred to as a **forward market**. The forward market occurs before sellers have produced units. A trade in the forward market is a binding agreement between a buyer and a seller. In other words, the seller agrees to produce a unit for the buyer and the buyer agrees to pay the seller for that unit.

All trading is conducted over the computer network. At the end of each trading cycle, any unit sold is automatically produced, and the cost of production is deducted from the seller's token balance. In addition, the computer will automatically account for sales or purchases that you have made and adjust your token balance accordingly. A listing of sales or purchases you have made and your adjusted token balance will be displayed on the computer screen at the end of every trading cycle. After you have viewed this information and clicked on OK, a new trading cycle with three bargaining rounds will begin. This experiment will consist of several trading cycles. We will conduct a practice cycle to familiarize you with the mechanics of the computerized market before the actual

experiment begins. **During the practice cycle, the information you see will be different than that in the actual experiment.**

Trading Partner Selection

At the beginning of each bargaining round, buyers will be given a list of sellers from which to choose a trading partner. Sellers are then given the option to accept or reject the buyer's choice. In this experiment there are 3 sellers and 4 buyers. One buyer will not get paired and will earn zero for the trading session. At the beginning of the next bargaining round a new selection process will begin. Once matches are made, the experiment proceeds to the bargaining round. The trading partner you have been paired with will be noted on the trading screen.

Specific Instructions to Buyers

During each trading cycle you are free to purchase up to 8 units. For the first unit that you buy during a trading cycle, you will receive the amount listed under UNIT VALUE for Unit 1. In this example, this amount, known as the redemption value, is 80 tokens. For the second unit that you buy you will receive the amount listed under UNIT VALUE for Unit 2, which is 70 tokens. The redemption values for these and subsequent units will be displayed on your computer screen.

The earnings from each unit that you purchase (which are yours to keep) are computed by taking the difference between the redemption value and purchase price of the unit bought. That is,

$$\text{Your Earnings} = \text{Redemption Value} - \text{Purchase Price}$$

Suppose, for example, that you buy 2 units in a trading cycle. If you pay 60 tokens for the first unit and 45 tokens for the second unit, your earnings are:

$$\text{earnings for Unit 1} = 80 - 60 = 20$$

$$\text{earnings for Unit 2} = 70 - 45 = 25$$

$$\text{total earnings} = 20 + 25 = 45 \text{ tokens}$$

During the experiment, this trading information will be summarized on the computer screen at the end of each trading cycle. Buyers also should be aware that they will not be allowed to spend more tokens buying units than what they have in their beginning balance in any one cycle.

Specific Instructions to Sellers

During each trading cycle you are free to sell up to 8 units while one person is free to sell up to 16 units. Remember, any units that you sell will automatically be produced once trading in the forward market is complete. The first unit that you sell during a trading cycle will cost you the amount listed under UNIT COST for Unit 1. In this example, this cost is 20 tokens. Unit 1's unit cost is 20 tokens. The second unit that you sell will cost you the amount listed under UNIT COST for Unit 2, which is 30 tokens and unit 3 is 40 tokens. The unit costs for these and subsequent units will be displayed on your computer screens.

The earnings from each unit that you sell (which are yours to keep) are computed by taking the difference between the sale price and unit cost of the unit sold. That is,

$$\text{Your Earnings} = \text{Sale Price} - \text{Unit Cost}$$

Let's suppose that in the forward market you sell Unit 1 for 50 tokens, Unit 2 for 45 tokens and Unit 3 for 45 tokens. Your earnings would then be:

$$\text{earnings for Unit 1} = 50 - 20 = 30$$

$$\text{earnings for Unit 2} = 45 - 30 = 15$$

$$\text{earnings for Unit 3} = 45 - 40 = 5$$

$$\text{total earnings} = 30 + 15 + 5 = 50 \text{ tokens}$$

During the experiment this trading information will be summarized on the computer screen at the end of each trading cycle. Sellers also should be aware that they will not be allowed to incur a production cost greater than the amount in their beginning token balance in any one cycle.

Trading Rules for the Forward Market

Only one unit may be bought and sold at a time. A buyer makes bids to the seller to purchase a unit. A "bid" is a proposed price at which a buyer is willing to purchase a unit. Bids must become progressively higher. In other words, if the first bid for a unit is 50 tokens, then the second bid must be higher than 50. Suppose the second bid is 55 tokens, then the third bid must be higher than 55, and so on.

A seller makes offers to the buyer to sell a unit. An "offer" is a proposed price at which a seller is willing to sell a unit. Offers must become progressively lower. In other words, if the first offer to sell a unit is for 60 tokens, then the second offer must be lower than 60. Suppose the second offer is 55 tokens, then the third offer must be less than 55, and so on.

There is one further set of restrictions on bids and offers. A buyer's bid cannot be higher than what is labeled on the computer screen as the SELLER'S CURRENT OFFER. In other words, a buyer cannot attempt to pay a price that is higher than that for which the seller is willing to sell. Similarly, a seller's offer cannot be lower than what is labeled as the BUYER'S CURRENT BID. In other words, a seller cannot attempt to sell at a price below that which the buyer is willing to pay. In fact, the computer will not allow such bids and offers.

A bid is made by typing the bid and pressing the ENTER key. Similarly, an offer is made by typing the offer, and pressing the ENTER key. During a market, a buyer will be making bids at the same time that a seller is making offers.

It should be apparent that the difference between the BUYER'S CURRENT BID and the SELLER'S CURRENT OFFER gradually decreases. A trade is made when the BUYER'S CURRENT BID equals the SELLER'S CURRENT OFFER. Suppose the BUYER'S CURRENT BID is 55 tokens and the SELLER'S CURRENT OFFER is 60 tokens. If a buyer decided that he or she was willing to purchase the unit for 60 tokens, he or she could type the number 60 and then press ENTER. There is, however, a quicker method to do this. As soon as the buyer saw the SELLER'S CURRENT OFFER was 60, he or she could simply click on "Accept." Whenever a buyer "Accepts", he or she automatically makes a bid which equals the SELLER'S CURRENT OFFER or, in other words, "accepts" the SELLER'S CURRENT OFFER.

As another example for sellers, suppose again that the BUYER'S CURRENT BID is 55 and the SELLER'S CURRENT OFFER is 60. If a seller decided that he or she was willing to sell the unit for 55 tokens, he or she could type the number 55 and then press ENTER. Again, there is a quicker method to do this. As soon as the seller saw the BUYER'S CURRENT BID was 55, he or she could click on "Accept." Whenever a seller "Accepts", he or she automatically makes an offer which equals the BUYER'S CURRENT BID or, in other words, "accepts" the BUYER'S CURRENT BID.

After a seller and buyer have made a trade, the trading price will be listed on both the buyer's and seller's screens. After a trade has been made, bid and offer values are cleared from the screen. A buyer and seller pair may then resume entering bids and offers for additional units. Trades are made between buyer and seller pairs for one minute. After a minute has elapsed, buyers choose sellers again and the next trading session begins.

Each forward market or trading cycle has a maximum time limit of 3 minutes or three one-minute trading sessions. A market will be terminated automatically if profitable trades cannot be made by the matched buyer and seller.

Random stop. No one knows when the experiment will end. Decisions will be made through 20 periods in the experiment. After period 20 the computer will randomly generate a number between 1 and 100. If the number falls between 1 and 20 the experiment will end. If the number is higher than 20, it will continue. Hence, the probability of stopping in a given period after period 20 is 1 in 5 and the probability of continuing for another period is 4 in 5. Are there any questions about this procedure?

Your Name and Identification

Before the practice session, the computer will ask for your name and W number which is your 9-digit student number. This information is kept confidential, but it is important to the funding agency as proof of your participation. The bids and earnings of people in the experiment are confidential. Please do not look at someone else's screen and do not speak to another participant once the experiment begins. You may ask the experimenter questions at any time during the experiment. Are there any questions before we conduct the practice session?

Private Negotiations

Full Name:	<input type="text"/>	
W Number:	<input type="text"/>	
Server:	10.241.7.26	
Port:	9000	<input type="button" value="Connect"/>

To begin the experiment you will be asked to type in your full name along with your W number.
Please type the “W” along with the number.

BUYER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, worth _____, was purchased for _____ (Profit: _____)

Unit 2 is worth _____ tokens.

Unit 3 is worth _____ tokens.

Unit 4 is worth _____ tokens.

Unit 5 is worth _____ tokens.

Unit 6 is worth _____ tokens.

Unit 7 is worth _____ tokens.

Unit 8 is worth _____ tokens.

Seller's Current Offer: _____

Your Current Bid: _____

Place a new bid:
 Next Bid: _____
 Enter Any New Bid Amount:

Tokens: _____

All buyers will receive this bargaining screen with redemption values for each of the units. This screen also displays the seller number with whom you are matched. Enter bids by typing them in the “enter any new bid amount” box and hitting enter or clicking “enter bid.” By clicking on the “accept offer” button with the mouse, a buyer has agreed to purchase the unit at the seller’s current offer.

SELLER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, which cost _____ to produce, sold for _____ (Profit: _____)

Unit 2, will cost _____ to produce, and will be next to sell.

Unit 3 will cost _____ to produce and has not yet been sold.

Unit 4 will cost _____ to produce and has not yet been sold.

Unit 5 will cost _____ to produce and has not yet been sold.

Unit 6 will cost _____ to produce and has not yet been sold.

Unit 7 will cost _____ to produce and has not yet been sold.

Unit 8 will cost _____ to produce and has not yet been sold.

Unit 9 will cost _____ to produce and has not yet been sold.

Unit 10 will cost _____ to produce and has not yet been sold.

Unit 11 will cost _____ to produce and has not yet been sold.

Unit 12 will cost _____ to produce and has not yet been sold.

Unit 13 will cost _____ to produce and has not yet been sold.

Unit 14 will cost _____ to produce and has not yet been sold.

Unit 15 will cost _____ to produce and has not yet been sold.

Unit 16 will cost _____ to produce and has not yet been sold.

Buyer's Current Bid: 0

Your Current Offer: 0

Enter a new offer:

Next Offer: _____

Enter Any New Offer Amount:

Enter Offer

Accept Bid

Tokens: _____

One seller will receive this screen with 16 units. This screen displays the buyer number with whom you are matched. Enter offers by typing them in the “enter any new offer amount” box and hitting enter or clicking “enter offer.” By clicking on the “accept bid” button with the mouse, a seller has agreed to sell the unit at the buyer’s current bid.

SELLER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, which cost _____ to produce, sold for _____ (Profit: _____)

Unit 2, will cost _____ to produce, and will be next to sell.

Unit 3 will cost _____ to produce and has not yet been sold.

Unit 4 will cost _____ to produce and has not yet been sold.

Unit 5 will cost _____ to produce and has not yet been sold.

Unit 6 will cost _____ to produce and has not yet been sold.

Unit 7 will cost _____ to produce and has not yet been sold.

Unit 8 will cost _____ to produce and has not yet been sold.

Buyer's Current Bid: 0

Your Current Offer: 0

Enter a new offer:

Next Offer:

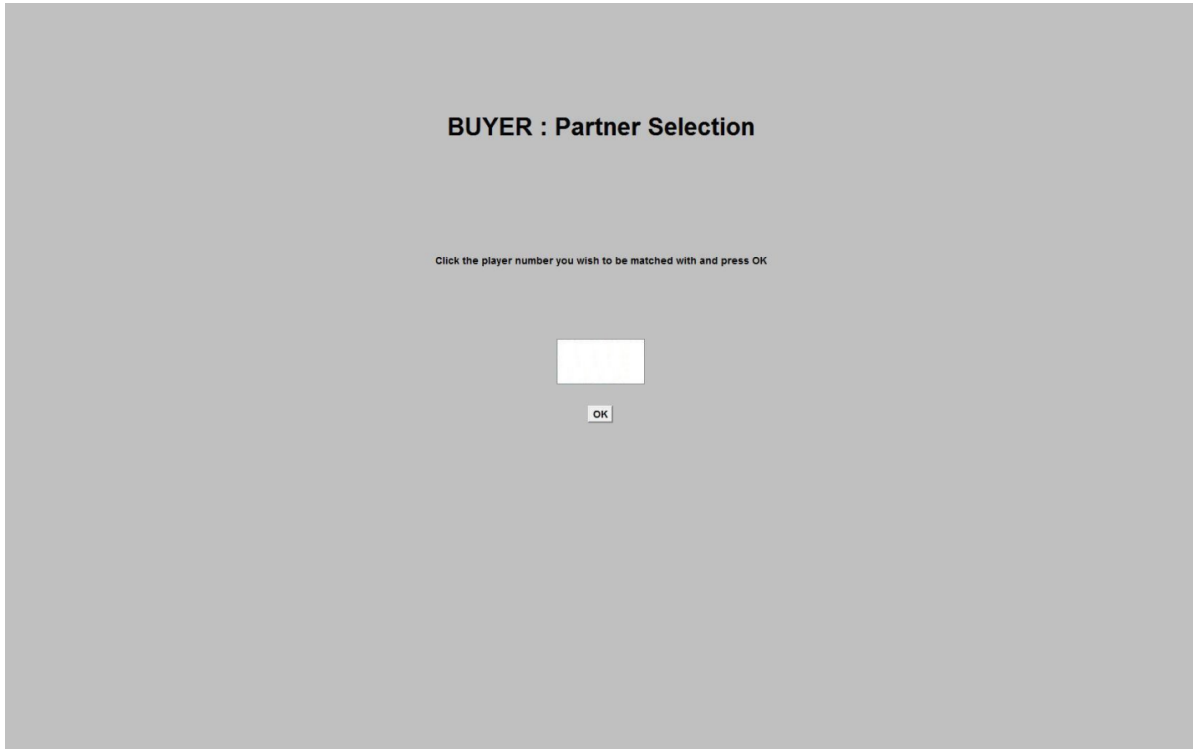
Enter Any New Offer Amount:

Enter Offer

Accept Bid

Tokens: _____

All other sellers will receive this screen with 8 units. This screen displays the buyer number with whom you are matched. Enter offers by typing them in the “enter any new offer amount” box and hitting enter or clicking “enter offer.” By clicking on the “accept bid” button with the mouse, a seller has agreed to sell the unit at the buyer’s current bid.



A buyer will get a list of available sellers. Each seller corresponds to a number. Click the player number you wish to be matched with and press OK to continue.

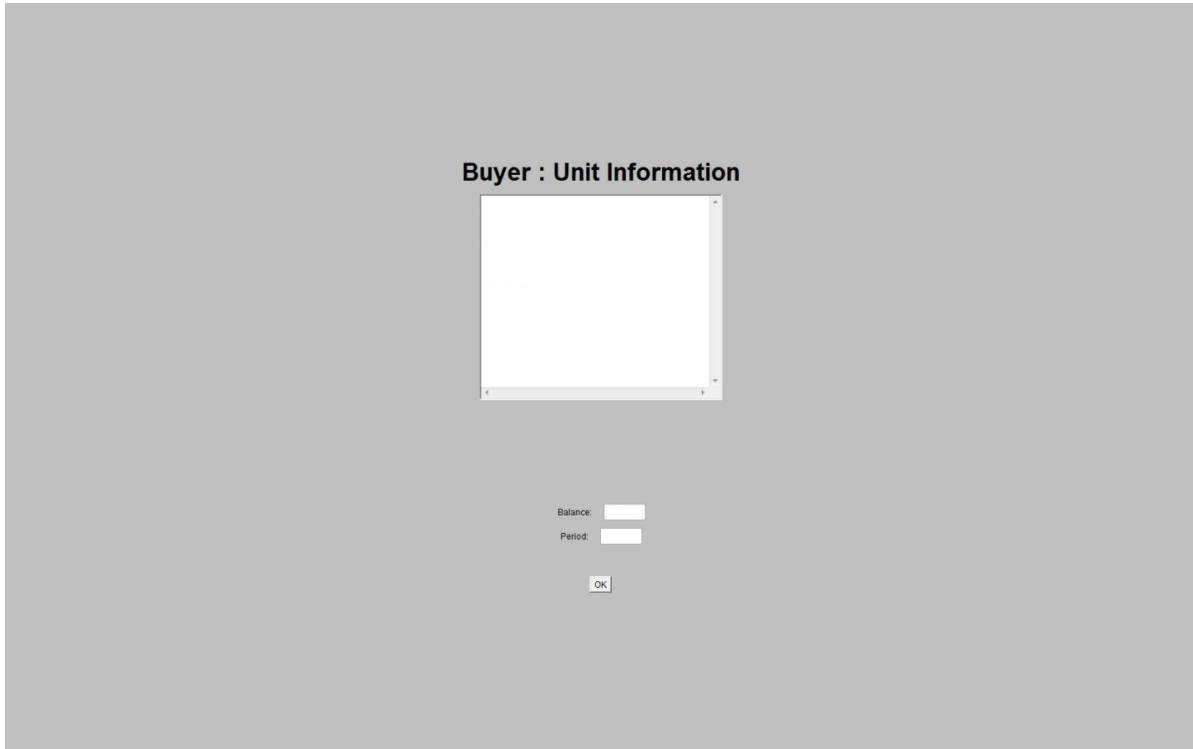


If you are a seller who has been selected by more than one buyer, you will see the top screen with a list of numbered buyers. Simply click on a buyer and click accept or click reject to reject all proposed matches.

SELLER : Partner Selection

You have been chosen by player number .
You may accept or reject this match.

A seller who has been selected by one buyer will receive this screen. Please, click accept or reject to continue.



After matches are made, the experiment continues with the bargaining rounds beginning this with a market recap screen. After reviewing the screen, click OK to continue.

Seller : Production Information

An empty rectangular window with a white background and a thin grey border, intended for displaying production information.

Initial Balance:

Period:

INSTRUCTION SET 3

Seller choose/4 Seller, 3Buyer

Introduction

This is an experiment in the economics of market decision making. In this experiment, we will set up a market in which some of you will be BUYERS and some of you will be SELLERS.

The commodity you are trading is referred to as a "unit". Sellers make earnings by producing units at a cost and selling these units to buyers. Buyers make earnings by purchasing units from sellers and then redeeming (or reselling) these units to the experimenter. Earnings are recorded in a fictitious currency called tokens. Tokens are exchanged for cash at the rate of **100 tokens = \$1.00**. Your earnings will be paid to you in CASH at the end of the experiment. To begin, every seller and buyer will be given an initial balance of **1000 tokens (\$10.00)**. You may keep this money PLUS any you earn.

Sellers will **choose** and be accepted by buyers with whom they will trade. In trading, buyers and sellers will exchange units for tokens in computerized markets over a sequence of trading cycles. Each trading cycle consists of three trading sessions or bargaining rounds during which pairs of buyers and sellers negotiate trading prices. Each trading cycle consists of what is commonly referred to as a **forward market**. The forward market occurs before sellers have produced units. A trade in the forward market is a binding agreement between buyer and seller. In other words, the seller agrees to produce a unit for the buyer and the buyer agrees to pay the seller for that unit.

All trading is conducted over the computer network. At the end of each trading cycle, any unit sold is automatically produced, and the cost of production is deducted from the seller's token balance. In addition, the computer will automatically account for sales or purchases that you have made and adjust your token balance accordingly. A listing of sales or purchases you have made and your adjusted token balance will be displayed on the computer screen at the end of every trading cycle. After you have viewed this information and clicked on OK, a new trading cycle with three bargaining rounds will begin. This experiment will consist of several trading cycles. We will conduct a practice cycle to familiarize you with the mechanics of the computerized market before the actual

experiment begins. **During the practice cycle the information you see will be different than that in the actual experiment.**

Trading Partner Selection

At the beginning of each bargaining round, Sellers will be given a list of buyers from which to choose a trading partner. Buyers are then given the option to accept or reject the seller's choice. In this experiment there are 3 buyers and 4 sellers. One seller will not get paired and will earn zero for the trading session. At the beginning of the next bargaining round a new selection process will begin. Once matches are made the experiment will proceed to the bargaining round. The trading partner you have been paired with will be noted on the trading screen.

Specific Instructions to Buyers

During each trading cycle you are free to purchase up to 8 units while one person is free to purchase up to 16 units. For the first unit that you buy during a trading cycle, you will receive the amount listed under UNIT VALUE for Unit 1. In this example, this amount is 80 tokens. Unit 1's redemption value is 80 tokens. For the second unit that you buy you will receive the amount listed under UNIT VALUE for Unit 2, which is 70 tokens. The redemption values for these and subsequent units will be displayed on your computer screen.

The earnings from each unit that you purchase (which are yours to keep) are computed by taking the difference between the redemption value and purchase price of the unit bought. That is,

$$\text{Your Earnings} = \text{Redemption Value} - \text{Purchase Price}$$

Suppose, for example, that you buy 2 units in a trading cycle. If you pay 60 tokens for the first unit and 45 tokens for the second unit, your earnings are:

$$\text{earnings for Unit 1} = 80 - 60 = 20$$

$$\text{earnings for Unit 2} = 70 - 45 = 25$$

$$\text{total earnings} = 20 + 25 = 45 \text{ tokens}$$

During the experiment this trading information will be summarized on the computer screen at the end of each trading cycle. Buyers also should be aware that they will not be allowed to spend more tokens buying units than what they have in their beginning balance in any one cycle.

Specific Instructions to Sellers

During each trading cycle you are free to sell up to 8 units. Remember, any units that you sell will automatically be produced once trading in the forward market is complete. The first unit that you sell during a trading cycle will cost you the amount listed under UNIT COST for Unit 1. In this example, this cost is 20 tokens. Unit 1's unit cost is 20 tokens. The second unit that you sell will cost you the amount listed under UNIT COST for Unit 2, which is 30 tokens and unit 3 is 40 tokens. The unit costs for these and subsequent units will be displayed on your computer screens.

The earnings from each unit that you sell (which are yours to keep) are computed by taking the difference between the sale price and unit cost of the unit sold. That is,

$$\text{Your Earnings} = \text{Sale Price} - \text{Unit Cost}$$

Let's suppose that in the forward market you sell Unit 1 for 50 tokens, Unit 2 for 45 tokens and Unit 3 for 45 tokens. Your earnings would then be:

$$\text{earnings for Unit 1} = 50 - 20 = 30$$

$$\text{earnings for Unit 2} = 45 - 30 = 15$$

$$\text{earnings for Unit 3} = 45 - 40 = 5$$

$$\text{total earnings} = 30 + 15 + 5 = 50 \text{ tokens}$$

During the experiment this trading information will be summarized on the computer screen at the end of each trading cycle. Sellers also should be aware that they will not be allowed to incur a production cost greater than the amount in their beginning token balance in any one cycle.

Trading Rules for the Forward Market

Only one unit may be bought and sold at a time. A buyer makes bids to the seller to purchase a unit. A "bid" is a proposed price at which a buyer is willing to purchase a unit. Bids must become progressively higher. In other words, if the first bid for a unit is 50 tokens, then the second bid must be higher than 50. Suppose the second bid is 55 tokens, then the third bid must be higher than 55, and so on.

A seller makes offers to the buyer to sell a unit. An "offer" is a proposed price at which a seller is willing to sell a unit. Offers must become progressively lower. In other words, if the first offer to sell a unit is for 60 tokens, then the second offer must be lower than 60. Suppose the second offer is 55 tokens, then the third offer must be less than 55, and so on.

There is one further set of restrictions on bids and offers. A buyer's bid cannot be higher than what is labeled on the computer screen as the SELLER'S CURRENT OFFER. In other words, a buyer cannot attempt to pay a price that is higher than that for which the seller is willing to sell. Similarly, a seller's offer cannot be lower than what is labeled as the BUYER'S CURRENT BID. In other words, a seller cannot attempt to sell at a price below that which the buyer is willing to pay. In fact, the computer will not allow such bids and offers.

A bid is made by typing the bid and pressing the ENTER key. Similarly, an offer is made by typing the offer, and pressing the ENTER key. During a market, a buyer will be making bids at the same time that a seller is making offers.

It should be apparent that the difference between the BUYER'S CURRENT BID and the SELLER'S CURRENT OFFER gradually decreases. A trade is made when the BUYER'S CURRENT BID equals the SELLER'S CURRENT OFFER. Suppose the BUYER'S CURRENT BID is 55 tokens and the SELLER'S CURRENT OFFER is 60 tokens. If a buyer decided that he or she was willing to purchase the unit for 60 tokens, he or she could type the number 60 and then press ENTER. There is, however, a quicker method to do this. As soon as the buyer saw the SELLER'S CURRENT OFFER was 60, he or she could simply click on "Accept." Whenever a buyer "Accepts", he or she automatically makes a bid which equals the SELLER'S CURRENT OFFER or, in other words, "accepts" the SELLER'S CURRENT OFFER.

As another example for sellers, suppose again that the BUYER'S CURRENT BID is 55 and the SELLER'S CURRENT OFFER is 60. If a seller decided that he or she was willing to sell the unit for 55 tokens, he or she could type the number 55 and then press ENTER. Again, there is a quicker method to do this. As soon as the seller saw the BUYER'S CURRENT BID was 55, he or she could click on "Accept." Whenever a seller "Accepts", he or she automatically makes an offer which equals the BUYER'S CURRENT BID or, in other words, "accepts" the BUYER'S CURRENT BID.

After a seller and buyer have made a trade, the trading price will be listed on both the buyer's and seller's screens. After a trade has been made, bid and offer values are cleared from the screen. A buyer and seller pair may then resume entering bids and offers for additional units. Trades are made between buyer and seller pairs for one minute. After a minute has elapsed, sellers choose buyers again and the next trading session begins.

Each forward market or trading cycle has a maximum time limit of 3 minutes or three one-minute trading sessions. A market will be terminated automatically if profitable trades cannot be made by the matched buyer and seller.

Random stop. No one knows when the experiment will end. Decisions will be made through 20 periods in the experiment. After period 20 the computer will randomly generate a number between 1 and 100. If the number falls between 1 and 20 the experiment will end. If the number is higher than 20, it will continue. Hence, the probability of stopping in a given period after period 20 is 1 in 5 and the probability of continuing for another period is 4 in 5. Are there any questions about this procedure?

Your Name and Identification

Before the practice session, the computer will ask for your name and W number which is your 9-digit student number. This information is kept confidential, but it is important to the funding agency as proof of your participation. The bids and earnings of people in the experiment are confidential. Please do not look at someone else's screen and do not speak to another participant once the experiment begins. You may ask the experimenter questions at any time during the experiment. Are there any questions before we conduct the practice session?

Private Negotiations

Full Name:	<input type="text"/>	
W Number:	<input type="text"/>	
Server:	10.241.7.26	
Port:	9000	<input type="button" value="Connect"/>

To begin the experiment you will be asked to type in your full name along with your W number.
Please type the “W” along with the number.

BUYER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, worth _____, was purchased for _____ (Profit: _____)

Unit 2 is worth _____ tokens.

Unit 3 is worth _____ tokens.

Unit 4 is worth _____ tokens.

Unit 5 is worth _____ tokens.

Unit 6 is worth _____ tokens.

Unit 7 is worth _____ tokens.

Unit 8 is worth _____ tokens.

Unit 9 is worth _____ tokens.

Unit 10 is worth _____ tokens.

Unit 11 is worth _____ tokens.

Unit 12 is worth _____ tokens.

Unit 13 is worth _____ tokens.

Unit 14 is worth _____ tokens.

Unit 15 is worth _____ tokens.

Unit 16 is worth _____ tokens.

Seller's Current Offer: 0

Your Current Bid: 0

Place a new bid:
Next Bid:
Enter Any New Bid Amount:

Place Bid

Accept Offer

Tokens: _____

One buyer will receive this screen with redemption values and 16 units. This screen displays the seller number with whom you are matched. Enter bids by typing them in the “enter any new bid amount” box and hitting enter or clicking “enter bid.” By clicking on the “accept offer” button with the mouse, a buyer has agreed to purchase the unit at the seller’s current offer.

BUYER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, worth _____, was purchased for _____ (Profit: _____)

Unit 2 is worth _____ tokens.

Unit 3 is worth _____ tokens.

Unit 4 is worth _____ tokens.

Unit 5 is worth _____ tokens.

Unit 6 is worth _____ tokens.

Unit 7 is worth _____ tokens.

Unit 8 is worth _____ tokens.

Seller's Current Offer: 0

Your Current Bid: 0

Place a new bid:

Next Bid: _____

Enter Any New Bid Amount:

Place Bid

Accept Offer

Tokens: _____

All other buyers will receive this screen with redemption values and 8 units. This screen displays the seller number with whom you are matched. Enter bids by typing them in the “enter any new bid amount” box and hitting enter or clicking “enter bid.” By clicking on the “accept offer” button with the mouse, a buyer has agreed to purchase the unit at the seller’s current offer.

SELLER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, which cost _____ to produce, sold for _____ (Profit: _____)

Unit 2, will cost _____ to produce, and will be next to sell.

Unit 3 will cost _____ to produce and has not yet been sold.

Unit 4 will cost _____ to produce and has not yet been sold.

Unit 5 will cost _____ to produce and has not yet been sold.

Unit 6 will cost _____ to produce and has not yet been sold.

Unit 7 will cost _____ to produce and has not yet been sold.

Unit 8 will cost _____ to produce and has not yet been sold.

Buyer's Current Bid: 0

Your Current Offer: 0

Enter a new offer:

Next Offer:

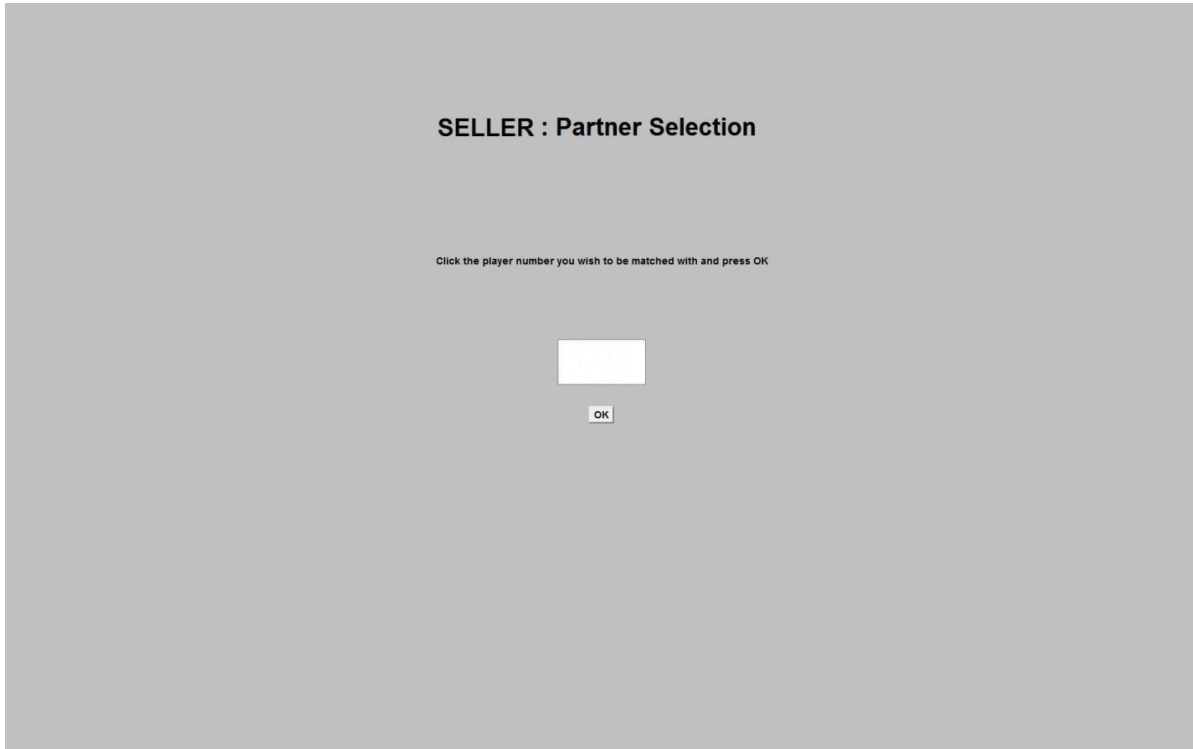
Enter Any New Offer Amount:

Enter Offer

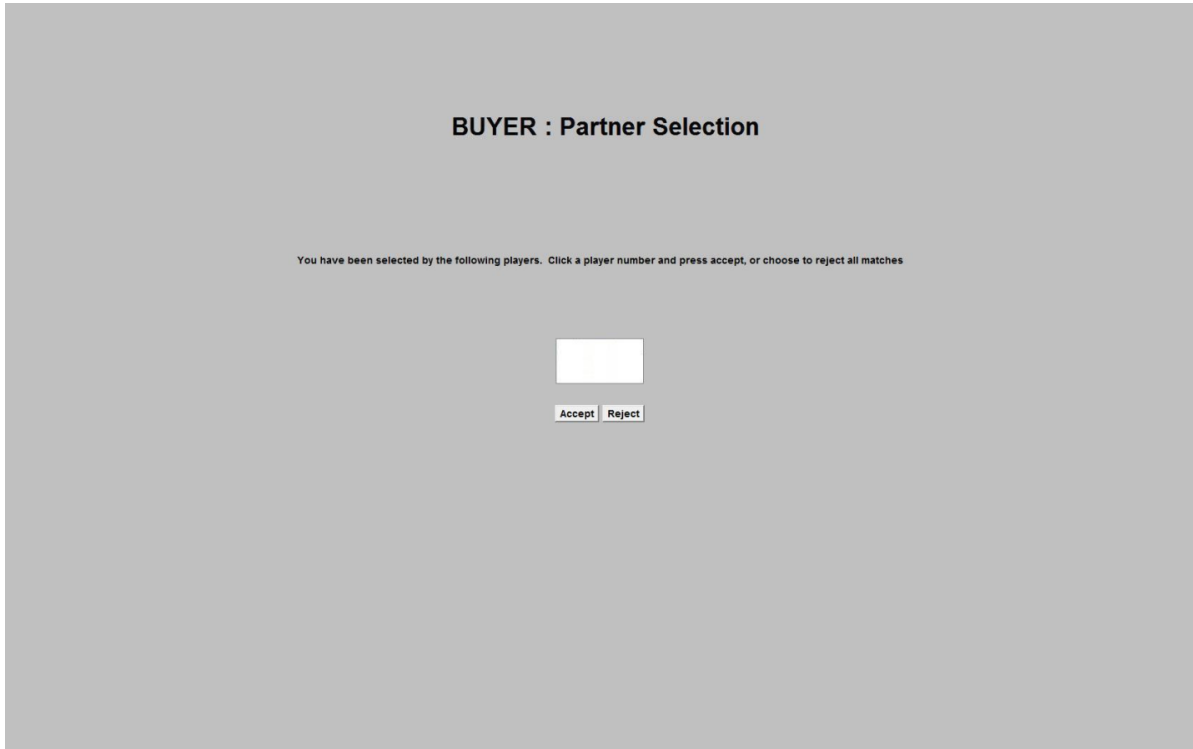
Accept Bid

Tokens: _____

All sellers will receive this bargaining screen with unit costs and 8 units. This screen displays the buyer number with whom you are matched. Enter offers by typing them in the “enter any new offer amount” box and hitting enter or clicking “enter offer.” By clicking on the “accept bid” button with the mouse, a seller has agreed to sell the unit at the buyer’s current bid.



A Seller will get a list of available sellers. Each buyer corresponds to a number. Click the player number you wish to be matched with and press OK to continue.

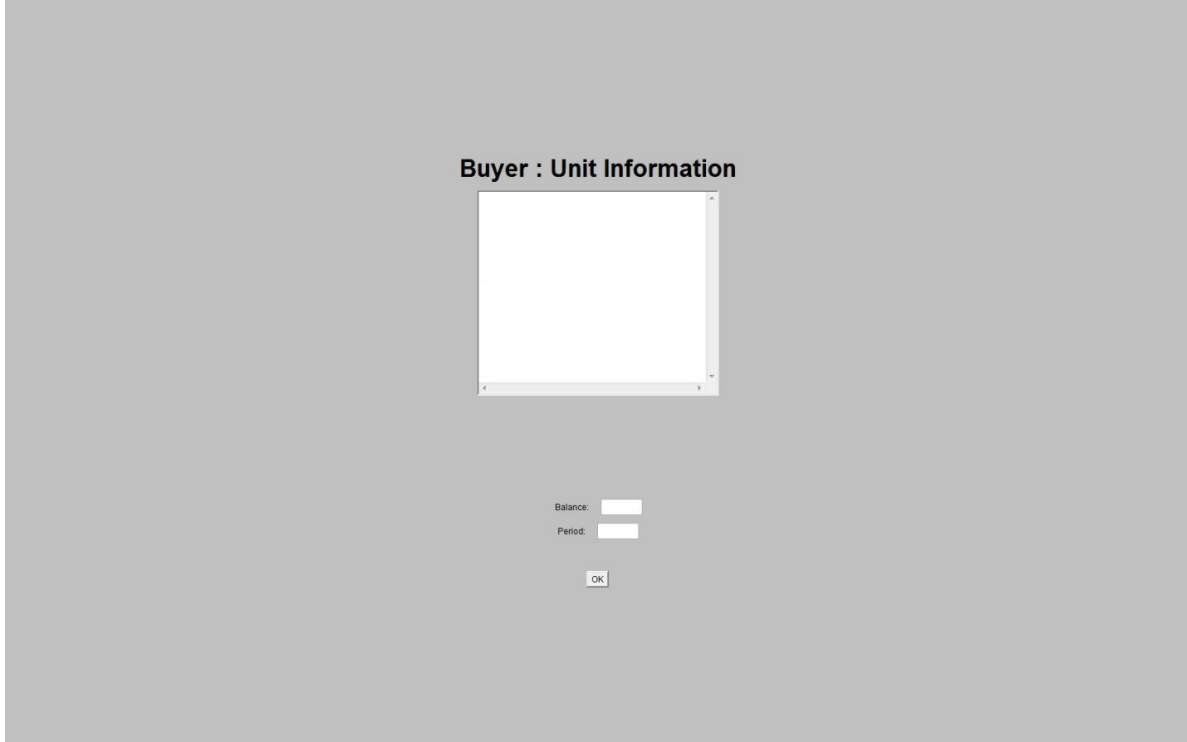


If you are a buyer who has been selected by more than one seller, you will see this screen with a list of numbered buyers. Click on a buyer and click accept or click reject to reject all proposed matches.

BUYER : Partner Selection

You have been chosen by player number .
You may accept or reject this match.

A buyer who has been selected by one seller will receive this screen. Click accept or reject to continue.



After matches are made, the experiment continues with the bargaining rounds beginning this with a market recap screen. After reviewing the screen, click OK to continue.

Seller : Production Information



Initial Balance:

Period:

OK

INSTRUCTION SET 4

Seller choose/4 Buyer, 3 Seller

Introduction

This is an experiment in the economics of market decision making. In this experiment, we will set up a market in which some of you will be BUYERS and some of you will be SELLERS.

The commodity you are trading is referred to as a "unit". Sellers make earnings by producing units at a cost and selling these units to buyers. Buyers make earnings by purchasing units from sellers and then redeeming (or reselling) these units to the experimenter. Earnings are recorded in a fictitious currency called tokens. Tokens are exchanged for cash at the rate of **100 tokens = \$1.00**. Your earnings will be paid to you in CASH at the end of the experiment. To begin, every seller and buyer will be given an initial balance of **1000 tokens (\$10.00)**. You may keep this money PLUS any you earn.

Sellers will **choose** and be accepted by buyers with whom they will trade. In trading, buyers and sellers will exchange units for tokens in computerized markets over a sequence of trading cycles. Each trading cycle consists of three trading sessions or bargaining rounds during which pairs of buyers and sellers negotiate trading prices. Each trading cycle consists of what is commonly referred to as a **forward market**. The forward market occurs before sellers have produced units. A trade in the forward market is a binding agreement between a buyer and a seller. In other words, the seller agrees to produce a unit for the buyer and the buyer agrees to pay the seller for that unit.

All trading is conducted over the computer network. At the end of each trading cycle, any unit sold is automatically produced, and the cost of production is deducted from the seller's token balance. In addition, the computer will automatically account for sales or purchases that you have made and adjust your token balance accordingly. A list of sales or purchases you have made and your adjusted token balance will be displayed on the computer screen at the end of every trading cycle. After you have viewed this information and clicked on OK, a new trading cycle with three bargaining rounds will begin. This experiment will consist of several trading cycles. We will conduct a practice cycle to familiarize you with the mechanics of the computerized market before the actual

experiment begins. **During the practice cycle the information you see will be different than that in the actual experiment.**

Trading Partner Selection

At the beginning of each bargaining round, sellers will be given a list of buyers from which to choose a trading partner. Buyers are then given the option to accept or reject the seller's choice. In this experiment there are 3 sellers and 4 buyers. One buyer will not get paired and will earn zero for the trading period. At the beginning of the next bargaining round a new selection process will begin. Once matches are made the experiment will proceed to the bargaining round. The trading partner you have been paired with will be noted on the trading screens.

Specific Instructions to Buyers

During each trading cycle you are free to purchase up to 8 units. For the first unit that you buy during a trading cycle, you will receive the amount listed under UNIT VALUE for Unit 1. In this example, this amount is 80 tokens. Unit 1's redemption value is 80 tokens. For the second unit that you buy you will receive the amount listed under UNIT VALUE for Unit 2, which is 70 tokens. The redemption values for these and subsequent units will be displayed on your computer screen.

The earnings from each unit that you purchase (which are yours to keep) are computed by taking the difference between the redemption value and purchase price of the unit bought. That is,

$$\text{Your Earnings} = \text{Redemption Value} - \text{Purchase Price}$$

Suppose, for example, that you buy 2 units in a trading cycle. If you pay 60 tokens for the first unit and 45 tokens for the second unit, your earnings are:

$$\text{earnings for Unit 1} = 80 - 60 = 20$$

$$\text{earnings for Unit 2} = 70 - 45 = 25$$

$$\text{total earnings} = 20 + 25 = 45 \text{ tokens}$$

During the experiment this trading information will be summarized on the computer screen at the end of each trading cycle. Buyers also should be aware that they will not be allowed to spend more tokens buying units than what they have in their beginning balance in any one cycle.

Specific Instructions to Sellers

During each trading cycle you are free to sell up to 8 units while one person is free to sell up to 16 units. Remember, any units that you sell will automatically be produced once trading in the forward market is complete. The first unit that you sell during a trading cycle will cost you the amount listed under UNIT COST for Unit 1. In this example, this cost is 20 tokens. Unit 1's unit cost is 20 tokens. The second unit that you sell will cost you the amount listed under UNIT COST for Unit 2, which is 30 tokens and unit 3 is 40 tokens. The unit costs for these and subsequent units will be displayed on your computer screens.

The earnings from each unit that you sell (which are yours to keep) are computed by taking the difference between the sale price and unit cost of the unit sold. That is,

$$\text{Your Earnings} = \text{Sale Price} - \text{Unit Cost}$$

Let's suppose that in the forward market you sell Unit 1 for 50 tokens, Unit 2 for 45 tokens and Unit 3 for 45 tokens. Your earnings would then be:

$$\text{earnings for Unit 1} = 50 - 20 = 30$$

$$\text{earnings for Unit 2} = 45 - 30 = 15$$

$$\text{earnings for Unit 3} = 45 - 40 = 5$$

$$\text{total earnings} = 30 + 15 + 5 = 50 \text{ tokens}$$

During the experiment this trading information will be summarized on the computer screen at the end of each trading cycle. Sellers also should be aware that they will not be allowed to incur a production cost greater than the amount in their beginning token balance in any one cycle.

Trading Rules for the Forward Market

Only one unit may be bought and sold at a time. A buyer makes bids to the seller to purchase a unit. A "bid" is a proposed price at which a buyer is willing to purchase a unit. Bids must become progressively higher. In other words, if the first bid for a unit is 50 tokens, then the second bid must be higher than 50. Suppose the second bid is 55 tokens, then the third bid must be higher than 55, and so on.

A seller makes offers to the buyer to sell a unit. An "offer" is a proposed price at which a seller is willing to sell a unit. Offers must become progressively lower. In other words, if the first offer to sell a unit is for 60 tokens, then the second offer must be lower than 60. Suppose the second offer is 55 tokens, then the third offer must be less than 55, and so on.

There is one further set of restrictions on bids and offers. A buyer's bid cannot be higher than what is labeled on the computer screen as the SELLER'S CURRENT OFFER. In other words, a buyer cannot attempt to pay a price that is higher than that for which the seller is willing to sell. Similarly, a seller's offer cannot be lower than what is labeled as the BUYER'S CURRENT BID. In other words, a seller cannot attempt to sell at a price below that which the buyer is willing to pay. In fact, the computer will not allow such bids and offers.

A bid is made by typing the bid and pressing the ENTER key. Similarly, an offer is made by typing the offer, and pressing the ENTER key. During a market, a buyer will be making bids at the same time that a seller is making offers.

It should be apparent that the difference between the BUYER'S CURRENT BID and the SELLER'S CURRENT OFFER gradually decreases. A trade is made when the BUYER'S CURRENT BID equals the SELLER'S CURRENT OFFER. Suppose the BUYER'S CURRENT BID is 55 tokens and the SELLER'S CURRENT OFFER is 60 tokens. If a buyer decided that he or she was willing to purchase the unit for 60 tokens, he or she could type the number 60 and then press ENTER. There is, however, a quicker method to do this. As soon as the buyer saw the SELLER'S CURRENT OFFER was 60, he or she could simply click on "Accept." Whenever a buyer "Accepts", he or she automatically makes a bid which equals the SELLER'S CURRENT OFFER or, in other words, "accepts" the SELLER'S CURRENT OFFER.

As another example for sellers, suppose again that the BUYER'S CURRENT BID is 55 and the SELLER'S CURRENT OFFER is 60. If a seller decided that he or she was willing to sell the unit for 55 tokens, he or she could type the number 55 and then press ENTER. Again, there is a quicker method to do this. As soon as the seller saw the BUYER'S CURRENT BID was 55, he or she could click on "Accept." Whenever a seller "Accepts", he or she automatically makes an offer which equals the BUYER'S CURRENT BID or, in other words, "accepts" the BUYER'S CURRENT BID.

After a seller and buyer have made a trade, the trading price will be listed on both the buyer's and seller's screens. After a trade has been made, bid and offer values are cleared from the screen. A buyer and seller pair may then resume entering bids and offers for additional units. Trades are made between buyer and seller pairs for one minute. After a minute has elapsed, sellers choose buyers again and the next trading session begins.

Each forward market or trading cycle has a maximum time limit of 3 minutes or three one-minute trading sessions. A market will be terminated automatically if profitable trades cannot be made by the matched buyer and seller.

Random stop. No one knows when the experiment will end. Decisions will be made through 20 periods in the experiment. After period 20 the computer will randomly generate a number between 1 and 100. If the number falls between 1 and 20 the experiment will end. If the number is higher than 20, it will continue. Hence, the probability of stopping in a given period after period 20 is 1 in 5 and the probability of continuing for another period is 4 in 5. Are there any questions about this procedure?

Your Name and Identification

Before the practice session, the computer will ask for your name and W number which is your 9-digit student number. This information is kept confidential, but it is important to the funding agency as proof of your participation. The bids and earnings of people in the experiment are confidential. Please do not look at someone else's screen and do not speak to another participant once the experiment begins. You may ask the experimenter questions at any time during the experiment. Are there any questions before we conduct the practice session?

Private Negotiations

Full Name:	<input type="text"/>	
W Number:	<input type="text"/>	
Server:	10.241.7.26	
Port:	9000	<input type="button" value="Connect"/>

To begin the experiment you will be asked to type in your full name along with your W number.
Please type the “W” along with the number.

BUYER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, worth _____, was purchased for _____ (Profit: _____)

Unit 2 is worth _____ tokens.

Unit 3 is worth _____ tokens.

Unit 4 is worth _____ tokens.

Unit 5 is worth _____ tokens.

Unit 6 is worth _____ tokens.

Unit 7 is worth _____ tokens.

Unit 8 is worth _____ tokens.

Seller's Current Offer: 0

Your Current Bid: 0

Place a new bid:

Next Bid: _____

Enter Any New Bid Amount:

Place Bid

Accept Offer

Tokens: _____

All buyers will receive this screen with redemption values and 8 units. This screen displays the seller number with whom you are matched. Enter bids by typing them in the “enter any new bid amount” box and hitting enter or clicking “enter bid.” By clicking on the “accept offer” button with the mouse, a buyer has agreed to purchase the unit at the seller’s current offer.

SELLER		Your Name	Matching Player:	Period:	Round:	Time:
		Unit 1, which cost to produce, sold for (Profit:) Unit 2, will cost to produce, and will be next to sell. Unit 3 will cost to produce and has not yet been sold. Unit 4 will cost to produce and has not yet been sold. Unit 5 will cost to produce and has not yet been sold. Unit 6 will cost to produce and has not yet been sold. Unit 7 will cost to produce and has not yet been sold. Unit 8 will cost to produce and has not yet been sold. Unit 9 will cost to produce and has not yet been sold. Unit 10 will cost to produce and has not yet been sold. Unit 11 will cost to produce and has not yet been sold. Unit 12 will cost to produce and has not yet been sold. Unit 13 will cost to produce and has not yet been sold. Unit 14 will cost to produce and has not yet been sold. Unit 15 will cost to produce and has not yet been sold. Unit 16 will cost to produce and has not yet been sold.				
Buyer's Current Bid:		0				
Your Current Offer:		0				
Enter a new offer:						
Next Offer:						
Enter Any New Offer Amount:		<input type="text"/>				
Enter Offer						
Accept Bid						
Tokens:						

One seller will receive this screen with 16 units. This screen displays the buyer number with whom you are matched. Enter offers by typing them in the “enter any new offer amount” box and hitting enter or clicking “enter offer.” By clicking on the “accept bid” button with the mouse, a seller has agreed to sell the unit at the buyer’s current bid.

SELLER

Your Name: _____ Matching Player: _____ Period: _____ Round: _____ Time: _____

Unit 1, which cost _____ to produce, sold for _____ (Profit: _____)

Unit 2, will cost _____ to produce, and will be next to sell.

Unit 3 will cost _____ to produce and has not yet been sold.

Unit 4 will cost _____ to produce and has not yet been sold.

Unit 5 will cost _____ to produce and has not yet been sold.

Unit 6 will cost _____ to produce and has not yet been sold.

Unit 7 will cost _____ to produce and has not yet been sold.

Unit 8 will cost _____ to produce and has not yet been sold.

Buyer's Current Bid: 0

Your Current Offer: 0

Enter a new offer:

Next Offer:

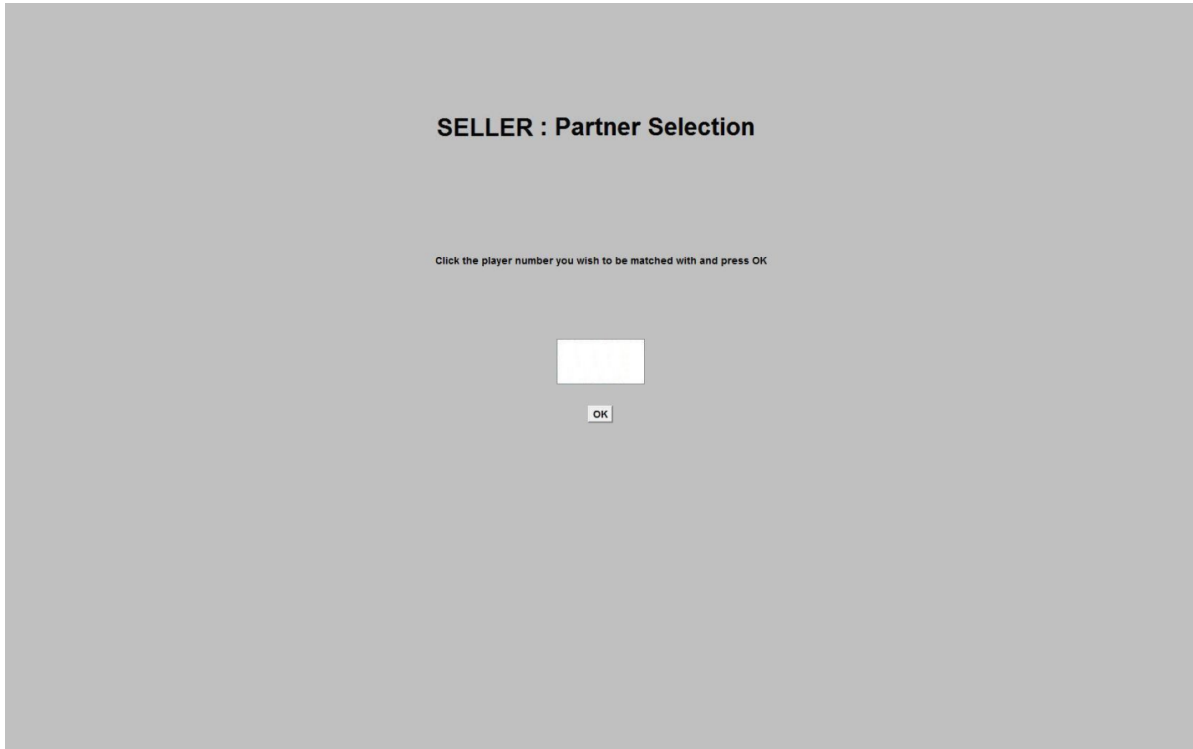
Enter Any New Offer Amount:

Enter Offer

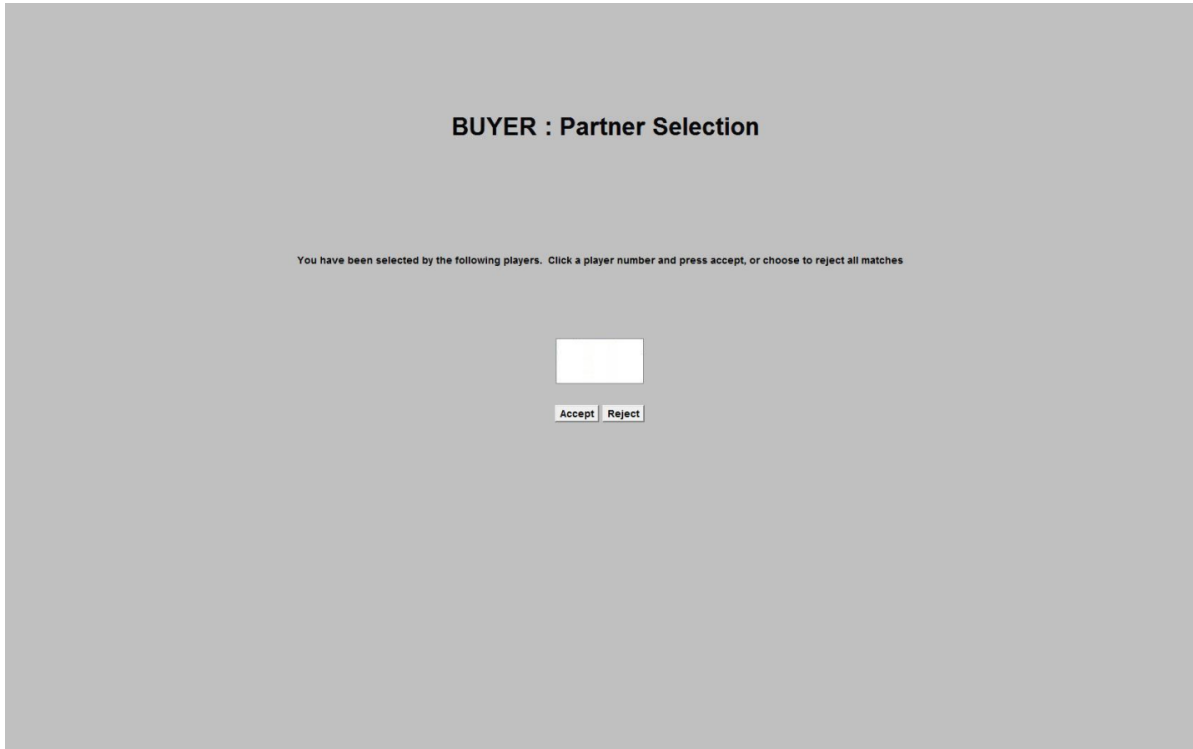
Accept Bid

Tokens: _____

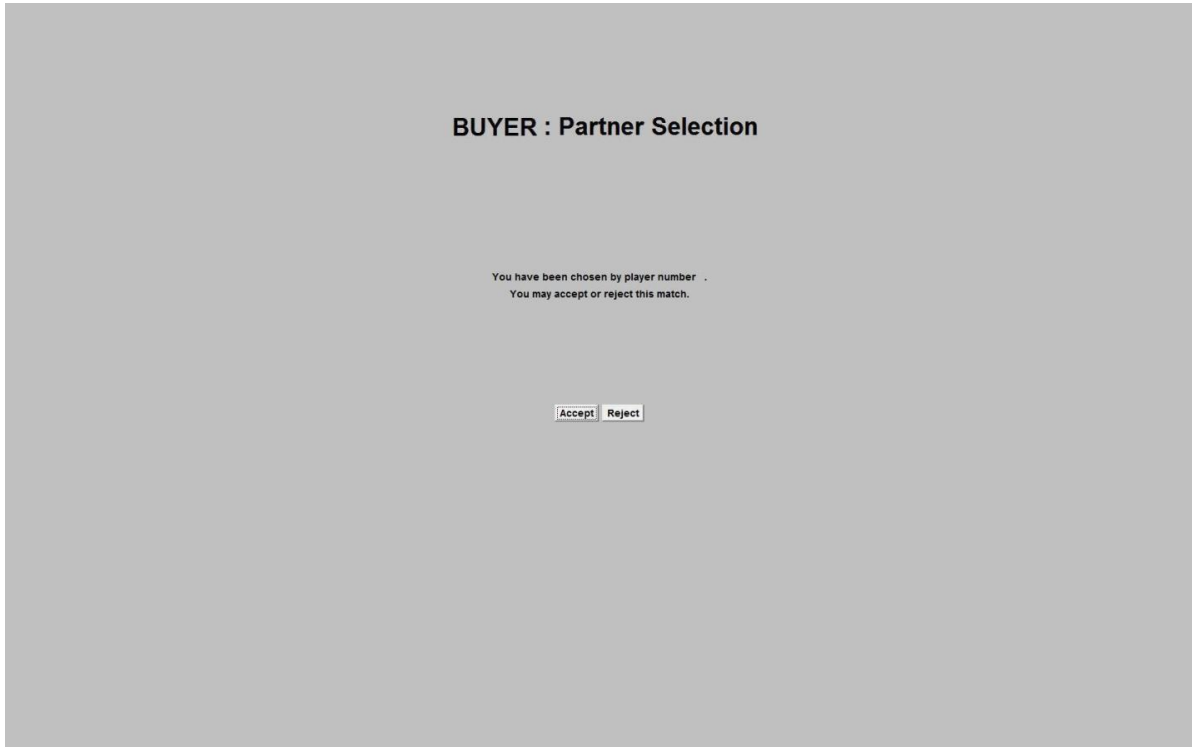
All other sellers will receive this screen with 8 units. This screen displays the buyer number with whom you are matched. Enter offers by typing them in the “enter any new offer amount” box and hitting enter or clicking “enter offer.” By clicking on the “accept bid” button with the mouse, a seller has agreed to sell the unit at the buyer’s current bid.



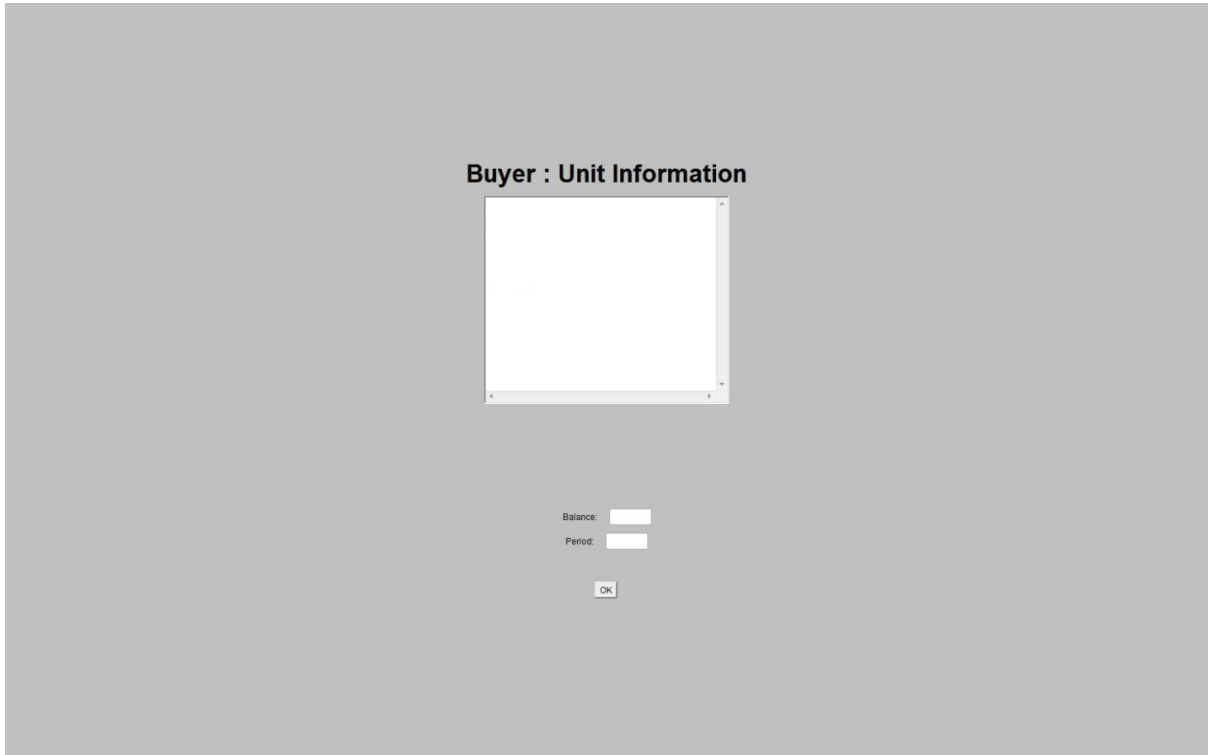
A Seller will get a list of available buyers. Each buyer corresponds to a number. Click the player number you wish to be matched with and press OK to continue.



If you are a buyer who has been selected by more than one seller, you will see this screen with a list of numbered buyers. Click on a buyer and click accept or click reject to reject all proposed matches.



A buyer who has been selected by one seller will receive this screen. Click accept or reject to continue.



After matches are made, the experiment continues with the bargaining rounds beginning this with a market recap screen. After reviewing the screen, click OK to continue.

Seller : Production Information

An empty table with a white background and a thin grey border, intended for displaying production information. It has a vertical scrollbar on the right side.

Initial Balance:

Period:

APPENDIX 2: ANALYZED AND GATHERED DATA

Buyer Concentrated Data

Unit	Price	Trade	BuyerEarning	SellerEarning	BESEDIF	TotalEarning	DSC4V4	DBCBB	DSCBB
1	68.33	17.00	171.00	93.67	77.33	1058.67	0	0	0
2	71.67	18.33	175.33	112.33	63.00	1150.67	0	0	0
3	73.67	17.67	161.00	118.00	43.00	1116.00	0	0	0
4	73.67	18.00	165.67	115.67	50.00	1125.33	0	0	0
5	73.33	17.33	163.33	114.00	49.33	1109.33	0	0	0
6	76.67	17.67	147.00	130.67	16.33	1110.67	0	0	0
7	77.67	17.67	144.00	129.33	14.67	1093.33	0	0	0
8	75.00	17.00	150.33	118.67	31.67	1076.00	0	0	0
9	74.67	18.67	169.33	119.67	49.67	1156.00	0	0	0
10	75.33	18.33	158.67	126.33	32.33	1140.00	0	0	0
11	75.00	18.67	161.33	126.00	35.33	1149.33	0	0	0
12	76.67	17.67	151.00	126.67	24.33	1110.67	0	0	0
13	75.67	19.00	159.33	125.67	33.67	1140.00	0	0	0
14	74.67	19.33	170.33	121.67	48.67	1168.00	0	0	0
15	77.33	18.67	157.00	130.33	26.67	1149.33	0	0	0
16	78.00	19.00	153.00	137.67	15.33	1162.67	0	0	0
17	77.00	18.67	151.00	124.00	27.00	1100.00	0	0	0
18	77.00	20.00	158.00	134.67	23.33	1170.67	0	0	0
19	77.67	19.33	153.67	138.00	15.67	1166.67	0	0	0
20	77.33	18.00	150.00	131.33	18.67	1125.33	0	0	0
1	69.33333	16	171.3333333	103.3333333	68.00	1098.67	1	0	0

2	68.66667	17.33333	180	97.66666667	82.33	1110.67	1	0	0
3	68.33333	17.33333	181.3333333	93.33333333	88.00	1098.67	1	0	0
4	69.33333	17	169	94	75.00	1052.00	1	0	0
5	69.33333	16.66667	168.3333333	94.66666667	73.67	1052.00	1	0	0
6	68.66667	18.33333	184	94	90.00	1112.00	1	0	0
7	69	18	181	96.33333333	84.67	1109.33	1	0	0
8	70.33333	19	189	96	93.00	1140.00	1	0	0
9	68.33333	18.66667	190	93	97.00	1132.00	1	0	0
10	69.66667	17.33333	169.3333333	102	67.33	1085.33	1	0	0
11	69.33333	18	187	96.66666667	90.33	1134.67	1	0	0
12	71	17.33333	174.6666667	104.3333333	70.33	1116.00	1	0	0
13	70	18	182	99.66666667	82.33	1126.67	1	0	0
14	70.66667	19	187	104.6666667	82.33	1166.67	1	0	0
15	71.66667	19.33333	182.3333333	104.3333333	78.00	1146.67	1	0	0
16	71	18	180.6666667	103.6666667	77.00	1137.33	1	0	0
17	71.33333	18	176.6666667	100.6666667	76.00	1109.33	1	0	0
18	71.33333	18.33333	174.3333333	104	70.33	1113.33	1	0	0
19	72.33333	19.33333	180	109.6666667	70.33	1158.67	1	0	0
20	72.33333	19.66667	180.3333333	107.6666667	72.67	1152.00	1	0	0
1	65.33333	14.66667	217.3333333	82.66666667	134.67	982.3333333	0	1	0
2	65.66667	14.33333	227.6666667	71.33333333	156.33	968.3333333	0	1	0
3	67.33333	15	239	74.33333333	164.67	1012.666667	0	1	0
4	64.33333	14.33333	229	69.66666667	159.33	966	0	1	0
5	63.66667	13	221.6666667	64.66666667	157.00	924	0	1	0
6	65	13.33333	219	62.66666667	156.33	907.666667	0	1	0
7	64.33333	16	243.3333333	67.66666667	175.67	1001	0	1	0
8	66.66667	15.33333	227.3333333	73.66666667	153.67	977.666667	0	1	0
9	63.66667	16	254	67.33333333	186.67	1031.333333	0	1	0

10	63.33333	16	241.3333333	64.33333333	177.00	982.3333333	0	1	0
11	64.33333	15.33333	238.6666667	71.33333333	167.33	1001	0	1	0
12	65.33333	14.66667	217	62	155.00	898.3333333	0	1	0
13	64.66667	15.33333	240	68.33333333	171.67	994	0	1	0
14	65.33333	15	221.6666667	65	156.67	926.3333333	0	1	0
15	63.66667	16	241	68	173.00	996.3333333	0	1	0
16	65.33333	16	240	70.33333333	169.67	1001	0	1	0
17	65.66667	16.33333	227	70.66666667	156.33	966	0	1	0
18	62.66667	16	253.3333333	58.33333333	195.00	994	0	1	0
19	64.33333	15.66667	246.3333333	68	178.33	1008	0	1	0
20	64.66667	16.33333	240.3333333	70.33333333	170.00	1001	0	1	0
1	72	17	216.3333333	101.3333333	115.00	1054.666667	0	0	1
2	71	17	226.3333333	96.33333333	130.00	1064	0	0	1
3	69.66667	18.33333	244.6666667	104.3333333	140.33	1150.333333	0	0	1
4	76	17.33333	198.3333333	110.6666667	87.67	1038.333333	0	0	1
5	77	18.33333	206.6666667	123.6666667	83.00	1115.333333	0	0	1
6	74	18	224	106.6666667	117.33	1096.666667	0	0	1
7	76.66667	19	208	132	76.00	1152.666667	0	0	1
8	75.33333	19.33333	219.3333333	124	95.33	1155	0	0	1
9	75.33333	18.66667	212.6666667	124	88.67	1136.333333	0	0	1
10	74.66667	17.66667	212.3333333	114.3333333	98.00	1092	0	0	1
11	73	18	221	111.3333333	109.67	1106	0	0	1
12	74.33333	17.66667	209.6666667	111.3333333	98.33	1075.666667	0	0	1
13	72.66667	18	224	108.6666667	115.33	1106	0	0	1
14	76.33333	16.33333	190.3333333	116	74.33	1033.666667	0	0	1
15	75	16.33333	191.3333333	108.3333333	83.00	1005.666667	0	0	1
16	73	17.66667	211	117.3333333	93.67	1101.333333	0	0	1
17	75.66667	17.66667	187	127.3333333	59.67	1071	0	0	1

18	74.66667	18	208.6666667	119.6666667	89.00	1103.666667	0	0	1
19	74	17.66667	206	116.3333333	89.67	1082.666667	0	0	1
20	75	18	214.3333333	111.3333333	103.00	1087.333333	0	0	1

Seller Concentrated Data

Unit	Price	Trade	BuyerEarning	SellerEarning	BESEDIF	TotalEarning	DSC4V4	DBCBS	DSCBS
1	68.33	17.00	171.00	93.67	77.33	1058.67	0	0	0
2	71.67	18.33	175.33	112.33	63.00	1150.67	0	0	0
3	73.67	17.67	161.00	118.00	43.00	1116.00	0	0	0
4	73.67	18.00	165.67	115.67	50.00	1125.33	0	0	0
5	73.33	17.33	163.33	114.00	49.33	1109.33	0	0	0
6	76.67	17.67	147.00	130.67	16.33	1110.67	0	0	0
7	77.67	17.67	144.00	129.33	14.67	1093.33	0	0	0
8	75.00	17.00	150.33	118.67	31.67	1076.00	0	0	0
9	74.67	18.67	169.33	119.67	49.67	1156.00	0	0	0
10	75.33	18.33	158.67	126.33	32.33	1140.00	0	0	0
11	75.00	18.67	161.33	126.00	35.33	1149.33	0	0	0
12	76.67	17.67	151.00	126.67	24.33	1110.67	0	0	0
13	75.67	19.00	159.33	125.67	33.67	1140.00	0	0	0
14	74.67	19.33	170.33	121.67	48.67	1168.00	0	0	0
15	77.33	18.67	157.00	130.33	26.67	1149.33	0	0	0
16	78.00	19.00	153.00	137.67	15.33	1162.67	0	0	0
17	77.00	18.67	151.00	124.00	27.00	1100.00	0	0	0
18	77.00	20.00	158.00	134.67	23.33	1170.67	0	0	0
19	77.67	19.33	153.67	138.00	15.67	1166.67	0	0	0

20	77.33	18.00	150.00	131.33	18.67	1125.33	0	0	0
1	69.33333	16	171.3333333	103.3333333	68.00	1098.67	1	0	0
2	68.66667	17.33333	180	97.66666667	82.33	1110.67	1	0	0
3	68.33333	17.33333	181.3333333	93.33333333	88.00	1098.67	1	0	0
4	69.33333	17	169	94	75.00	1052.00	1	0	0
5	69.33333	16.66667	168.3333333	94.66666667	73.67	1052.00	1	0	0
6	68.66667	18.33333	184	94	90.00	1112.00	1	0	0
7	69	18	181	96.33333333	84.67	1109.33	1	0	0
8	70.33333	19	189	96	93.00	1140.00	1	0	0
9	68.33333	18.66667	190	93	97.00	1132.00	1	0	0
10	69.66667	17.33333	169.3333333	102	67.33	1085.33	1	0	0
11	69.33333	18	187	96.66666667	90.33	1134.67	1	0	0
12	71	17.33333	174.6666667	104.3333333	70.33	1116.00	1	0	0
13	70	18	182	99.66666667	82.33	1126.67	1	0	0
14	70.66667	19	187	104.6666667	82.33	1166.67	1	0	0
15	71.66667	19.33333	182.3333333	104.3333333	78.00	1146.67	1	0	0
16	71	18	180.6666667	103.6666667	77.00	1137.33	1	0	0
17	71.33333	18	176.6666667	100.6666667	76.00	1109.33	1	0	0
18	71.33333	18.33333	174.3333333	104	70.33	1113.33	1	0	0
19	72.33333	19.33333	180	109.6666667	70.33	1158.67	1	0	0
20	72.33333	19.66667	180.3333333	107.6666667	72.67	1152.00	1	0	0
1	73.33333	17.33333	164	140.3333333	23.67	1077.00	0	1	0
2	78.33333	17	128.3333333	170	-41.67	1023.33	0	1	0
3	77.66667	17	138.6666667	168.3333333	-29.67	1059.67	0	1	0
4	79	18	136.3333333	181	-44.67	1088.33	0	1	0
5	80.33333	19.66667	142	198.6666667	-56.67	1164.00	0	1	0
6	80.66667	17.66667	129.3333333	188.3333333	-59.00	1082.33	0	1	0

7	79.33333	18.66667	133.3333333	177.3333333	-44.00	1065.33	0	1	0
8	78	18.33333	143	175.3333333	-32.33	1098.00	0	1	0
9	78	17.66667	132.6666667	168	-35.33	1034.67	0	1	0
10	78.66667	19.33333	132.6666667	174.3333333	-41.67	1053.67	0	1	0
11	79.66667	20	140.3333333	190.6666667	-50.33	1133.33	0	1	0
12	80	19	130.3333333	180.3333333	-50.00	1062.33	0	1	0
13	81.33333	18.66667	134	184.6666667	-50.67	1090.00	0	1	0
14	80.66667	19	137.6666667	197	-59.33	1141.67	0	1	0
15	81.66667	20	133.6666667	200.3333333	-66.67	1135.67	0	1	0
16	81.33333	18.66667	123.6666667	185.3333333	-61.67	1050.67	0	1	0
17	81	19.33333	133.3333333	193.6666667	-60.33	1114.33	0	1	0
18	80.33333	18.66667	128.3333333	191.3333333	-63.00	1087.33	0	1	0
19	81.33333	20	125.6666667	196.3333333	-70.67	1091.67	0	1	0
20	82	19.33333	131	203.3333333	-72.33	1134.00	0	1	0
1	71	15	150	134	16.00	1002.00	0	0	1
2	72.33333	15.33333	151	143.3333333	7.67	1034.00	0	0	1
3	73.33333	15.66667	136	141	-5.00	967.00	0	0	1
4	76.33333	17.33333	146	163.3333333	-17.33	1074.00	0	0	1
5	78.33333	16	138.6666667	170.6666667	-32.00	1066.67	0	0	1
6	79	15.66667	120.6666667	163.6666667	-43.00	973.67	0	0	1
7	78	15	125.6666667	155.6666667	-30.00	969.67	0	0	1
8	80.33333	15.66667	121	172.6666667	-51.67	1002.00	0	0	1
9	82.66667	17.33333	124	177	-53.00	1027.00	0	0	1
10	81.66667	17	119.6666667	176.3333333	-56.67	1007.67	0	0	1
11	83.66667	15.66667	111	173.3333333	-62.33	964.00	0	0	1
12	80	16	120	161.3333333	-41.33	964.00	0	0	1
13	82.33333	18	120.3333333	193	-72.67	1060.33	0	0	1

14	78.33333	15.66667	120.6666667	159.6666667	-39.00	961.67	0	0	1
15	82.33333	17	122	194.3333333	-72.33	1071.00	0	0	1
16	80.33333	17.33333	132.3333333	182.6666667	-50.33	1077.33	0	0	1
17	78.66667	17.33333	132	172.3333333	-40.33	1045.00	0	0	1
18	80.66667	16.33333	131.3333333	168.3333333	-37.00	1030.33	0	0	1
19	81.33333	17.66667	123.6666667	186.3333333	-62.67	1053.67	0	0	1
20	81.66667	18.66667	129	201	-72.00	1119.00	0	0	1