The Culture of Private Negotiation: Price Drift in Bilateral Bargaining*

Owen R. Phillips
Department of Economics and Finance
University of Wyoming
Laramie, WY 82071-3985
owenphil@uwyo.edu

Dale J. Menkhaus
Department of Agricultural and Applied Economics
University of Wyoming
Laramie, WY 82071-3354
menkhaus@uwyo.edu

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Abstract

The culture of private negotiation leads parties to agreements below a price that anchors beginning bids and offers. Possible anchors are a list price or suggested retail price. The anchor may be endogenous, e.g., the average reported trade price from previous trading activity. An endogenous anchor may cause a downward or upward drift in negotiated prices. Using bilateral bargaining data from laboratory experimental markets, this paper demonstrates how price information reports create drifts in negotiated prices. A downward drift is robust and causes sharp declines in total market surplus. Also, relative earnings are distributed toward buyers and away from sellers.

JEL Codes: C78, C91, D80

Key Words: Negotiation, Anchoring, Price Drift, Experiments

Short Summary

Market reports can anchor transactions. They give traders a cue from which to begin a bargaining round. These cues have substantial impacts on bargaining outcomes, such as a downward drift in market price. More information does not necessarily improve market performance in privately negotiated trading.

I. Introduction

Imagine a trading institution that is a double auction with just one buyer and one seller. Bids and offers are proprietary. We refer to this institution as private negotiation, because learning and information on market outcomes is restricted to the two traders. This environment is a simple version of actual negotiations. In reality there are multiple interests and parties, and numerous related contractual issues that may be decided through bargaining. This construction, however, captures the essence of the negotiation process and will be the framework through which we study negotiated outcomes in this paper.

It is widely recognized that arrangements for trading food commodities such as grains, produce, and livestock are moving away from auction institutions in which numerous agents interact and toward private negotiation.[1] Policy makers are concerned that the shift toward private negotiation restricts the "price discovery" process in a market. In other words, the lack of interaction among numerous buyers and sellers crying out bids and/or offers damages the information transparency of a market. This transparency in auction environments is credited with moving prices toward the intersection of supply and demand. Under private negotiation a trader may have few opportunities to buy or sell, and therefore trade in ignorance of what the value of the commodity is to the rest of the market. The relatively uninformed trader can lose surplus to the more knowledgeable party. Cattle sales, for example, are shifting toward a bargaining environment in which large processors trade bilaterally with numerous and small cattle sellers. The processor could have many negotiations with sellers, while the seller could have just one transaction with a buyer. The fear held by policy makers is that private negotiation generates an asymmetry of information that favors the buyer.

The United States Department of Agriculture (USDA) has mandated a policy that requires prices and quantities from privately negotiated livestock sales to be publicly reported (Grunewald, Schroeder and Ward 2004).[2] The underlying assumption is that more information is better than less. Public price reports are thought to improve market efficiency because they reflect information about supply and demand and serve to provide information to otherwise uninformed market participants (Grossman and Stiglitz 1976). Better informed sellers should negotiate prices that are closer to the competitive prediction. The purpose of this paper is to study the impact of reported price information on bargaining behavior in private negotiation trading. Individuals privately negotiate in a computer laboratory market with different information conditions. It is demonstrated that injections of price information can move traders away from the intersection of the predicted demand and supply equilibrium and harm trading agents as a group.

Experiments using private negotiation as the trading institution are less common than those with auction designs. Smith (1982) and Kagel and Roth (1995) provide excellent reviews of the auction and bargaining literature. Notable experimental studies involving private negotiation trading are Hong and Plott (1982) and Grether and Plott (1984). These studies allow traders to use the telephone to strike bargains as a clock ticks down. The Hong and Plott study found that private negotiation was more efficient than a posted-price institution, in terms of total realized surplus. Grether and Plott documented the collusive influence of selected market practices that were common in petro-chemical negotiations, for example, price announcements from sellers that became common knowledge for all trading agents. Buccola (1985) studied pricing efficiency for forward (production-to-demand) delivery in a double auction with multiple buyers and sellers, along with negotiated trading using a laboratory approach. The experiments

were conducted orally. In multiple bargaining sessions, just as in an auction market, transaction prices were reported on a chalkboard as soon as the trades were made. Price variance was found to be lower in auction trading than in the bargaining experiments, suggesting auctions are more efficient at getting agents to equilibrium. Buccola did not allow negotiated outcomes to be proprietary.

II. The Negotiating Culture

Private negotiation is a common form of conducting business. Houses, automobiles, employment contracts, and even weekend garage sales are examples for which private negotiation is the primary trading institution. Every bilateral bargaining environment has some conventions, or commonly accepted practices with which traders are acquainted. These conventions collectively create a bargaining culture.[3]A common feature of a bargaining culture is that no buyer pays a seller's initial asking price, and no seller accepts a buyer's first offer. It is understood that the final agreed price will be somewhere in between. There are familiar variations on this culture. For homes and automobiles there is a posted asking price from the seller. Autos have a Manufacturer's Suggested Retail Price and homes have a listed price, often with a Multiple Listing Service. These prices anchor the negotiations in such a way that no one anticipates paying the asking price or anything above it, negotiations are over the amount of discount. In housing, while the list price may be going up or down, a tight market is often measured by the size of the discount. The same holds true for autos, prices above the suggested retail price are infrequent. There are exceptions (often widely publicized); but the culture is to negotiate an agreement below a benchmark or anchor. Our work shows that this anchor is very important to a bargaining outcome. An anchor can be endogenous and change from one bargaining period to the next.

It is a fascinating and important area of investigation to better understand the information that anchors negotiations. This information controls the beginning phase of negotiation and is capable of setting bounds on acceptable bargaining outcomes. The anchoring perspective generally can decide outcomes (Tversky and Khaneman 1974). If public policy creates or changes an anchor, it can change bargaining outcomes. Our bargaining experiments show that without any information injected into the environment, paired buyers and sellers, randomly matched and repeatedly negotiating the sale of an item, move toward an equilibrium price predicted by the intersection of supply and demand.

Behavior in private negotiation becomes strikingly different when "market reports" are injected into the bargaining environment. Suppose an outside entity reports the average trading price of bargains in a period, before trading begins in the next period. We argue, and present evidence in support, that this information creates a benchmark for the parties from which a discount should be negotiated. The reported price becomes something like a manufacturer's suggested retail price or the asking price on a house -- it is the starting point from which the seller compromises and the buyer thinks there should be a discount. In other words, it anchors the bargaining process.

The market report information creates a downward drift in average prices. Each average price in period t leads negotiators to settle on prices below this benchmark or anchor. The average reported in period t+1 becomes lower. This leads to lower negotiated prices, and so on. In a sense, the public reported market average combined with the negotiating culture creates a lemons-type market, generally damaging payments to sellers. Quality issues do not exist, but as prices drift downward, it is possible that sellers exit the market and fewer goods become available.

Anchoring exists when responses are influenced by numerical prompts, even when the prompt is uninformative (Tversky and Khaneman 1974, see also the discussion in McFadden 2001). In an uncertain choice environment the prompt signals appropriate behavior even though no such action is required. Little is understood about how market agents assimilate information and accept it as an anchor for future trading activity. By necessity it must carry some credibility with the consumer, such as a manufacturer's suggested retail price or an appraised value. McFadden writes:

> Education trains individuals to use problem solving protocols in which responses to questions are based not only on substantive knowledge, but also on contextual cues as to what a correct response might be (p.264).

To further illustrate anchoring McFadden cites a coauthored study (Green et al. 1998) that asks visitors to a science museum how much they would be willing to pay (WTP) to save 50,000 off-shore seabirds from small oil spills. Without a prompt, the median response is $25. With a "warm-up" referendum question that first asked if they would agree to a specified amount (ranging in different cases from $5 to $400) if it could be guaranteed 50,000 birds would be saved, the authors were able to move median WTP responses down to $10 and up to $50, when the same control question followed. A one-dollar increase in the prompt question increased the mean WTP amount by 28 cents.

Related to negotiation specifically, we constructed a simple bargaining survey that asked subjects the beginning price at which they would open negotiations to sell an ordinary writing pen, and at what price they thought agreement eventually would be reached. The survey had a picture of the pen. One version of the survey was anchored by reporting the original store price of the pen at $2.39. A second version eliminated any reference to a price. The anchored survey read as follows:

This is a survey about how bargaining agreements are reached. Imagine that a pen, as illustrated below, was recently purchased and never used. The original price was $2.39.

(picture)

It is now for sale again. The agreed price will be reached through a series of offers and counteroffers between a buyer and a seller. Please answer the following questions as best you can:

As a seller:

1. At what price would you make the first offer to sell?_____
2. At what price would you think an agreed sale price will be reached?_____

An anchored and non-anchored survey also was given to buyers. A total of 222 people were surveyed. Results are summarized below for the four treatments.

Summary of Survey Results

	Buyer anchored	**Seller anchored**	**Buyer non-anchored**	**Seller non-anchored**
Avg. first offer	1.29	2.41	0.91	4.61
Std. dev.	0.54	0.54	0.84	6.23
Avg. agreed price	1.88	1.89	1.54	2.68
Std. dev.	0.45	0.48	1.21	2.72
Number surveyed	50	50	59	63

Most noteworthy is that anchoring on the original purchase price encouraged buyers and sellers on average to "bargain" alike. Without ever actually getting into making offers and counteroffers, both parties believed the actual agreed price would be $1.88 or $1.89.[4] Buyers began low and bargained up by $0.59 on average; sellers started above the original purchase price, and bargained down by $0.52. The agreed price was on average about $.50 below the original sales price.

Without the price prompt in the non-anchored survey, there was considerably greater difference in the beliefs of buyers and sellers as a group, and greater variance in individual beliefs. A number of people taking the survey found it difficult to put down an offer to sell or

buy. Numerous people wrote that their offer would be some fraction, e.g. half, of the original selling price whatever it was. A number of people wrote that they could not answer the survey questions because they did not know the original selling price. For those people answering with a dollar and cent amount, there was a wide difference in the average first buy offer and the average first sell offer ($4.61-0.91=$3.70), compared to a difference of $1.12 in the anchored treatment. Buyers without an anchor thought the final price would rise by $0.63 and non-anchored sellers thought the eventual selling price would fall by $1.93. Relative to anchored sellers, these sellers began relatively high. The non-anchored buyer and seller forecasted selling prices of $1.54 and $2.68, respectively, are significantly different. This does not mean that less trading would take place in the non-anchored negotiation environment. It does mean the market may have to discipline traders to change perceptions of acceptable negotiated prices. As this disciplining takes place we would expect relatively high variances in actual trade prices.

This simple bargaining survey and nearly all WTP surveys are hypothetical. Individuals can behave far differently with or without an anchor if those surveyed are required to donate to a hypothetical cause. Further, very little work has studied anchoring in actual market transactions, and how information may create anchors. This paper suggests that not all price information is equally effective in anchoring decisions. As consumers are provided information, its value is weighed. It is possible for information that might be "anchoring," but does not match well with experience, or private information, to be rejected or play a less prominent role in the bargaining environment.

Conceivably different price drifts could come from different benchmarks. Suppose negotiators get reports on prices from a second market; perhaps goods are similar except for geographic separation. If these prices trend upward and are used as an anchor, negotiated prices

in the first market could increase. The negotiated price would be less than the reported price, but depending on the relative discount, prices could trend upward. In order for this to occur, the information must be accepted as a reference point from which bargaining begins. The dependency between the benchmark and negotiated prices is decided by the trading agents. Upward trends in negotiated prices exist because the anchor moves up, pulling negotiated prices upward, and these prices may feedback on the benchmark in the next period.

In the experimental sessions conducted below, we create a downward drift in prices by reporting an average trade price from all buyer and seller pairs in the market at the beginning of a trading period. This downward drift is robust. We believe the average is treated like a manufacturer's suggested retail price or an appraisal from which negotiations begin in the next period. Further, in our laboratory markets we then attempt to create an upward drift in prices by reporting hypothetical averages from another market. This is accomplished with some degree of success. The upward drift is less robust, but there is pressure against it, because sellers attempt to make more trades as prices increase. Our experimental results show that the higher reported prices induce substantially more trades.

III. Basic Market Conditions and the Experimental Negotiation Environment

Laboratory markets (Plott 1982; Smith 1976 1982) offer a useful approach to study the culture of private negotiation. The setting is by necessity a reduced version of naturally occurring markets. In any experimental/laboratory situation, it is advantageous to construct treatments in such a way as to clearly isolate the variable of interest. The goal is to design the experiments, just as models are designed, in order to learn something useful and to answer questions motivated by the research issue. It is futile to attempt to replicate in the laboratory the complexities of an actual environment; reality has infinite detail and an infinite amount of detail

will remain uncaptured (Friedman and Sunder 1994, p. 11). Our experimental design is quite simple, compared to reality, in order to elicit a better understanding of behavior in privately negotiated transactions.

The basic competitive supply and demand model has been an effective means of predicting most market outcomes especially those from auction markets. Agents, myopically acting to maximize gains through bids and/or offers, and unaware of broader market forces, move toward average total trades and price established by the intersection of the market supply and demand schedules. Figure 1 illustrates demand and supply for the laboratory market in this study. Individual unit values and unit costs are in table 1. Units traded are discrete and this gives the stair-cased look to figure 1. The predicted competitive outcome for an individual trader, given by the intersection of supply and demand, is 80 tokens for price and between five and six units for quantities traded. A horizontal summation of the individual supply and demand relations for four buyers and four sellers yield quantities traded between 20 and 24 units. Results from double auction trading show that traders quickly move toward this competitive prediction (Phillips, Menkhaus and Krogmeier 2001).

The method of trading over a set period of time repeatedly matches a different buyer with a different seller, and gives them the opportunity to sequentially trade units at possibly different prices. Agents do not have to trade when matched, they can decide that better bargains exist with a later match, but there are a limited number of matches. Prices are established through private negotiation between one buyer and one seller. Each types into a computer a bid price and an offer price, respectively. Agents can quickly change their offers by one token with the click of the mouse, or they can make bigger changes by typing in a bid or offer. Following usual experimental procedures an improvement rule exists - buyers must bid higher than the

previous bid, and sellers offer less that the previous offer. Identical bids and offers define a trade. As soon as a trade is made, new negotiations for another unit begin between the paired buyers and sellers.

Buyers and sellers were randomly paired. Pairs were given one minute to trade a homogeneous good, and then another random match was made. There were three matches during a three-minute period. A new three-minute period in the experiment began with traders starting fresh on table 1. This procedure allowed for multiple trading partners during a trading session and throughout the experiment. Earnings were denoted in a monetarily convertible currency called tokens (1 token = 1 cent). All buyers faced the same unit values, and all sellers faced the same unit costs. Unit values and unit costs in the experiments are identical in each treatment to facilitate comparison (Table 1).

An experiment, following standard practices (Davis and Holt 1993; Friedman and Sunder 1994) and previous related research (Menkhaus et al. 1999 and 2000; Phillips, Menkhaus and Krogmeier 2001a and 2001b), began with reading the instructions. An unpaid practice session was always conducted and questions were encouraged. Consistent with these and other previous studies (Krogmeier et al. 1997; Noussair, Plott and Riezman 1995) four buyers and four sellers participated in each laboratory market session. The experiments consisted of 20 three-minute periods. The exact number of periods was unknown to market participants, in order to avoid any strategic behavior that otherwise might take place in the final period. Students recruited primarily from economics and business classes participated in the study.

In the experiments each buyer was allowed to purchase one at a time, up to eight units during each three-minute trading period. The first unit purchased in each period was the highest value unit, the second purchased was the second highest valued unit, and so on. Likewise, each

seller was allowed to sell up to eight units one at a time in each trading period. The first unit 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 equaled the redemption value of the particular unit less the price paid to the seller. The 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 periods and were displayed on the computer screen at the end of each trading period. At the end of the experiment, participants were paid the cash equivalent of their earnings. Each participant was given an initial token balance (700 tokens = $7.00) at the beginning of the experiment.[5]

Information was injected into the bargaining games in one of two ways; the two forms of information provision represent treatments in the experiments. The first information treatment computed the average price for the trades made in the previous three-minute period (three trading rounds) and this was reported to all subjects. This treatment is referred to as the average price or (AP treatment). A second information treatment reported "prices from other markets." The prices from the other markets were contrived to create a rising price trend. In this treatment, the first period news, reported after the first bargaining period, was the average first period price of the "no news" baseline and the AP treatment. From this average subsequent price reports come from a rising trend line. This outside news report is discussed in more detail below. Three experiments were conducted for each treatment.

IV. Summary of the Data

The data from these three treatments are reported and interpreted graphically and then given more careful analysis using a simple convergence model (Ashenfelter et al. 1992;

Noussair, Plott and Reizman 1995). The time series are helpful toward spotting trends and gauging the reliability of asymptotic predictions.

Figure 2 shows an average of the negotiated prices for the PN and the AP treatments. The PN treatment is the baseline trend with no injection of information into the system. In this treatment prices appear to begin relatively high and then move downward toward the competitive prediction of 80 tokens. Prices stabilize after period 12 around the 80 token-level. This trend is consistent with that observed in auction markets with the same supply and demand schedules (Phillips, Menkhaus and Krogmeier March 2001). The AP treatment reports the average trade price in the previous period. Subjects were asked to record this price, so they had a complete history of prices in front of them. There is a noticeable and persistent downward trend in prices. They begin near 80, but then trend downward and are about 75 tokens by period 20. The trend continues downward to the end of the experiment.[6]

This declining price trend led us to consider creating a positive drift by changing the information. If progressively higher averages were consistently reported would the trend drift upwards? The last treatment in this series of experiments created a news report that took the average of the PN and AP prices in period 1, and added 0.24 tokens to this average in later periods. Figure 3 reports the outcome of this treatment as MN (Market News). These data show that negotiated prices start low and trend upward until period 11, when prices peak above 82 tokens. Prices seem to stabilize around 80 tokens. After period 9 there seems to be little difference between the PN and MN treatments.

Interestingly, the rising market news reports have a pronounced effect on sales. Figure 4 shows the quantity traded under the MN treatment is about 2 units (or 12.5%) more than the other two treatments. The PN and AP experiments appear to have fairly stable sales at 16 units.

A perfectly competitive market predicts sales in the 20 to 24 unit range. So all three treatments have fewer sales than what is predicted by the intersection of supply and demand. Clearly however, the rising market price reports encourage more trading activity in private negotiation. We conclude sellers would like to trade nearer the higher reported MN prices, but cannot given the number of units they want to trade. As a group they are unable to reduce units sold, so price falls below the rising reported averages. Interviews with sellers after the MN news experiments reflected considerable frustration over the difference between the reports and actual prices negotiated. It is difficult to sustain an upward price trend if sellers cannot control quantity supplied. The combined data in figures 3 and 4 show that traders were impacted by the market news, and that the news was used by traders as an anchor.

Figures 2 and 4 together show that actual average price reports (AP treatment) create an anemic market. Sales are relatively low and prices are trending down. In period 18, for example, total revenue generated is about 1200 tokens and falling. In the no information PN treatment revenues are stable at about 1300 tokens. The most robust market is created by the rising price reports. Total revenue in period 18 is about 1450 tokens and stable. A perfectly competitive market would have revenues that are at least 1600 (20 units x 80 tokens) tokens.

Figure 5 illustrates the relation between the AP reports and actual trade prices. Prices in the AP treatment closely track the average prices reported to traders. The negotiated price is not always below the reported price, but it is in 13 of the 19 periods (68%) for which there is a reported average. Figure 6 graphs the relation between the MN reports and the actual negotiated prices. The price is always below the reported news. After period 11 there appears to be strong resistance in the market to going above 80 tokens. Even though the news prices continue to rise,

actual trade prices stay close to 80 tokens; this is because quantities traded in the market are relatively high.

The last set of observations shows the division of earnings going to buyers and sellers. This is important because the policy prescription in agricultural markets is intended to put sellers on a better footing against buyers in private negotiations. Just the reverse takes place. Buyers do better against sellers in both the AP and MN treatments. Figure 7 shows that in the no information PN market environment buyer earnings are around 130 tokens per period after period 12. In the AP treatment they are over 150 tokens per period after period 15. In the MN treatment they are about 140 tokens. The anchoring price information (AP and MN types) increases buyer earnings by 10 to 15% over the baseline treatment.

In the AP treatment, the anchoring price information reduces seller earnings. Figure 8 shows that without the information earnings appear to be around 140 tokens; with the AP report they drop to about 120 tokens (about 14%). This difference is pervasive, beginning in about period 4. The market news reports (treatment MN) do not impact seller earnings. They seem to be about the same as those with no information. Generally, we conclude from the earnings trends in figures 7 and 8 that buyers noticeably benefit from the information reports. Sellers do not, and sellers in the AP report treatment have noticeably lower incomes.

V. Asymptotic Estimates

The purpose of this section is to estimate the convergence levels of prices, quantities and earnings, using all of the data, from respective starting points to the end of the experiment. Statistical inferences also can be made across treatments. The time series data within an experiment may be serially correlated and heteroscedastic. Data also may be contemporaneously

correlated between cross sections (treatments) due to the same unit values or costs being used by subjects.

We estimated variations of the following general convergence model.

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

were P_{it} = average sale price (or units traded, surplus or earnings) across the three replications and all trades for each of t periods in cross section (treatment) i; B_0 = the predicted asymptote of the dependent variable for the base category (competitive prediction); B_1 = predicted starting level of the data for the base category; t = trading period 1, ..., 20; D_j = dummy variable representing the j^{th} treatment (competitive prediction, PN, AP, and MN); and u_{it} = error term. The asymptote values are of primary interest in this study, particularly how they differ across treatments. Sale prices were averaged across the three replications to reduce the influence of individual traders.

This model provides a useful means to determine the effect of trading period (t) on outcome variables (prices, units traded, total surplus and buyer and seller earnings) for each treatment. Separate equations were estimated for each dependent variable. The base treatment in this analysis was the competitive prediction. These are 80, 20, 1200, and 150 for price, units traded, total surplus, and both buyer and seller earnings, respectively. The dummy variables (D_j) take on the value of one when the dependent variable is from the j^{th} treatment and are otherwise zero. For the base treatment, the asymptote of the dependent variable is given by B_0 and the B_1 is the origin of a possible convergence process (starting level). These are adjusted by α_j and Γ_j, respectively, for the experimental treatments. Note that if t = 1, then the value of the dependent variable is equal to B_1 for the base treatment. As t gets large the weight of B_1 is small, because 1/t approaches zero, while the weight of B_0 is large, i.e., (t-1)/1 approaches 1.

The Parks (1967) method was used to estimate the model. This is an autoregressive model (SAS 1993) in which the random errors u_{it}, i = 1, 2,...N, t = 1, 2,...T, have structures $E(u^2_{it}) = \sigma_{ii}$ (heteroscedasticity), $E(u_{it} u_{jt}) = \sigma_{ij}$ (contemporaneously correlated), and $u_{it} = \rho_i u_{i, t-1} + \varepsilon_{it}$ (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 1993, pp. 882-884, for details of this estimation method.) The use of the Parks method allowed 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 convergence model results for prices, quantities traded, buyer and seller earnings, and total surplus are presented in table 2.

The results reported in table 2 measure trends in the different series. There are beginning and ending estimates of prices for each of the three treatments. The PN treatment price begins about 3.3 tokens above the competitive prediction of 80 and moves toward an asymptotic prediction of about 1.6 tokens above this level. Negotiated prices toward the end of the treatment are averaging about 81.6 tokens, a bit above the predicted equilibrium. The AP treatment begins with negotiated price above 81 tokens, but in twenty periods of trading moves downward toward a level of about 76 tokens. An upward price drift discussed earlier in the MN "market news" treatment is not statistically significant. Neither the starting level nor the asymptote is significantly different from 80 tokens in the treatment. The difference between asymptotic and starting level estimates on fewer periods, for example periods 1 to 12, confirm a significant upward trend in price, but the trend is moving to the competitive prediction.

Quantities traded in the MN treatment are stable and stay one or two units below the predicted level of 20 units. This is the highest trade level for any of the treatments. The lowest quantity traded convergence level occurs when actual averages are reported (AP treatment), and is about four units below the competitive prediction. The reports of progressively higher MN prices encourages sellers to sell more, but this supply prevents them from negotiating the higher prices reported to the traders. The significantly lower prices negotiated in the AP treatment may cause sellers to generally offer less, helping to bolster negotiated prices.

The estimates in table 2 confirm that buyers generally do well in the information treatments and do best in the AP treatment. The asymptotic estimate in the AP treatment is no different than the competitive prediction of 150 tokens. The other two asymptotes are significantly less; but the MN environment is substantially better than the PN treatment for buyers. Sellers do relatively better in the PN treatment than the AP treatment; the asymptotes show individual sellers earning on average about 19 tokens more without the added information. Sellers do better with the rising MN price reports than the AP reports. Under the MN treatment seller earnings are near the competitive prediction because prices are relatively higher and quantities traded are larger.

VI. Discussion

The U.S. Department of Agriculture, Mandatory Price Reporting Act was passed in 1999. Reporting of negotiated sales began in August 2001. The prices of all privately negotiated cattle sales became public. These price reports are summarized as daily averages for cattle buyers and sellers. In March 2002 sellers (Grunewald, Schroeder and Ward (2004)) were queried on the value of this information. A total of 1,501 feedlots were surveyed and 316 responded.

They were asked on a scale of 1 to 9, 1 indicating strongly disagree and 9 indicating strongly agree, to respond to the statement, "MPR [Mandatory Price Reporting] has enhanced my ability to negotiate…with packers." Two other statements were in the survey. One generally stating, "MPR is benefiting the beef industry" and the other stating "Information in the market has increased." Sellers averaged close to 4 in the opinions of the last two statements, reflecting no strong feeling, and some mild disagreement. On the first question the average response was 2.97. On the negotiation statement 35% responded with a 1 and another 28% responded with a 2 or 3. Opinions are stronger and more disagreeable. These results suggest that industry impressions from the seller side of the market line up reasonably well with the experimental results we have reported. The market is not benefited by the information and seller earnings are damaged relative to buyer earnings.

The problem identified in our work is fundamental to private negotiation as a trading institution. It is the culture of striking a deal. Individual buyers do not want to be the agent who pays an above average price. Sellers offer a homogenous good, so they are not in a position to ask for more. These perspectives are so pervasive that a downward drift in negotiated prices is created. This works to the advantage of buyers and against sellers. Our work shows that a correction can be achieved by simply <u>not</u> "helping" the market with added reports. A natural development of history and learning in private negotiation is better for the market.

The USDA market reports anchor transactions. They give traders a contextual cue from which to begin a bargaining round. Such cues have substantial impacts on bargaining outcomes. In the twenty periods subjects bargained under the AP treatment, prices fell 9%, sales were about 8% lower, and total surplus in the market fell 8% below that in markets without the reported averages. A market in Akerlof's lemons model rested on buyers never paying more than the

average price. We show that lemon-like outcomes can be created in private negotiation by simply reporting the average price in a homogenous goods market. A downward drift in market price results from the tendency of traders to use the average from which to begin further negotiations. More information does not necessarily improve market performance in privately negotiated trading.

Endnotes

1. For example, in the early 1990's about 10% of the cattle sales in Kansas and Texas were not reported because of a lack of trading volume. By 2000, this increased to 60%. For the U.S. as a whole, 20% of the cattle were sold through marketing agreements and contract sales in1995. In 2001, 45% of the sales were contracted. See USDA (2001) and Grunewald, Schroeder and Ward (2004) for more details.

2. "By making the reporting on marketing information mandatory, USDA will facilitate price discovery, make the market open, and provide all market participants with market information that can easily be understood" (Federal Register p. 75464). Mandatory Price Reporting (MPR) requires processors to report prices and the terms of each transaction (See Grunewald, Schroeder and Ward 2004).

3. Often these conventions are taken for granted. For example in the sale of houses the culture includes a posted for-sale sign, a multiple listing service description, or a real estate agent who represents the seller in negotiations. A buyer, often through argument, makes a written first bid. Through their agent a seller rejects or counters in writing. A specific time limit is set for either party to make a counter offer or accept the standing offer. Offers are considered in the order

received, and early low offers must be rejected before later higher offers are put to negotiation. Earnest money is provided with an offer to signal the seriousness of the intended buyer.

4. These prices are not significantly different. The sample standard deviation is $std.dev = \left(\frac{0.45^2}{50} + \frac{0.48^2}{50} \right)^{\frac{1}{2}} = 0.09$. The test statistic is (1.89-1.88)/0.09=0.11

5. The initial token balance was given to be consistent with related treatments that required payment for production in advance of sales.

6. A simple OLS fit between period and average price yields

$$\underset{(188.70)}{\text{Price} = 79.65} \underset{(-6.41)}{- 0.24 \cdot \text{Period}}.$$

The t-statistics are in parenthesis; adjusted $R^2 = 0.69$. Average negotiated prices are falling by about 0.24 tokens each negotiating period.

References

Akerlof, George. "The Market for Lemon's: Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics*, August 1970, 84(3), pp. 488-500.

Ashenfelter, Orley and Genesove, David. "Testing for Price Anomalies in Real-Estate Auctions." *American Economic Review*, May 1992 (*Papers and Proceedings*), 82(2), pp. 501-505.

Buccola, Steven T. "Pricing Efficiency in Centralized and Noncentralized Markets." *American Journal of Agricultural Economics*, August 1985, 86(3), pp. 583-590.

Davis, Douglas and Holt, Charles. *Experimental Economics*, Princeton University Press: Princeton, N.J., 1992.

Federal Register. Department of Agriculture, Agricultural Marketing Service, Vol. 65, No. 232, 7 CFR Part 59, December 1, 2000.

Friedman, Daniel and Sunder, Shyam. *Experimental Methods*, Cambridge University Press: New York, New York, 1994.

Green, Donald; Jacowitz, Karen; Kahneman, David and McFadden, Daniel. "Referendum Contingent Valuation, Anchoring, and Willingness to Pay for Public Goods." *Resource and Energy Economics*, June 1998, 20(2), pp. 85-116.

Grether, David M. and Plott, Charles, R., "The Effects of Market Practices in Oligopolistic Markets: An Experimental Examination of the Ethyl Case." *Economic Inquiry*, October 1984, 22(4), pp. 479-507.

Grossman, Sanford J. and Stiglitz, Joseph E. "Information and Competitive Price Systems." *American Economic Review*, May 1976 (Papers and Proceedings), 66(2), pp. 246-253.

Grunewald, Sarah, Schroeder, Ted C. and Ward, Clement E., "Cattle Feeder Perceptions of Livestock Mandatory Price Reporting," *Review of Agricultural Economics*, Winter 2004, 26(4), pp. 521-538.

Hong, James T. and Plott, Charles, R. "Rate Filing Policies for Inland Water Transportation: An Experimental Approach." *Bell Journal of Economics*, Spring 1982, 13(1), pp. 1-19.

Kagel, John, H. "Auctions: A Survey of Current Research," in J.H. Kagel and A.E. Roth (eds.), *The Handbook of Experimental Economics*. 1995, Princeton, NJ: Princeton University Press.

Krogmeier, Joseph L., Menkhaus, Dale J., Phillips, Owen R. and Schmitz, John D. "An Experimental Economics Approach to Analyzing Price Discovery in Forward and Spot Markets." *Journal of Agricultural and Applied Economics*, December 1997, 29(2), pp. 327-336.

McFadden, Daniel. "Economic Choices." *American Economic Review*, June 2001, 91(3), pp. 351- 378.

Menkhaus, Dale J., Bastian, Chris, T., Phillips, Owen R. and O'Neill Patrick, D. "Endogenous Choice of Institution Under Supply and Demand Risks in Laboratory Forward and Spot Markets." *Journal of Agricultural and Resource Economics*, December 1999, 24(2), pp. 553-571.

Menkhaus, Dale J., Bastian, Chris, T., Phillips, Owen R. and O'Neill Patrick, D. "Supply and Demand Risks in Forward and Spot Markets: Implications for Agriculture." *Journal of Agricultural and Applied Economics*, April 2000, 32(1), pp. 159-173.

Menkhaus, Dale J., Phillips, Owen R., and Yakunina, Alla V., "Public Information and Bilateral Trading in Laboratory Markets." University of Wyoming Working Paper, March 2003.

Menkhaus, Dale J., Phillips, Owen R., Bastian, Chris T. and Gittings, Lance B., "Facilitating Influences in Private Negotiation: The Matching Problem and Inventory Loss Risk." University of Wyoming Working Paper, May 2004.

Noussair, Charles N., Plott, Charles R. and Riezman, Raymond G. "An Experimental Investigation of the Patterns of International Trade." *American Economic Review*, June 1995, 85(3), pp. 462-491.

Parks, Richard W. "Efficient Estimation of a System of Regression Equations When Disturbances Are Both Serially and Contemporaneously Correlated." *Journal of the American Statistical Association*, 1967, 62, pp. 500-509.

Phillips, Owen R., Menkhaus, Dale J. and Krogmeier, Joseph L. "Laboratory Behavior in Spot and Forward Markets." *Experimental Economics*, December 2001, 4(3), pp. 243-256.

Phillips, Owen, R., Menkaus, Dale, J. and Krogmeier, Joseph, L. "Production-to-Order or Production-to-Stock: The Endogenous Choice of Institution in Experimental Auction Markets." *Journal of Economic Behavior and Organization*, March 2001, 44(3), pp. 333-345.

Plott, Charles R. "Industrial Organization Theory and Experimental Economics." *Journal of Economic Literature*, December 1982, 20(4), pp. 1485-1527.

SAS Institute Inc. *SAS/ETS user's guide version 6, second edition*. Cary, NC: SAS Institute Inc., 1993, pp. 869-894.

Smith, Vernon L. "Experimental Economics: Induced Value Theory." *American Economic Review*, June 1976, 66(2), pp. 274-279.

Smith, Vernon L. "Microeconomic Systems as an Experimental Science." *American Economic Review*, December 1982, 72(5), pp. 923-935.

Tversky, Amos and Khaneman, Daniel. "Judgment Under Uncertainty: Heuristics and Biases." *Science*, September 1974, 185(4157), pp. 1124-31.

U.S. Department of Agriculture. *USDA Announces New Confidentiality Guidelines for Livestock Mandatory Reporting Program*. News Release, USDA, Washington, August 3, 2001. Available at http://www.usda.gov/news/releases/2001/08/0132.htm.

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
8	60	100

Table 2. Estimated Coefficients (Standard Errors) for Prices, Quantities, Earnings, and Total Surplus

		Relative to Base					
	Comptitive Prediction	PN		AP		MN	
Dependent Variable		Start	Asym	Start	Asym	Start	Asym
Price $R^2 = 0.99$	80	3.32*[c] (1.28)	1.55*[a] (0.46)	1.40[c] (0.96)	-3.81*[b] (0.37)	-2.83[c] (1.43)	-0.04[a] (0.49)
Quantity $R^2 = 0.99$	20	-7.58*[d] (0.36)	-3.19*[a] (0.11)	-5.08*[c] (0.75)	-3.89*[a] (0.27)	-1.98*[d] (0.58)	-1.30*[b] (0.20)
Buyer Earnings $R^2=0.99$	150	-43.87*[c] (5.50)	-22.23*[a] (1.74)	-33.47*[c] (8.15)	-4.49[b] (3.32)	10.06[d] (6.42)	-11.81*[b] (2.13)
Seller Earnings $R^2=0.99$	150	-17.13*[cd] (6.62)	-13.83*[a] (2.47)	-10.67*[c] (3.20)	-33.17*[b] (0.98)	-35.13*[d] (7.79)	-4.12[a] (2.63)
BESE Dif $R^2=0.68$	0	-16.55 (11.39)	-13.13* (4.05)	-19.31 (8.18)	27.08* (3.25)	33.07 (13.31)	-2.08 (4.49)
Total Surplus $R^2=0.99$	1200	-257.19*[c] (18.10)	-132.18*[a] (5.45)	-179.26*[cd] (37.76)	-148.76*[a] (13.28)	-71.67*[d] (21.00)	-80.61*[b] (6.77)

*Estimated Asymptote/Starting Level significantly different from the competitive equilibrium or base value and the Asymptote/Starting Level for the difference between buyer and seller earnings (BESE Dif) significantly different from zero, $\alpha = 0.01$.

a,b,c,d - Same letter indicates no significant difference between estimated asymptotes (starting levels) in the respective equations. Different letters indicate a significant difference between estimated asymptotes (starting levels), $\alpha = 0.01$.

Figure 1. Induced Market Supply and Demand.

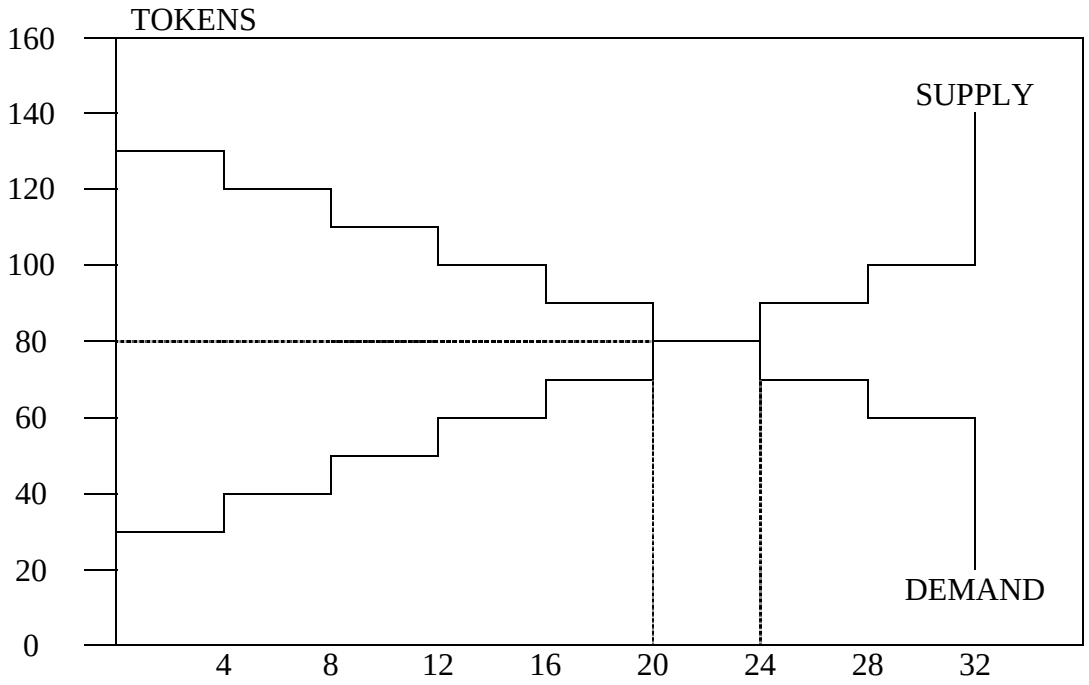

Figure 2. Private Negotiation Prices with No Market Report (PN) and Average Market Price (AP).

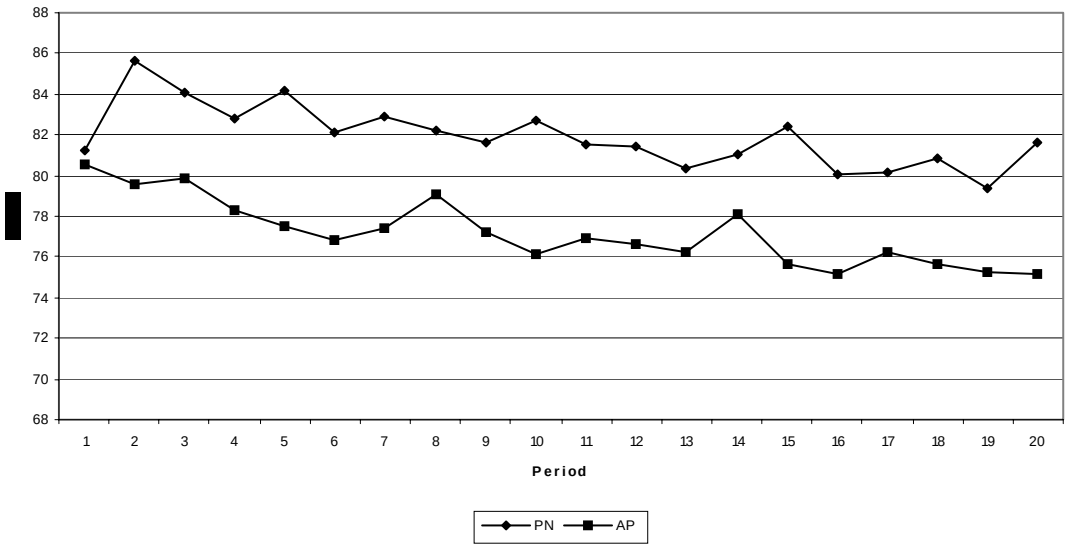

Figure 3. Private Negotiation Prices with No Market Report (PN) and Market News (MN).

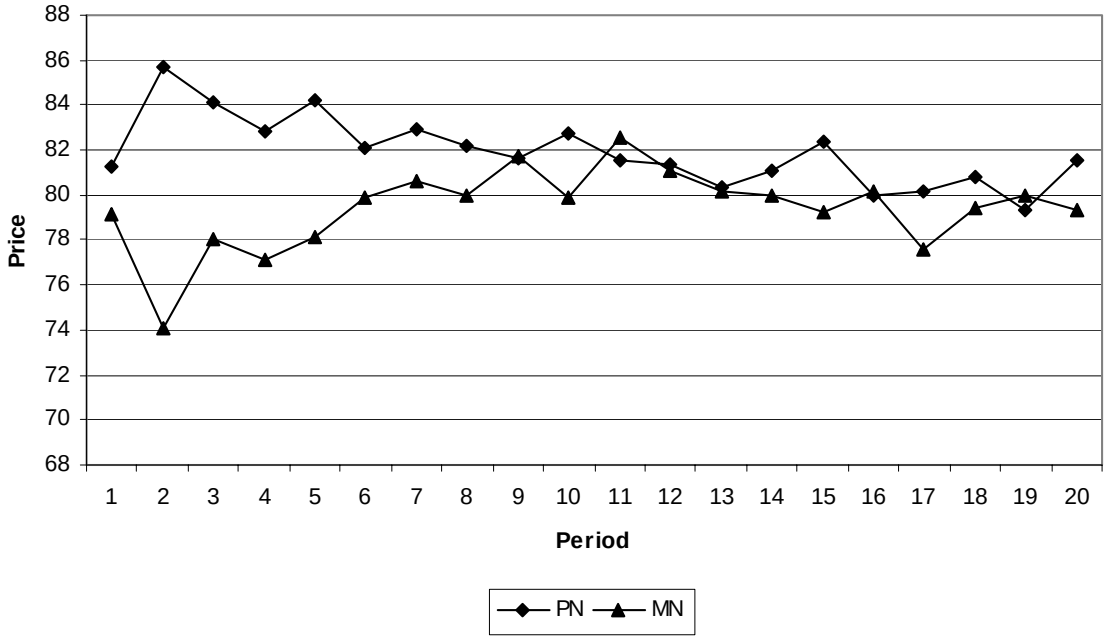

Figure 4. Trades, Private Negotiation No Market Report (PN), Market Price (AP) and Market News (MN).

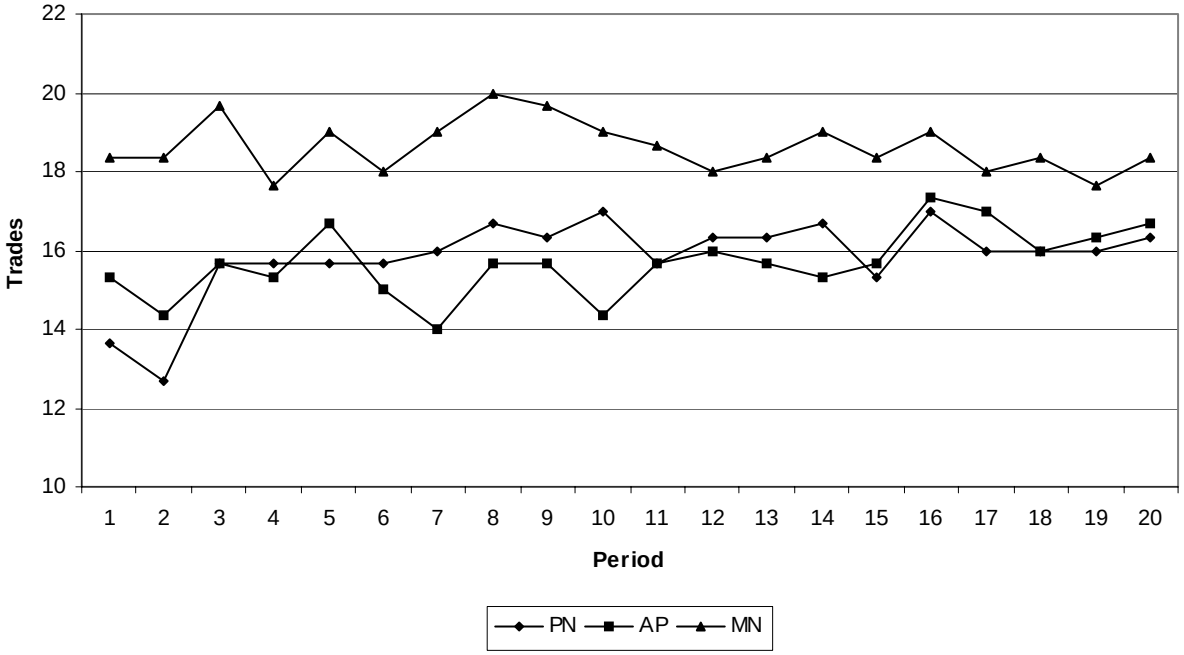

Figure 5. Average Price News Report (Ave. Price) and Trade Prices in the Private Negotiation
Average Price Reported Treatment

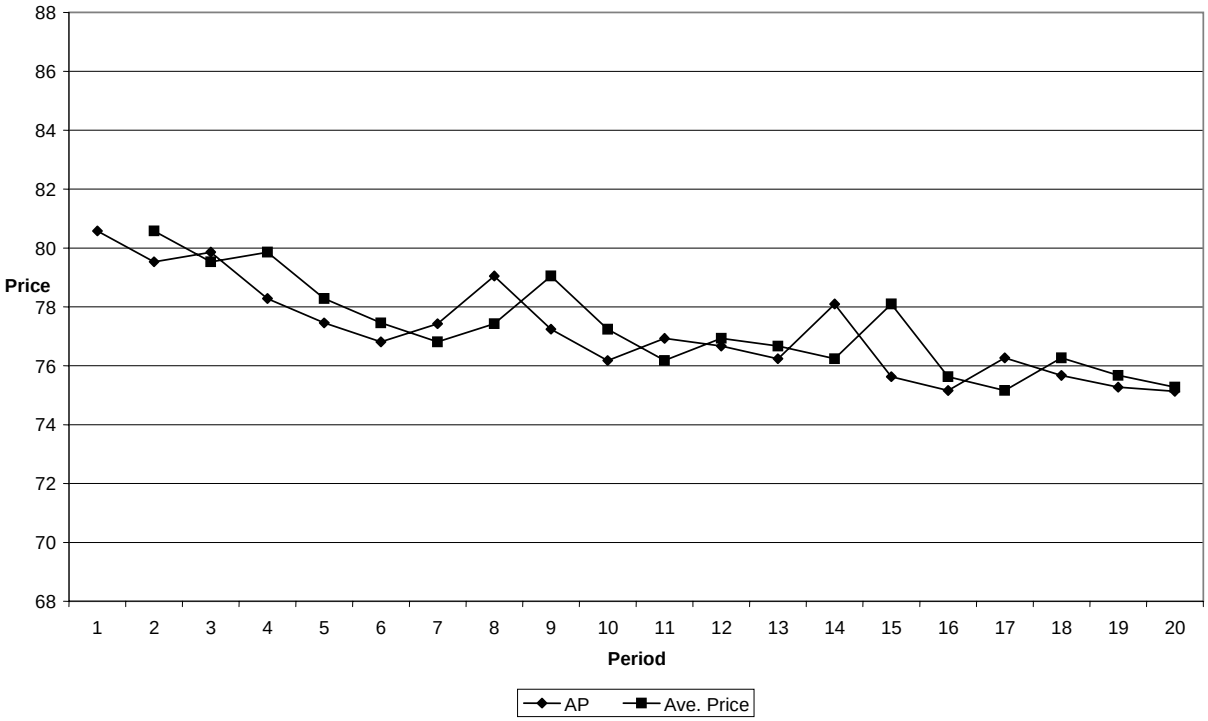

Figure 6. Market News Price Reported (News Report) and Trade Prices (MN) in the Private Negotiation Market News Treatment

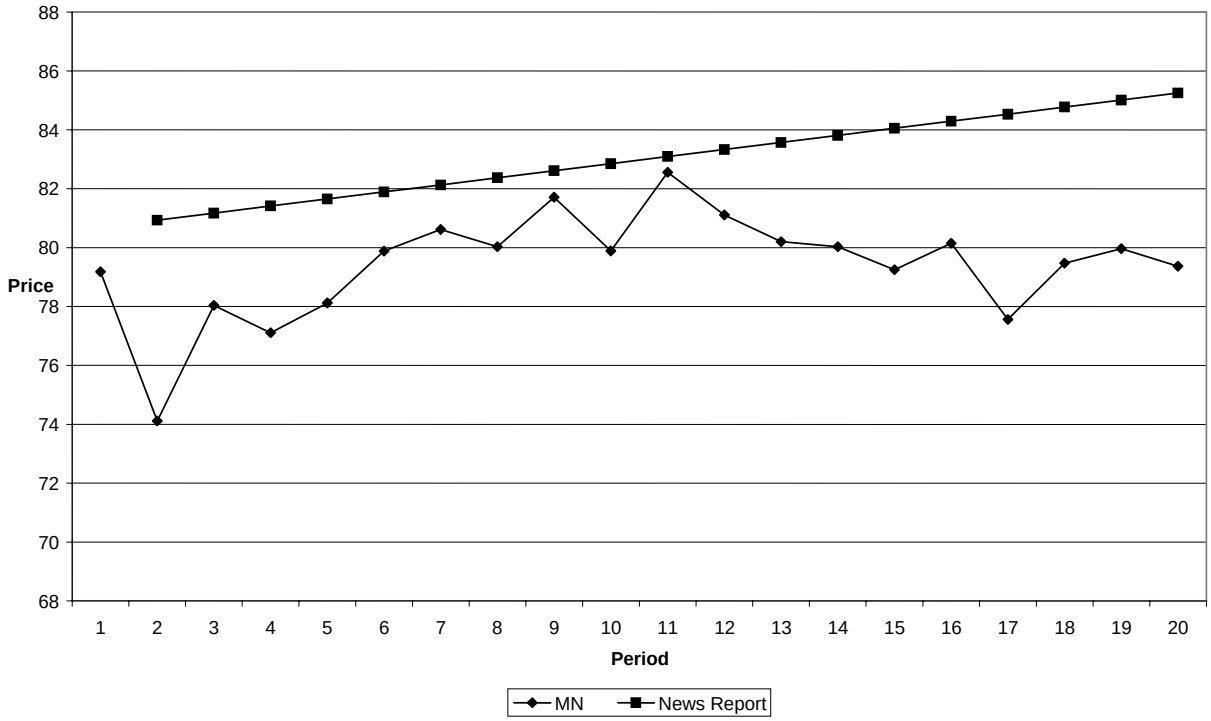

Figure 7. Buyer Earnings, Private Negotiation No Market Report (PN), Market Price (AP) and Market News (MN).

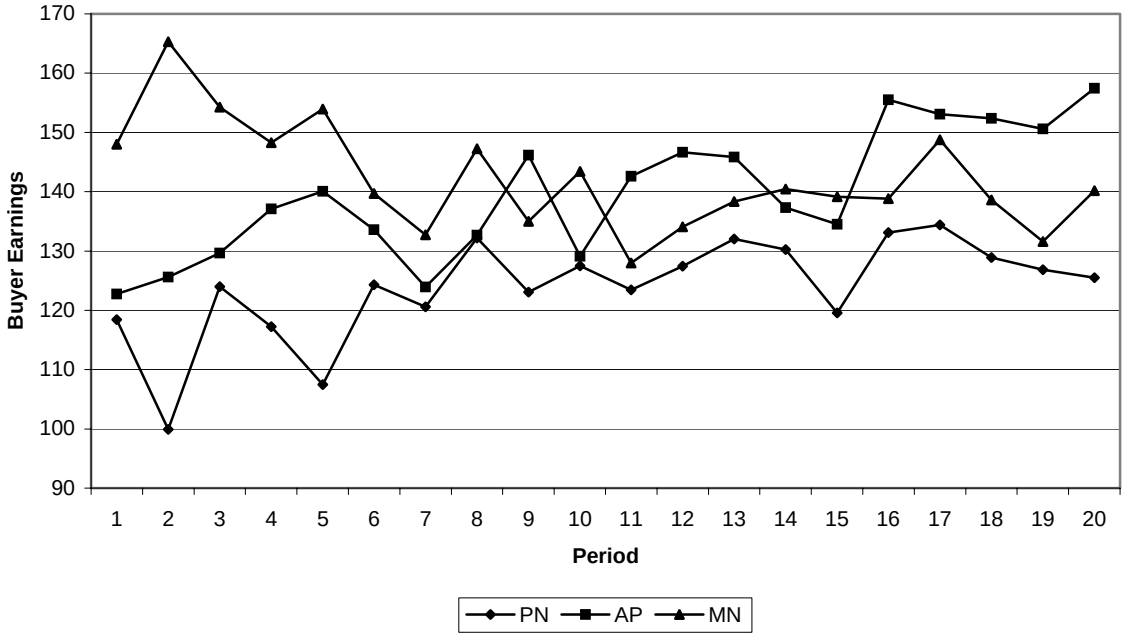

Figure 8. Seller Earnings, Private Negotiation No Market Report (PN), Market Price (AP) and Market News (MN).