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IMPLICATIONS OF ELECTRONIC TRADING
FOR AGRICULTURAL PRICES

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FOR AGRICULTURAL PRICES

ABSTRACT

Electronic trading is expected to result in net prices which are more favorable to producer sellers and/or buyers of agricultural products than those generated in traditional trading systems. Lower transaction costs and reduction of market power imbalances account for the difference in net prices. Review of the evidence from actual electronic trading supports these hypotheses. The importance of balanced information availability and effective loss of power by one side of the market due to electronic trading suggests that the move to greater use of such systems must come from agricultural producers.

IMPLICATIONS OF ELECTRONIC TRADING FOR AGRICULTURAL PRICES

A trading innovation, if it has any effect at all, can be expected to affect prices of the commodity involved. One cannot imagine a change affecting the behavior of economic units which would not affect price in a market which is competitive to any substantial degree. Certainly, price is a central consideration in the evaluation of an institutional change. One might gauge success of an institutional change to a substantial degree based on its impact on price.

In the following sections, I present hypotheses regarding the impact of electronic trading on prices, review the empirical evidence from electronic trading systems which have been implemented, and attempt to draw some implications for the future of electronic trading. We must face the fact that electronic trading has not been as widely accepted as some of us expected 15 years ago.

EFFECTS EXPECTED

The general hypotheses can be stated very simply. Electronic trading, where appropriate, is expected to result in prices more favorable to farmers and in prices which more accurately reflect a true temporal and spatial equilibrium price than is the case for traditional trading/pricing mechanisms. Other papers in this series of papers identify conditions which are "appropriate".

Price Level

Price levels resulting from electronic trading are expected to favor the farmer. It is perhaps more correct to say that electronic

trading is expected to result in higher net prices to sellers and/or lower prices to buyers unless a monopolistic or monopsonistic market structure is moved in the competitive direction by the institution of electronic trading. In that case, net prices may move to favor the formerly disadvantaged.

Electronic trading can result in net prices more favorable to both buyers and sellers simultaneously. Physical costs of transfer from buyers to sellers are expected to be lower than those in traditional central markets. The access to more trading alternatives is expected to result in more nearly optimal spatial and temporal allocation (thus lower costs) than alternative systems. Search costs are expected to be lower, thus traders would be more certain that they have obtained the best available match. Reduced uncertainty and lower costs flowing from more nearly perfect information provide the possibility for realized transaction prices to be more favorable to both buyer and seller. The share of reduced costs reflected to each in a competitive market depends on the relative responsiveness of quantity demanded and supplied to price. Shares may be quite different in the long and short runs.

If the market structure is changed by the initiation of electronic trading, it would most likely be shifted in the direction of effective competition. The number of potential traders exposed to a given bid or offer is usually increased and the cost of information is usually reduced sufficiently that more information is effectively available to the smaller trader. Thus, prices may well shift in favor of the less concentrated side of the market even without any reduction in transaction cost other than the cost of search. Farmers, usually on the less concentrated side, are expected to gain from this change. The

extent of such gain in price which would persist in the long run depends upon the market participants' response to price. One can imagine the case in which a cost increasing electronic trading system imposed on monopsonistic buyers replacing an cost-efficient direct buying system might still produce gains for the sellers through reduction of buyers' market power.

Pricing Accuracy

The prices resulting from a system of electronic trading are expected to reflect more accurately the equilibrium price level as well as spatial and temporal differences than the systems it is likely to replace. That is, the ideal system should result in a state in which, if all bids and offers were known to all potential traders, none would elect further exchange. This is a quite different criteria than the assumption that any set of prices which clears the market is an equilibrium in the sense of the equilibrium concept of economics. The actions of a set of economic agents, content in a state of incomplete information, may appear to clear a market when more complete information would result in further exchange and a different set of prices. This does not imply that the original state of information was irrational given the cost of added information for the individual.

Argument for enhanced pricing accuracy through electronic trading is based largely on the prospect that the quality of information available to traders is enhanced and that the distribution of information is more uniform among traders. The power of the larger traders is reduced as the cost of information is reduced. If each market participant is aware of more transaction alternatives, can act on

information quickly and the scope for exercise of market power is more limited, one would expect resulting transaction prices to more nearly reflect the competitive equilibrium level of price and differentials among prices. Changed conditions in the market are also expected to be translated into price change more quickly.

The notion of pricing accuracy, while reasonably clear as a concept, is not easy to measure. One would like to measure deviations from an equilibrium price set which cannot be observed. The alternative is to take measurements which are related to the concepts of interest. Even then one must either compare simultaneously operating systems which most likely affect each other or make before and after comparisons where control of other factors affecting price is not possible.

When there are alternative estimates of a market clearing price, one would expect the more sensitive indicator to lead, in time, the less sensitive one. Thus the prices generated by electronic trading would be expected to lead price quotes or estimates based on other less sensitive indicators. This assumes that even the less accurate pricing mechanism or quotes based on a less sensitive indicator will eventually reflect reality.

It seems likely that information affecting trader behavior will be changing continuously and further that the likelihood of news having a positive or negative impact on price is equally likely. If these hypotheses are valid, one would expect prices to be in a continual process of change with small changes occurring frequently. One would also expect price increments and decrements to be of more or less similar size.

We must recognize that the discussion of price as if it were a single number, in many cases, is absurd. There is no counterpart for the concept of the price in actual dynamic markets in space, time, and form. At best, we must deal with an index representing a constellation of prices. That is, unless one uses individual transaction prices, the price is an average of prices in a defined area, time, or quality range. The way the index is computed may well affect the result of an analysis.

OBSERVED EFFECTS

Experience gained in the operation of the electronic trading systems described in the preceding paper has provided an opportunity to test some of the hypotheses about the impact of electronic trading on prices. The tests are limited. In most cases, the share of trading captured by electronic trading has been small. Only limited analyses have been completed on Telcot, where the share of market and time of operation are more satisfactory for analysis. Some things have been learned in spite of these problems.

Egg Clearinghouse, Inc.

Egg Clearinghouse, Inc. (ECI) has been in operation since 1972. The computer arrived later but the trading format was consistent with the definition of an electronic market even when trade matching was manual. Pricing and pricing accuracy were major goals of its founders, the National Egg Pricing System Study Committee (Rogers and Voss, p. 256). Trading rules were structured with price discovery a major consideration. ECI also sponsored an independent committee to produce price quotes twice weekly based primarily on trades, bids and offers on

ECI. A record of consistently derived prices for the several classes of nest run eggs is available. Formula pricing based on a private market quote (Urner Barry's Price-Current) is the general rule for routine transactions at all levels in the egg marketing channel for the U.S. east of the Rocky Mountains. The Urner Barry report was considered to represent traditional pricing although the details of trading on ECI have been available to Urner Barry since the early days of the clearinghouse.

There being no quotation or reporting of trading comparable to the nest run pack which dominates trading on ECI, price level comparison is all but impossible. The private quote has not maintained a consistent relationship to transaction prices at any level of the commodity system, a fact which further complicates price level comparison.

An analysis of a sample of trades on ECI by nine firms during January through August of 1980 indicated that prices on ECI tended to be higher than those for similar purchases and sales by other means for the same firms (Schrader and Larzelere). The data were limited and the study should be regarded as little more than weak evidence of higher prices from electronic trading. A common buyer complaint that ECI prices are "too high to make a profit on grading and packing" also suggests that trades by other means are made at lower prices. The fact that ECI is regarded as a price discovery mechanism has probably caused the producer-seller to sell lower in private to avoid registering a lower trade on the public market.

Prices based on ECI activity have shown a clear tendency to change more often and by smaller increments than the Urner Barry quotes. During the 1974-78 period, the average change on days when prices did

change was 0.14 cents per dozen smaller on ECI than for the Urner Barry quote. Price decreases averaged larger than increases for both series but the imbalance was greater for the Urner Barry quotes. Analysis of the 1979 - 82 Tuesday and Thursday quotes indicates that ECI price changes remain more frequent and balanced.

An analysis of 1977 through 1978 prices by Bessler and Schrader indicated that changes in ECI nest run prices tended to lead changes in the Urner Barry quote one, two and three quote periods into the future. The Bessler-Schrader analysis was repeated using 1979-1981 data. The new analysis indicated a shift to Urner Barry leading ECI prices. Further analyses of 1975-78 and 1979-82 data have been completed using vector autoregression and including both East and Midwest ECI based quotes. This analysis, which takes into account contemporaneous correlation, does not provide a definitive answer. The leading role of ECI based prices has apparently diminished since 1978. Several factors may account for the change. Urner Barry began changing their quotes any day that change was indicated by conditions rather than twice weekly in the earlier period. The private report may have made greater use of ECI information in the later period. It is also possible that lower trading with more emphasis on influencing price has reduced the accuracy of prices generated on the Clearinghouse.

HAMS

The HAMS experiment was structured to provide a rather complete analysis of its price impact on the market for live slaughter hogs. Prior to and after the experiment most hogs marketed through the cooperative Producers' Livestock Association, were bought by Eastern

Order Buyers (a subsidiary) and resold to packers. Thus, both before and after HAMS, Eastern Order Buyers established the market for Ohio hogs. The area served by HAMS was sufficiently limited that prices generated by HAMS could be compared to prices in other areas to evaluate its impact on price level (Rhodus et al.). Ohio price levels were analyzed as differences from the Indiana direct and Peoria market quotes. These comparisons indicated that average daily prices for hogs sold on HAMS were \$.94 to \$.99 per hundred pounds higher relative to the other markets than were Ohio prices before and after the experiment. The price impact was noted almost immediately when the trading system was changed.

The frequency and size of price changes indicated by HAMS trading were also compared to Indiana and Peoria prices and to the Ohio prices before the experiment (Rhodus et al.). HAMS prices did change more frequently (98.6 percent of the days vs. 88 and 85 for the other quotes) and by smaller amounts (\$.51 vs. \$.66 and \$.55 per hundred pounds). The average price change on HAMS was also smaller than the average change in the cooperative price quote before and after HAMS. Rhodus also regressed the daily quote on the previous day's average price and other variables representing market conditions on that day for HAMS and the two comparable markets. The partial correlations of the current day's price and the prior day's price was significantly lower for HAMS than for the comparable markets during the same period. HAMS prices were apparently more sensitive to current conditions than were prices in comparable markets.

Russell studied the pricing impact of lamb trading in the NEMA system. His models of the difference between lamb prices in Virginia and regional prices and between Virginia and national price levels indicated a highly significant increase in the Virginia price relative to the national and regional prices after initiation of electronic trading. This is particularly interesting in view of Holder's earlier work which indicated that the use of the telephone auction (replaced by NEMA) had already had a positive impact on lamb prices in the area. The positive impact extended to prices in regular livestock markets in the area served by the electronic system.

Russell also found that changes in prices in regular auction lamb sales tended to lag changes in the electronic auction by one week. This relationship, established early after initiation of electronic trading, had diminished by 1983 (Purcell).

CATTLEX

Specific lot prices for sales of feeder cattle on the CATTLEX system were compared to reported average prices paid in regular auctions (Mahoney). Comparison of prices of lots traded on the electronic market, matched with a nearby auction price for the same date, sex, and weight category, revealed significantly higher prices on the electronic market. A covariance analysis including location, time, sex, grade, quantity, and weight produced similar results with an indicated \$2.23 per hundred pound higher price in the electronic market.

Mahoney's analysis of price variation indicated no significant difference in variance of prices in auction markets and CATTLEX prices. Prices from individual trades on the electronic market and session

averages for the auctions were used in this test. One would expect the mean of several sales to vary less than the individual sale prices. Thus, the individual trade price on auctions is likely to have been more variable than the CATTLEX prices.

Other Experience

Helmreich, Epperson, and Huang compared prices of feeder cattle in Georgia teleauctions and regular auctions. While I disagree with their interpretation of their analysis, it did indicate significantly higher prices in the teleauctions even when quality attributes of the teleauction lots were considered.

Ethridge and Mathews used Telcot prices as the standard for evaluation of the Daily Spot Cotton Quotation published by Agricultural Marketing Service. This indicates the degree of acceptance as an accurate price indicator achieved by Telcot. Their analyses did not indicate a difference in price level between the industry committee quote but they did note the appearance that the committee quote tended to lag price change registered on Telcot.

IMPLICATIONS

The individual studies of price level and accuracy in electronic trading are weak. They lack the controls and correspondence of measured variables to economic concepts which we would like. The cumulative effect, however, provides substantial support for the a priori hypotheses. The studies produced no clearly contrary evidence.

The evidence for increased price levels must be interpreted with caution. Sellers may have demanded more when selling on electronic

systems. Both CATTLEX and ECI showed some tendency in that direction. Traders may prefer to take their low prices in private. There may have been some novelty effect included in the early stages. Even so, the rather consistently observed increase in price level across commodities lends credibility.

The difference in price level may have been the result of reduced transaction costs, a shift in market power, or both. Our analyses cannot discriminate. Both concepts are closely tied to the availability and quality of information.

The evidence supports the hypotheses related to enhanced pricing efficiency in electronic markets. They are nervous and continually groping for price. Economists will find it easy to believe that the search leads in the direction of equilibrium. There was some evidence of a price leader role for electronic trading. It is interesting to note that, in two cases for which this tendency was identified, it appeared to have diminished with time. This may indicate only that as others learn that the electronic market is more accurate the lag simply becomes too short to identify.

If one accepts these conclusions, the obvious question is "If these markets are so effective, why is there so little support?". There are several reasons. Only Telcot has operated at a volume necessary to achieve low unit costs. Existing systems do not give way to new ones just because eventually the new will be more efficient. The salvage value of an institution may be quite low. Thus the cost for the innovator is high at the start. New also means uncertainty, at least to some degree.

If the use of electronic trading does result in a shift in market power from the concentrated side to the less concentrated side of a market, the concentrated side is not likely to be an enthusiastic supporter of the change. Thus the initiative for change probably must come from the powerless side--the farmer. In the case of Telcot, a farmer cooperative initiated the change. ECI was started primarily because of producer dissatisfaction with pricing.

But many producers do not believe that they have a problem. Most feel they are selling at better than average prices regularly. A recent survey of wheat farmers (Norton) revealed that only about 5 percent of the farmers believed they received lower net returns for wheat marketed compared to other producers in their area. If this attitude is common, farmers may not be ready to change their marketing methods.

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