

Prices
C

The Economic Feasibility and Impacts of Electronic Markets:
A Tentative Appraisal^{1/}

By

Dennis R. Henderson
Lee F. Schrader
Thomas L. Sporleder
E. Dean Baldwin^{2/}

UNIVERSITY OF CALIFORNIA
DAVIS

AUG 20 1979

Agricultural Economics Library

Prices 1979

One obvious solution to pricing problems stemming from thinly traded markets is market "thickening." That is, many pricing problems can be mitigated by increasing the amount of trading in an organized market to the point where the volume of trading is adequate to generate prices which reflect marketwide supply and demand conditions with an acceptable degree of accuracy.

Market Thickening by Electronic Exchange

One innovative institution which has been put forth as a means of market thickening is the computerized trading floor, or the so-called electronic market. This is a marketing system in which the negotiation of prices, and perhaps other terms of exchange among a large number of buyers and sellers is centralized in a single, computerized trading operation.^{3/} The physical flow of product from sellers to buyers occurs in a direct or nearly direct manner subsequent to successful sales negotiations.

^{1/} Prepared for the symposium entitled "Commodity Marketing Systems: Issues and Alternatives," Joint Annual Meeting, American Agricultural Economics Association and Western Agricultural Economics Association, Pullman, Washington, July 29-Aug. 1, 1979.

^{2/} Dennis R. Henderson and E. Dean Baldwin are Associate Professors, Agricultural Economics, The Ohio State University. Lee F. Schrader is Professor, Agricultural Economics, Purdue University. Thomas L. Sporleder is Professor, Agricultural Economics, Texas A&M University. The authors are members of the Electronic Markets Task Force, North Central Regional Research Committee number NC-117.

^{3/} It is important to distinguish between electronic markets and computerized information systems. The latter use computer technology and often remote

Buyers and sellers do not physically stand on the centralized trading floor; rather, trading is conducted by a central computer and traders participate through various means of long distance communications such as telephones, teletype terminals, computer terminals or other remote access, high speed electronic media. The computer acts as communication manager and performs numerous marketing functions such as matching bids and offers, auctioneering, recording and confirming transactions, invoicing, managing traffic, enforcing trading rules, and compiling and disseminating price reports and other market information. Products are sold by description rather than by personal inspection and third-persons are normally used to certify the accuracy of such descriptions.

Electronic markets are organized exchange mechanisms, rather than computerized compilations of assorted and diverse private transactions. The essence of an organized market is centralized price discovery. Centralized assembly of products in one physical location is not necessary, nor necessarily desirable if the products can be accurately described in terms meaningful to the market participants. The characteristics necessary for organized trading are: 1) trading is conducted according to some predetermined set of rules; 2) all potential traders have equal and ready access to the market and the information generated from it, including prices and volumes traded, and 3) all potential buyers and sellers have freedom to act on the information available (Sporleder et al., p. 13). A successful organized exchange requires a sufficient number of potential traders to make for a competitive market.

electronic communications to compile and disseminate information on sales offerings, purchase requirements and/or prices and other terms of trade subsequent to actual transactions. They do not include a mechanism for actual sales negotiations. Electronic markets, on the other hand, include sales negotiation as an integral part of the computerized system. That is, the computer actually monitors, facilitates, and records sales negotiations among buyers and sellers. As such, price establishment occurs within the electronic marketing process rather than in private negotiations as an adjunct to a computerized market information system.

One might envisualize an electronic market as similar to a trading pit on a major commodity exchange. Numerous buyers and sellers meet as a large group and sort out deals from among the offers and bids of other participants in a process that is competitive, visible, and governed by impersonal rules. The major difference is, in the electronic market buyers and sellers are not physically present at a single location; rather, they enter the market and engage negotiations through long distance communications while a computer manages the interface. For a comprehensive description of electronic markets, see Henderson, Schrader and Turner.

Theoretical Performance of Electronic Markets

Conceptually, the economics benefits of electronic marketing follow mainly from its characterization as a remotely-accessed, organized exchange. Because of its remote-access feature, traders do not have to physically travel to one central location to meet with other participants in the market. Because product shipment is arranged after transactions have been successfully negotiated, direct or nearly direct product movement from seller to buyer is possible. As a result, the operational efficiencies which are normally realized with directly negotiated private sales, in comparison to central assembly markets, can be achieved.

At the same time, the ability is created to generate the magnitude of pricing efficiency previously associated only with large-volume central assembly markets. Sellers offer their products to many buyers rather than one or a select few, as is characteristic of private transactions, and buyers have access to the supply of many sellers. Thus, participation in both sides of the market is much expanded compared to private trading. Furthermore, because price negotiations occur in an organized, centralized and competitive arena, the ability of a dominant trader to unduely influence price is

appreciably reduced compared to the typical one-on-one nature of private treaty. As a result, it is reasonable to expect that prices which are established within an electronic trading mechanism are more accurate reflections of market-wide supply and demand conditions and thus more efficient in their role of allocating resources and products among alternative uses.

Because a large number of transactions are negotiated at one point (the central computer) and because the computer tracks and records the results of all negotiations, comprehensive and continuously updated market and price information become an integral feature of electronic markets. Conceptually, this potential to expand the quantity, quality, accuracy and timeliness of market information and to equalize its availability among a large number of potential market participants creates a "public good" aspect to computerized marketing roughly comparable to publicly supported market reporting services.

Electronic communications makes possible an additional source of potential operational efficiencies. When computer terminals are used for communications among traders (rather than telephones or other forms of voice communication) electronic data rather than audible data are transmitted. Each bit of electronic data can be transmitted on a single electronic cycle, whereas 3,000 cycles or more are required for voice communications. As a result, a substantially larger volume of electronic data can be transmitted in the same communications space that is required for a lesser amount of voice communication. Therefore, data can be transmitted much more rapidly electronically than audibly, significantly reducing the communication time required for sales negotiation.

Industry structure may be impacted by electronic marketing as well as operational and pricing efficiency. Because the electronic market is

accessible through remote communication media, and because numerous trade possibilities can be found at one place (the centralized computer trading floor), the ability of smaller and more remotely located traders to participate in the market is enhanced. This should moderate the magnitude of risk associated with potential market foreclosure, reducing the exit rate of small and/or geographically remote producers and mitigating the need for both producers and handlers to engage long term contractual or other integrative arrangements.

To summarize, based upon theoretical reasoning the establishment and widespread use of electronic markets for agricultural products would be expected to result in: 1) improved pricing efficiency; 2) greater operational efficiency; and 3) a reduced rate of economic concentration and integration. The first is most directly relevant to the topic of concern in this symposium, that is pricing systems; however, the others are also important economic impacts which deserve consideration in any appraisal of this marketing innovation.

Experience With Electronic Marketing

Empirical validation of the performance expectations for electronic markets in agriculture requires observations of the results from actual computerized trading. To date, however, only a few such markets have been commercialized. Currently, there are a number of efforts underway to develop additional electronic markets for agricultural products. Most of these are experimental, designed to further test the feasibility of this institutional innovation.

The computerized markets that exist and that are being developed vary considerably in design and operation. There is, at this point, no standard design which has proved itself most effective. However, all systems combine the technical capacities of remote communication with some form of electronic computing for purposes of common price negotiation among large numbers of remotely located sellers and buyers.

The earliest commercialized electronic-type market is a teletype auction, developed by the Ontario Pork Producers Marketing Board for selling slaughter hogs produced in that province. It has been used continuously since its introduction in 1961 (Peer). The Board has a provincial monopoly for marketing hogs and has elected to sell essentially all 2.5 million to 3 million hogs produced in Ontario annually through its electronic auction. A similar hog marketing system has been in operation in Alberta since 1969 (Hawkins et al.), and another operated in Manitoba from 1965 to 1977 (Lowe, 1968B) but ceased operation when declining hog marketings became insufficient to support a competitive marketing system.

The most technically advanced system currently in operation is TELCOT, a computer terminal marketing network for upland cotton operated by Plains Cotton Cooperative Association at Lubbock, Texas. In operation since 1975, this system directly connects cotton producers, through more than 165 local gins, to about 45 cotton merchants and other buyers over a network of TV-like cathode ray tube computer terminals (Highley). All transactional activities, including invoicing, payments, inventory control and market information in addition to price negotiations, are facilitated by the central TELCOT computer. In 1977-78 this system marketed about 844,000 bales of cotton, roughly 20 percent of total Texas production (not forward contracted). It serves buyers throughout Texas and the Southeast cotton marketing areas and has recently been expanded to a capacity of more than 4 million bales per year.

Other operating systems include the computerization of a relatively small volume trading floor for nest run eggs operated by the Egg Clearinghouse, Inc. of Durham, New Hampshire (Cox), a similar system operated as the Central Egg Agency in the United Kingdom (Schwartz), and a computerized exchange system, called Woolnet, that has recently been developed in Australia for the

international marketing of wool (Computer Sciences of Australia).^{4/}

In addition to these computerized markets are numerous teleauctions for various agricultural products. A large number of feeder pigs and market lambs are sold by teleauction in the U.S. along with relatively small quantities of feeder cattle, slaughter cattle and butcher hogs (Henderson). The teleauction is a manual selling procedure, utilizing conference telephone arrangements to interconnect several buyers at remote locations for bidding on consigned sales which are sold by description. Teleauctions offer some competition enhancing capability; however, trading is relatively slow and selling capacity is considerably smaller than for computer-managed systems. Thus, their potential economic impacts are not directly comparable. Some teleauctions, nonetheless, have clear potential to evolve into computerized systems as trading volume expands, and this evolutionary process provides additional insight into the feasibility of electronic marketing (See Holder, 1977, for example).

To encourage further evaluation of the economic feasibility and performance of electronic markets in agricultural industries, the U.S. Department of Agriculture's Agricultural Marketing Service (AMS) initiated a program to support, with partial funding, the development and pilot operation of a limited number of experimental projects (Schlei). Four electronic marketing projects have been initiated in response. These include: 1) an expansion of the nationwide electronic market operated by Egg Clearinghouse, Inc. (ECI) for nest run eggs by developing a computer terminal communication network whereby egg traders have direct communications with other market participants through the central market computer (Egg Clearinghouse, Inc.); 2) the development and operation of a computerized trading network for the daily marketing of slaughter hogs in Ohio and surrounding areas (Baldwin); 3) the design and development

^{4/} In addition to the described systems for agricultural products, several somewhat similar systems have been developed for marketing financial securities. Most notable are computerized trading networks for corporate stocks operated by the Cincinnati and Toronto stock exchanges.

of an electronic marketing system for feeder cattle in Texas (Sporleder and Davis); and 4) expansion of the teleauction method of selling cull cows in Virginia with a feasibility analysis for conversion to a large-volume computer-assisted system (Virginia Department of Agriculture and Commerce).

Empirical Evidence

The operating and developing systems provide the basis for our research into the performance implications of electronic marketing in agriculture. At this point, the appraisal is tentative as it is based largely upon analysis of the results reported by others who have examined various aspects of existing systems, plus observations, considerations and experiences to date in the process of developing and deploying the experimental AMS-related projects.

There currently exists no body of generalizable evidence as to the performance implications of electronic marketing for agriculture, as no comprehensive evaluation has been completed nor have the various marketing systems been evaluated vis a vis one another. The Electronic Markets Task Force of the North Central Regional Research Committee NC-117 has as one of its objectives, to complete such a comprehensive evaluation and, to the extent possible, draw generalizable conclusions. While satisfactory progress toward that objective is being made, complete evaluation awaits full implementation of actual trading in the four experimental projects. These will not be completed for another 12 to 18 months. Thus, at this time the report is limited to tentative conclusions based upon developmental considerations, partial evidence, and preliminary analyses.

Pricing Efficiency

As would be expected, the Canadian teletype hog markets have been the subject of much of the research reported to date which evaluates empirical results of electronic trading. The major impetus for developing these markets

stemmed from concern over lack of effective buyer competition and the related impacts in terms of incomplete arbitrage and pricing inefficiencies. Thus, much of the reported research has concentrated on pricing impacts.

In a time series analysis, Wen-Fong Lu found statistically significant increases in average price levels for hogs in both Ontario and Manitoba which correlated with the introduction of electronic marketing. He interpreted these results as indicative of increased buyer competition. Generally, consistent findings were reported by Lowe (1968A). Lu also found a statistically significant decrease in the difference between average transportation costs and average provincial prices associated with the introduction of electronic teletype selling. These findings support the hypothesis that, electronic marketing enhances geographic arbitrage and thus improves pricing efficiency.

While the relationship between arbitrage and pricing efficiency is direct and straightforward, there is a less clear interpretation of the relationship between pricing efficiency and short term price variability. Chang-Mei Lu, in a study of price variability in the Manitoba hog industry, found both intraday and interday price variability to be greater in electronic markets than in private treaties. Lu interpreted this finding as indicative of increased pricing efficiency in the electronic system.

While little definitive theoretical work has been reported on the specification of the relationship between short term price variability and pricing efficiency, it is intuitively appealing to except Lu's conclusion. The logic can best be illustrated with a comparison of the price-contracting process in a private treaty with that in an open, organized market. In most private negotiations between farmers and others in the marketing channel, there is a considerable disparity in the amount and quality of market information possessed by each party. Typically, an individual buyer purchases larger volume and is in the market more frequently than is an individual farmer-seller. Buyers