Bilateral Trading and the Curse of Knowledge:
An Experimental Economics Study

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Abstract

This research investigates the impacts of reporting different kinds of trade information to buyers and sellers in laboratory markets, for which exchange is made through bilateral bargaining. Results suggest that public information may improve the bargaining position of buyers relative to sellers when there is spot delivery. In some cases sellers earn less than in a no information baseline. There is evidence of a curse of knowledge for sellers in our information experiments when quantity traded for the entire market is known. The mandatory price reporting of all trades does not improve the income of sellers.

Background

The market structure of U.S. agriculture is evolving from auction trading to closer coordination between the stages of production. This coordination comes in the form of vertical integration, business alliances, or exclusive supply contracts. Price in this system typically is not discovered through the interaction of many buyers and sellers as in auction exchange. Instead, it is discovered primarily through private, bilateral negotiation. We also note that privately negotiated trades are common in the transition economies such as Russia, in which open or centralized trading has not developed and therefore is not a significant method of marketing food products.

An important aspect of the trading institution is the information it generates for participants. An auction market typically is characterized by offers and/or bids being made in the presence of all potential traders and anyone may accept or counter with another bid/offer. A feature of private negotiation is that each price is found bilaterally by a single buyer and seller. The negotiation process, if it occurs, is usually conducted with little formality. Third parties normally are unaware of the bids and trade prices made (Buccola 1985). There is thus an information shortage in this market institution, as compared to auctions. There also is a "matching" problem in private negotiation trading that is not present in auction trading. A bargaining pair may be unable to trade or only make inefficient trades because differences between buyer values and seller costs are small or negative. Effectively, there is less competition in private negotiation trading as compared to auction trading. The institutional structure of the market place and the market information base therefore likely impact the effectiveness of price discovery and market efficiency.

An amendment to the Agricultural Marketing Act of 1946, commonly referred to as Mandatory Price Reporting, has been passed into federal law and was largely in response to a concern that bilateral traders, in particular sellers, did not have sufficient information to make their most profitable trades. Mandatory Price Reporting requires the particulars of large negotiated transactions to be made public. Thus, agents have trade information from auction markets, which as mentioned are becoming smaller, and certain previously made negotiations. There is, however, reason to believe that providing agents with more information, far from improving market competitiveness tends to make it worse (Smith 1994). Better-informed agents, perhaps through public information, are unable to ignore this information, even when it is advantageous to do so. Some types of information, as we show in this paper, may increase the bargaining power of buyers as a group. The information creates market power that reduces

market efficiency. This situation of more information not always being better has been referred to as the "curse of knowledge" (Camerer, Loewenstein and Weber 1989).

We know the method of delivery impacts market outcomes in alternative trading institutions. Here we refer to a transaction that requires production before negotiation – advance production or spot delivery, or a transaction that is a forward agreement, where production comes after the price is decided, and there is later production-to-demand. Spot delivery carries higher opportunity costs for the seller, because inventory must be held and it may not be possible to keep inventories across production cycles. Hence leftover stocks become a sunk cost. Phillips, Menkhaus and Krogmeier (2001) examined pricing behavior for forward and spot deliveries where the trading institution was a double auction. Results suggest a tendency for prices in spot delivery to converge to a level 10% higher than prices in forward delivery. Market forces take into account the added costs of advance production in spot delivery, resulting in fewer trades and higher prices relative to forward delivery. Price and quantity traded in forward delivery with auction trading are close to the predicted competitive equilibrium.

Forward prices in private negotiation trading also are similar to the predicted competitive price level. Spot delivery prices, on the other hand, are significantly lower than forward delivery prices in private negotiation trading (Menkhaus et al. 2001), and seller earnings are severely reduced. The advance production characteristics of spot delivery places sellers at a disadvantage to buyers. Take the case of one bargaining round. If a buyer in private negotiation trading fails to purchase a unit, he/she earns zero; if a seller fails to sell a production unit, he/she loses the cost of production. This is common knowledge for all agents. The buyer therefore has the incentive to bid zero on a unit. The seller has the incentive to accept low bids in order to avoid losing the total cost of production. In repeated play the seller must be paid a price that at least covers costs or there will be no future production; but the bulk of the market surplus can still go to the buyer. Can public information provided via a market news report improve seller earning in spot private negotiation trading?

Research Objective

The objective of this research is to investigate the impacts of alternative public information scenarios on market outcomes when there is private negotiation in spot delivery markets. We create these markets in a laboratory setting, using college students as paid traders. Alternative market information scenarios include no information, market price from the previous production period, market price and quantity traded from the previous production period, and price reported for each trade as it occurs. Reporting all trade prices as they occur is intended to more closely mimic an auction trading institution in which all trade prices are known to agents. We focus on spot delivery, i.e. advance production, because it dominates in agriculture. Contracts typically are negotiated after the majority of production costs are incurred.

Theoretical Considerations

The simple model of bilateral monopoly helps to organize thinking about what market outcomes to expect in the private negotiation experiments discussed below. Given market demand and a marginal cost schedule there are corresponding marginal revenue and factor cost schedules. A monopoly seller restricts sales and seeks a high price determined by the intersection of marginal revenue and marginal cost. The monopsony buyer restricts sales and seeks a low price determined by the intersection of demand and the marginal factor cost schedule. Figure 2 illustrates supply and demand, and marginal revenue and factor cost for our laboratory markets. Units are discrete and this gives the stair-cased look. The model generally

predicts a sales level less than the competitive market level and a range of prices that bracket the competitive prediction.

We argue that advance production or spot delivery in bilateral trading throws market power to the buyer. Some of the argument was sketched above, and we now provide more detail. Imagine sellers and buyers matched n times, after sellers have made the production decision and inventory is in stock. The seller has the opportunity to sell all stock during the n rounds of matches with buyers in a production cycle. Excess inventory however, becomes worthless at the end of the nth negotiating round. We already have noted that in the last round the buyer has the incentive to bid and pay virtually zero for all stock. This price paid at the end means that zero should be paid in the n-1 round, then for n-2, and so on for all negotiation pairs. Through backward induction the predicted Nash equilibrium price therefore is zero for a single production cycle, but if sellers make losses they will not produce in future cycles, and the market disappears.

The buyer in a multi-period game seeks to maximize consumer surplus. In principle the buyer can offer any price for units over a production cycle; moving up the cost schedule until consumer surplus is maximized. We shall assume there is no price discrimination and the buyer pays a uniform price. The equilibrium price therefore occurs, we know, where marginal factor cost intersects the demand schedule. Price and quantity sold are determined as if the buyer had perfect monopsony control of the market. This is the multiple production cycle Nash equilibrium. The result hinges on advance production delivery. It gives the buyer bidding control. Private negotiation with forward delivery restores bilateral control of the market, giving more market power to the seller, and we would predict higher prices.

Given spot trading, can symmetric (market) information about past trades transfer surplus to the seller and move the market toward the competitive outcome? We believe the answer is no. Our reasoning goes as follows. Suppose there is information that causes sellers to produce more – they move up the market supply schedule. This has no impact on the maximum surplus buyers can extract from the market. They have no interest in buying the additional units, leftover inventory is larger and seller earnings decline. Suppose there is information that causes sellers to produce less. It may take time for buyers to adjust, but they will pay less for fewer units, moving down the cost schedule, in order to maximize their surplus. Seller earnings, or produce surplus, declines. Hence we argue that any information that makes sellers produce more or less in the market will adversely impact their earnings.

In actual market trading like that constructed in our computer laboratories, with several buyers and sellers, an individual agent faces a "matching risk." Late random matches may pair a buyer with a seller where one or the other may not gain from a trade. The traders cannot find a reasonably positive difference between marginal value and marginal cost. If there are n finite matches in a production cycle, valuable trading time is wasted. Hence we believe that traders have an incentive to trade early in a production cycle, and this may dilute some of the buyer's market power. Buyers, wishing to avoid a later mis-match, will bid the price above the pure monopsony level. The matching problem can benefit sellers, because it damages the control of buyers in the late bargaining rounds of a production cycle. Market information can repair this control, and work in favor of the buyer, by signaling buyers, for example, that plenty of inventory will be available toward the end of a production cycle. Information that relieves the matching problem is likely to help buyers.

In summary, the impact of market information on an equilibrium is complicated by the organization of the market. For an institutional setting in which transactions are conducted through private negotiation and sellers must have inventory on hand before trading commences, we have presented arguments suggesting the seller cannot be helped by providing market information to all the trading agents. It is, however, an empirical question, and it centers on how powerful is the bargaining position of buyers when there is advance production by sellers. In the

next section we describe how we construct markets to study the role of information when there is private negotiation

Methods and Procedures

Laboratory experimental markets (Plott 1982; Smith 1982) are constructed to obtain data for analyses. This approach has merit because data from private negotiations in naturally occurring markets usually are proprietary and unavailable. Laboratory markets facilitate the study of alternative information scenarios. We are able to reduce the confounding influence of the myriad of variables present in naturally occurring markets. Laboratory markets provide for a controlled environment. By using a sufficiently simple framework, the effects resulting from a change in market information or other variable can be isolated.

<u>Basic Design</u>

All trading was conducted over a computer network. Consistent with previous studies (e.g., Menkhaus et al. 2001) an experimental session consisted of 20 three-minute trading (or production) cycles. Each cycle has three one-minute matches of buyers and sellers. As in Noussair, Plott, and Riezman (1995) and Mestelman and Welland (1987) four buyers and four sellers participated in each laboratory market session.

Reservation values, unit costs, and earnings were denoted on a monetarily convertible currency called tokens. The exchange rate used in the experiments was 100 tokens = 1 dollar. At the beginning of each session, each participant was given an initial token balance (700 tokens).[1] Participants were told that they were free to keep this money plus any they earned from trading.

Buyers were privately given a table that listed the maximum reservation (resale) values for each unit purchased. Sellers were similarly provided with unit costs. Unit values and unit costs were identical for each buyer and each seller, respectively. Unit values and unit costs used in the experiments are reported in Table 1.

Each buyer was allowed to purchase, one at a time, up to eight units during each trading period. The first unit purchased in each period was the highest value unit, the second purchased was the second highest value unit, and so on. Likewise, each seller was allowed to produce up to eight units and to sell them, one at a time, in a trading cycle. The first unit

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[1] This initial balance was deemed necessary in our spot market experiments, because sellers must incur production costs prior to being given the opportunity to earn profit from sales. An additional concern is that the initial endowment be large enough to preclude the possibility of individual bankruptcy early in the session, particularly for sellers. In order that symmetry between buyers and sellers be maintained, the initial balance will be given to both buyers and sellers.

Table 1. Unit Values and Unit Costs (tokens).

Unit(s)	Unit Values (Buyers)	Unit Costs (Sellers)
1	130	30
2	120	40
3	110	50
4	100	60
5	90	70
6	80	80
7	70	90

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8   60   100

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produced (sold) was the lowest cost unit, the second unit was the second lowest cost unit, and so on.

Earnings for a buyer on each unit purchased were equal to the redemption value of the particular unit less the price paid to the seller. Earnings for a seller on each unit sold were equal to the price received by the seller less the production cost of the particular unit. Earnings accumulated over the sequence of trading cycles and were displayed on the computer screen at the end of each trading cycle. At the end of the experiment, participants were paid the cash equivalent of their earnings. Each experiment session lasted from $2^1/_2$ to 3 hours, and the average earnings per participant was about \$32.00.

Buyers (sellers), when paired, were allowed at any time to submit bids (offers) for a single unit. Bids (offers) were submitted by typing the numerical value into the computer. The best bid (offer) was displayed on each individual's computer screen. Valid bids (offers) were made to follow an "improvement" rule, i.e., the bid (offer) to be displayed to the market was required to be higher (lower) than that previously displayed as the best bid (offer). Also, following common practice, a valid bid (offer) in our experiments was not allowed to exceed (be lower) than the asking (bid) price currently displayed if one existed. A trade occurred when a best bid (offer) equaled the best offer (bid), or either party accepted the currently displayed bid (offer). Our bargaining rounds did not allow any other communication between the agents.

The baseline treatment in this experiment is the competitive norm, which is detailed later. Test treatments involve private negotiation in a spot market, without and with designed market news scenarios. Figure 1 illustrates the design of the trading cycle for each treatment. A practice session (Phase 1) was conducted after the instructions for the experiment were presented to the participants and before the actual experiment began. At the end of every trading cycle, earnings were reported (Phase 5) and a new trading cycle then began.

Sellers made a production decision (Phase 2), thereby providing units for sale once negotiation commences (Phase 3). Note that production costs are incurred before trading begins, reflecting the advance production nature of a spot market. Sellers are allowed to sell only the number of units they produce and there is no inventory carryover from one trading cycle to the next.[2] Buyers resell purchased units to the auctioneer at predetermined prices to make a profit on each unit.

A great diversity of designs could have been used for the private negotiation institution. We chose a design to capture the essence of bargaining, without verbal communication or the

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[2] This is characteristic of perishable commodities that are common agricultural/food markets.

Instructions	Actual Experiment			
Phase 1	*Phase 2* Production Period	*Phase 3* Spot Trading	*Phase 4* News	*Phase 5* Earnings

Buyers (4)

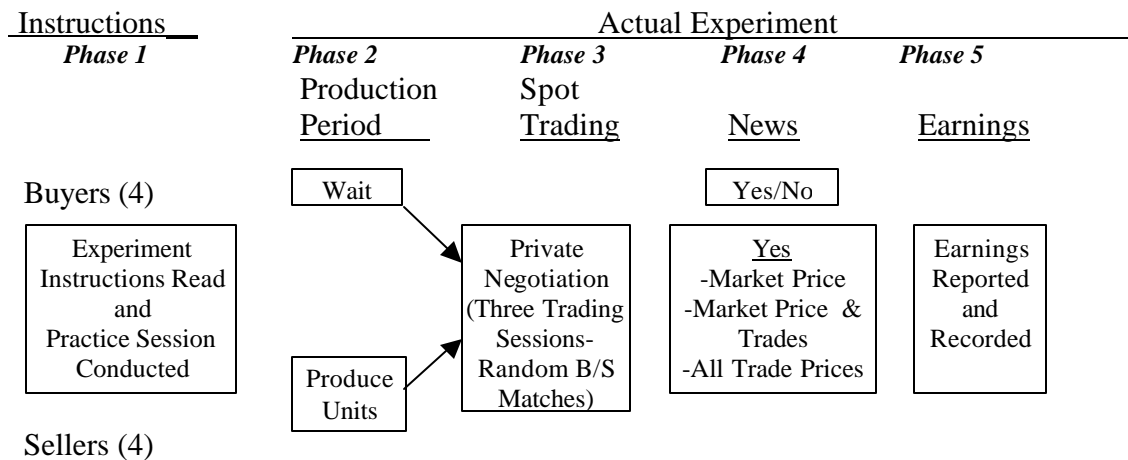|	Wait		Yes/No	
Experiment Instructions Read and Practice Session Conducted		Private Negotiation (Three Trading Sessions- Random B/S Matches)	Yes -Market Price -Market Price & Trades -All Trade Prices	Earnings Reported and Recorded
	Produce Units			

Sellers (4)

Figure 1. Organization of Trading Cycle for Buyers (B) and Sellers (S).

sending of explicit messages. Private negotiation is a complicated process and usually involves strategic behavior that is fostered through repeated encounters with other agents. Reputation building would necessarily appear if we permitted subjects to choose a trading partner and communicate. We are not interested in investigating a repeated game between two agents, and our design eliminates this for the purpose of control. Buyers and sellers were randomly matched in the private negotiation treatments. In these sessions, matched pairs were given one minute to trade and then another random match was made, for three matches during these minute trading session. The trading procedures in the private negotiation sessions essentially followed those of the double auction except for the number of traders.

Relying on induced value theory (Smith 1976, 1982), the values and costs used in the experiment (Table 1) constitute individual demand and supply for each trading cycle (bold lines in Figure 2). When summed horizontally (over four sellers and four buyers) the aggregate supply and demand curves are derived. Competitive price theory predicts an equilibrium price of 80 tokens and units traded between 20 and 24 units per period. Adding inventory costs in the spot delivery setting would reduce the number of units traded and increase the price relative to the competitive equilibrium. Figure 2 also illustrates the bilateral monopoly solution for the unit values and unit costs used in our experiments. The predicted quantity traded for the bilateral monopoly case is four units for both a buyer and a seller, summing over the four sellers and buyers would suggest sales of 16 units. The predicted bilateral monopoly price is in the range of 60 to 100 tokens; the monopsony price is 60 tokens. We are predicting prices close to this level, rather than the monopoly price of 100 tokens.

Market Information

Four types of market information were investigated in this study:
- Variant 1 - No market news report labeled as the Spot/Private Negotiation (SPN) treatment.
- Variant 2 - After the trading was completed, we provided agents with the average market price in the cycle. This is labeled as the Spot/Private Negotiation/Market Price (SPNMP) treatment.
- Variant 3 - After the trading was completed, we provided agents with the average price and units traded in the cycle. For reference the label is the Spot/Private Negotiation/Market Price/Quantity Traded (SPNMPQT) treatment.

- Variant 4 - Every trade price was displayed to all participants in the session immediately after the trade had been made. The treatment is labeled Spot/Private Negotiation/Market Price/Trade Price (SPNMPTP).
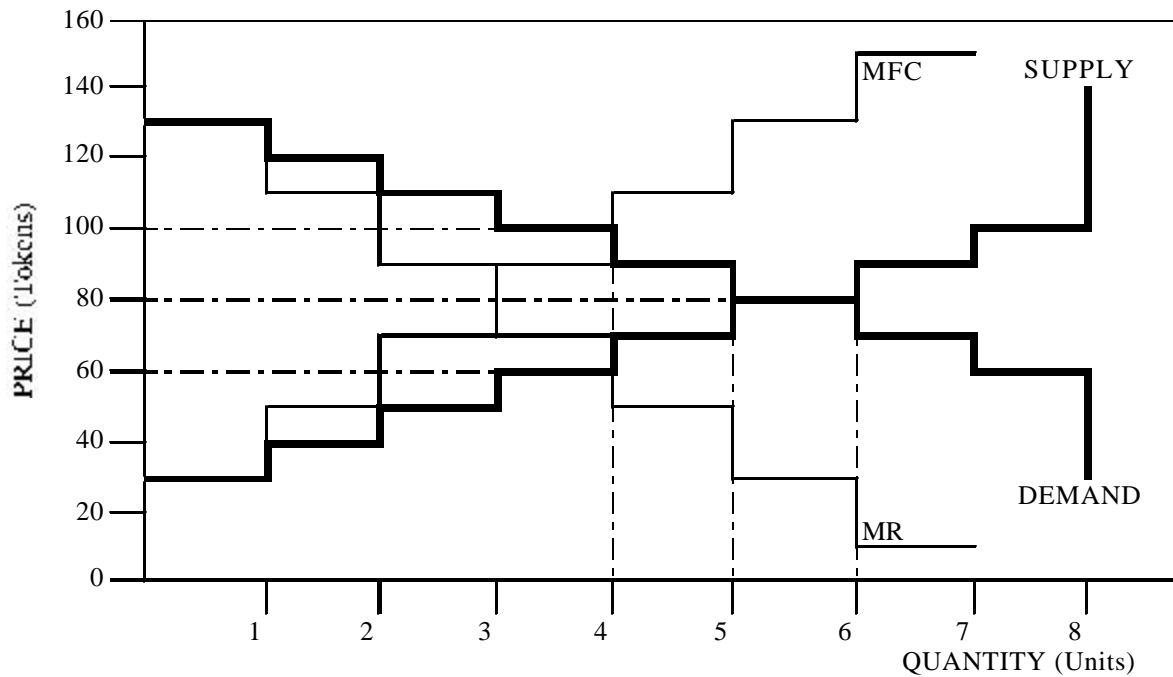

Figure 2. Bilateral Monopoly Model

Data Analysis

A description of the characteristics of the data generated in the experiments conducted in this study is provided by means of a convergence model (Ashenfelter et al. 1992; Noussair, Plott and Reizman 1995). The experimental data generated over several time periods, pooled with cross section data (for example across the treatments described in the presentation of the experimental design) may be serially correlated and heteroscedastic. Data also may be contemporaneously correlated between cross sections due to the same unit values/costs being used, as an example, between and among alternative treatments. These complications, in the absence of a well-developed theory of the convergence process in markets, create problems with statistical analyses designed to identify patterns that may exist in the data.

We estimate variations of the following general convergence model.

$$P_{it} = B_0 [(t-1)/t] + B_1(1/t) + \sum_{j=1}^{i-1} a_j D_j [(t-1)/t] + \sum_{j=1}^{i-1} G_j D_j (1/t) + u_{it},$$

where
P_{it} = average sale price (or units traded or earnings) across all replications and all trades for each of t cycles in cross section (treatment) i;
B_0 = the predicted asymptote of the dependent variable for the base category (Dj);

B_1 = predicted starting level of the data;

t= trading cycles – 1,..., 20;

i = treatment – 1,..., 5 – competitive norm (base), spot decentralized, spot decentralized price report, spot decentralized/price and trades report, and spot decentralized every trade price reported;

D_j = dummy variable representing treatment (competitive norm is the base); and

u_{it} = error term.

The asymptote values are of primary interest in this study, particularly how they differ across treatments. Sale prices (and units traded and earnings) for a treatment are averaged across the replications to reduce the influence of individual agents.

The Parks (1967) method is used to estimate the model. This is an autoregressive model in which the random errors u_{it}, i=1, 2 ...5, t=1, 2, ...20, have the structures (SAS, 1993)

$$E\ (u^2_{it}) = \sigma_{ii}\ (\text{heteroscedasticity});$$

$$E\ (u_{it}\ u_{jt}) = \sigma_{ji}\ (\text{contemporaneously correlated}); \text{ and}$$

$$u_{it} = \rho_i u_{i,t-1} + ?_{it}\ (\text{autocorrelation}).$$

The Parks method assumes a first-order autoregressive error structure with contemporaneous correlation between cross sections. The covariance matrix is obtained by a two-stage procedure leading to the estimation of model regression parameters by generalized least squares. (See SAS, pp. 882-884, for details of this estimation method.) The use of the Parks method allows us to take account of the unique statistical problems resulting from the panel data sets that consist of time series observations on each of the several cross-sectional units generated in our experiments. The method requires the number of observations per cross section to be balanced and the number of time series observations to be greater than the number of cross-sections. Differences (buyer earnings minus seller earnings) were used as the dependent variable in the convergence model for buyer and seller earnings.

Results

In this section the results of the following 18 experimental sessions are summarized and analyzed:[3]

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[3] Six replications were conducted for the SPN and SPNMP treatments – three were conducted in which expected market prices for a trading period were elicited from both buyers and sellers prior to the production phase. Price expectations for buyers and sellers were either equal or within a few tokens in latter periods and were slightly above the market price when market price when market price was not announced and slightly below market price with price information. A Wilcoxon nonparametric test indicated no statistical difference in average prices and quantities traded between the three replications whether or not expected prices were elicited. We therefore pooled those replications in the SPN and SPNMP treatments.

- private negotiation spot market (SPN) – 6 replications;
- private negotiation spot market with reports (information) of previous period average price (SPNMP) – 6 replications;
- private negotiation spot market with reports (information) of previous period average price and quantities traded (SPNMPQT) – 3 replications;
- private negotiation spot market with immediate reports of every trade price in the same replication of the decentralized market (SPNMPTP) – 3 replications;

The experiments generated data for several market outcomes – prices, quantities produced and traded, total earnings, and seller and buyer earnings.

Means and standard deviations for prices and quantities traded across replications by treatment for periods 16-20[4] are reported in Table 2. Data for spot double auction trading (SDA) also are reported for comparison. Private negotiation trading with spot delivery (SPN) resulted in lower prices and higher variances, as compared to spot double auction trading. The price is lowest for the SPNMPTP treatment. This treatment also exhibits the greatest standard deviation. Providing information to agents in private negotiation trading did little to raise prices and, in some cases, resulted in even lower prices. Quantities traded are fewer in private negotiation trading, as compared to the double auction trading with spot delivery. Fewer trades generally did not result in higher prices.

The estimated convergence models and related statistical tests for price, trades, buyer/seller earnings differences, and total earnings are presented in Table 3. We focus primarily on the estimated asymptotes in the discussion that follows.

Table 2. Means and Standard Deviations (SD) by Treatment for Trade Prices and Quantity Traded Across Replications (Reps), Periods 16-20.

Treatment (Reps)	Price		Quantity Traded	
	Mean	SD	Mean	SD
SPN (6)	74.85	4.59	15.83	2.38
SPNMP (6)	76.62	8.24	14.40	1.48
SPNMPQT (3)	68.01	3.47	12.67	1.99
SPNMPTP (3)	66.92	17.39	13.47	4.12
SDA (5)[a]	83.87	1.74	20.04	1.34

a) SDA is spot double auction (Phillips, Menkhaus and Krogmeier 2001).

<u>Price</u>

The estimated asymptotes for each private negotiation treatment is significantly below the competitive norm level of 80 tokens, a tendency predicted by our theory. The greatest differences from the competitive norm are for the SPNMPQT and SPNMPTP treatments, in which the estimated asymptotes for price converge to levels of about 68 tokens. The asymptotes for these two treatments are not significantly different. Reporting the market price from the previous production period (SPNMP) raised price slightly above that in private negotiation trading without market information (SPN). The additional information associated

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[4] Trading periods 16-20 are used to reduce the effects of learning, the majority of which likely occurred in earlier periods.

Table 3. Estimated Convergence Models and Related Statistical Tests for Price, Quantity Trades, Buyer Minus Seller Earnings, and Total Earnings.

Variable	Price	Qnt. Traded	Buyer-Seller Earn.	Total Earnings
Asymptotes				
Comp. Norm	80.00	20	0.00	1200.00
SPN	-5.83*a	-4.33*a	41.38*a	-154.58*a

	(0.19)	(0.15)	(1.44)	(5.33)
SPNMP	-3.50*b	-5.16*b	18.38*b	-195.06*b
	(0.36)	(0.25)	(2.01)	(8.14)
SPNMPQT	-12.70*c	-7.41*c	72.91*c	-267.25*c
	(0.47)	(0.23)	(4.29)	(9.55)
SPNMPTP	-11.81*c	-6.18*bc	30.72*d	-194.34*b
	(0.83)	(0.49)	(2.50)	(7.63)
Starting Level				
Comp. Norm	80.00	20	0.00	1200.00
SPN	-2.22*a	-3.97*a	23.30*a	-161.91*a
	(0.64)	(0.43)	(4.68)	(16.23)
SPNMP	-5.87*b	-4.27*a	46.00*b	-127.74*a
	(0.95)	(0.53)	(5.92)	(20.51)
SPNMPQT	-15.16*c	-4.27*a	120.52*c	-128.63*a
	(1.40)	(0.71)	(12.71)	(29.27)
SPNMPTP	-3.35ab	-4.38*a	35.99*ab	-133.55*a
	(2.26)	(1.10)	(6.74)	(20.76)
R^2	0.99	0.99	0.97	0.99

* Significantly different from zero, a=0.01. Standard errors are reported in parentheses.

a,b,c,d, - Same letter indicates no significant difference between estimated asymptotes (starting levels) in the respective equations. A different letter indicates a significant difference between estimated asymptotes (starting levels), a=0.01.

with announcing quantity traded or the trade price as it occurred apparently helped the bargaining power of buyers. A comparison of the estimated asymptote with the estimated
starting levels reflects downward trends in price over the 20 trading periods for the SPN and SPNMPTP treatments. The greater downward trend is in the latter treatment.

Quantity Traded

Estimated asymptotes for quantity traded are significantly lower than the lower limit of the competitive norm quantity tunnel of 20 tokens. Trades in SPN are approximately as predicted by the bilateral monopoly model – 16 units – and is at a level significantly greater that for other treatments. Units traded in other treatments range from about 12.50 in SPNMPQT to about 15 in other treatments.   Starting levels are all about 16 tokens, indicating slight downward trends through the 20 periods, when compared to estimated asymptotes.

Buyer/Seller Earnings Differences

The competitive equilibrium model predicts equal distribution of earnings between buyer and seller – 150 tokens each.   The estimated asymptote difference between buyer and seller earnings are positive and significantly different from zero for each treatment.   This reflects an advantage to buyers in each of the private negotiation trading treatments, without or with information. The sellers were least disadvantaged in the SPNMP treatment and most impacted in the SPNMPQT treatment. Information was not successful in yielding price levels that resulted in an equitable distribution of earnings to buyers and sellers. Buyer earnings were higher in the earlier trading periods than in the latter in all treatments except SPN.

Market efficiency was adversely affected in each of the private negotiation trading treatments, regardless of information given to the agents. Bilateral trading results in fewer quantities traded, which reduced total earnings to market participants.

Discussion

Previous research (Menkhaus et al. 2001) indicates that advance production associated with spot delivery puts sellers at a disadvantage relative to buyers in the bilateral negotiation of prices. Other research (Phillips, Menkhaus, and Krogmeier 2001) reports that sellers fare better than buyers in auction (double auction) trading with spot delivery. Market forces in the latter case signal sellers to reduce production and price increases. Buyers benefit through increased bargaining power in private negotiation trading with advance production, leading to reduced prices. Sellers are forced to produce less as a result, but still cannot negotiate for higher prices.

Alternative types of information in private negotiation trading with spot delivery, as provided in our experiments, do not improve the seller's position and in some cases appear to improve the bargaining position of buyers, relative to that of sellers, putting sellers in a worse position. There is evidence of a "curse of knowledge" for sellers in our information experiments when quantity is known, either explicitly (SPNMPQT) or implicitly (SPNMPTP).

Spot delivery imposes risk on the seller – the risk of losing the entire cost of a unit or the risk of selling a unit at a loss. These losses are summarized in Table 4 for each of the private negotiation treatments in our experiment design for trading periods 16-20. On average, less than one unit is lost per trading session among all sellers. There is no strong evidence that the added information contributes to reducing this risk. The average loss for trades for which cost exceeded price tends to be higher for the information treatments as compared to the SPN treatments without information, but these additional losses are minimal. We conclude that the sellers iterate toward production decisions that minimize the losses from over-production in latter periods of the experiments with or without information. The imperfect market between production and sales will make risk-averse agents produce fewer units, as indicated by results from our experiments.

Table 4. Losses (Tokens) from Advance-Production in Private Negotiation, Periods 16-20.

Treatment	Average Number of Units Lost/ Period	Average Loss for Trades Where Cost>Price
SPN	0.50	8.28
SPNMP	0.47	13.88
SPNMPQT	0.43	15.60
SPNMPTP	0.40	14.07

Trading data for sessions 1-3 across all replications and periods 16-20 by treatment are reported in Table 5. Most trades are made in trading session 1 and 70-75% of the trades occur in sessions 1 and 2. Prices are near the competitive norm for the SPN and SPNMP treatments in

session 1 and for SPNMP in session 2. We argued that price in the third match should be near 60 tokens, but because of matching risk could be higher in earlier bargaining rounds. Prices generally should be closer to 60 than 100 tokens. Data presented in Table 5 generally support these predictions. By session 3 there is a clear advantage to buyers in all treatments. Moreover, buyers negotiate for lower prices in all sessions of the SPNMPQT and SPNMPTP treatments. Knowledge of quantity, as previously suggested, provides an increased negotiation advantage to buyers. Information about quantity traded could allow buyers to be more patient and mitigate the "matching risk" that they potentially face. In session 3 the buyer knows that he/she need only bid slightly above the unit cost for the seller and make a trade and still allow the seller to produce. By backward induction the same strategy should apply in trading sessions 1 and 2. This strategy is stronger when quantity is known.

Conclusions and Implications

The trading institutions in agriculture are evolving from auction to private ngeotiation. We find that bilateral trading with spot delivery moves the market away from the competitive norm. Prices and quantities traded are lower, and seller earnings are lower relative to those of buyers. Can public information available to both sellers and buyers improve the distribution of earnings between buyers and sellers in private negotiation trading with spot deliveries? Results of experiments conducted in this study suggest that sellers can be disadvantaged if quantity related data are publicly made available to both buyers and sellers - a curse of knowledge in private negotiation trading with spot delivery.

The setting modeled by the experiments in this study resembles that of a feedlot as a producer of a commodity that cannot be held in inventory for a long period of time. Costs can be sunk as in our study. Experimental results suggest that the packer in this example would have increased bargaining power. The feedlot producer would be in a take-it-or-leave-it position regarding price negotiation. If the cattle are not sold they gain weight and may be discounted in future negotiations. The packer need only provide a price that encourages production, something just above the cost. Information on trade prices, either for those in the previous production period or all trade prices, does not enable the seller encourages production, something just above the cost. Information on trade prices, either for those in the Table 5. Percent Trades and Average Trade Prices for Each Trading Session by Treatment Across Replications and Trading Periods 16-20.

	Percent Trades		
Treatment	Random Match Session 1	Random Match Session 2	Random Match Session 3
SPN	39.41	34.63	25.96
SPNMP	40.03	32.61	27.36
SPNMPQT	45.76	29.80	24.44
SPNMPTP	42.10	27.78	30.12
	Average Trade Prices		
	Random Match Session 1	Random Match Session 2	Random Match Session 3
SPN	78.37	74.45	69.71
SPNMP	78.83	79.24	70.00

| SPNMPQT | 68.51 | 70.10 | 63.67 |
| SPNMPTP | 69.51 | 70.15 | 63.90 |

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previous production period or all trade prices, does not enable the seller to improve his/her bargaining position. Such information, particularly that related to quantity, seems to strengthen the position of the buyer. The results of this study suggest it is possible that mandatory price reporting could benefit buyers more than sellers in their negotiations.

Additional research is warranted to explore alternatives that might improve a seller's negotiation position in private negotiation trading with spot delivery, whether in a transition economy or in U.S. agriculture. Alternatives that generally would increase the bargaining position of sellers relative to buyers are possible avenues for future research. Cooperative arrangements, for example, could provide increased bargaining power to sellers in private negotiation trading. We also know that alleviating the risk of advance production through production-to-demand arrangements improves seller negotiation power.

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