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ORGANIZATION OF AGRICULTURAL INDUSTRIES: DISCUSSION

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While the two papers presented pertain to greatly different aspects of the economic organization of agricultural industries, both are relevant to this topic. The papers are discussed in the order presented.

The central theme of Professor Johnston's paper is that models used for explaining growth of individual firms are not adequate for understanding relationships between growth of individual firms and changes in structure of industries. Since I am in basic agreement with most of Johnston's presentation, the following comments merely serve to summarize and reinforce his discussion.

Growth of individual firms can be treated as a process of capital accumulation and measured in terms of output which the firm produces. Johnston is concerned with the relationship between the distribution of an industry's output among its member firms, which is related to growth of individual firms, and various industry structure variables. The structure variables. The structural variable of interest in the paper presented is the extent of vertical integration in agricultural industries.

While hypotheses concerning the relationships between some exogenous change -- say the imposition of a new tax -- and the growth of an individual firm are readily available, testable hypotheses concerning the relationship between an exogenous change and structure of an industry are in much shorter supply. Growth models, which concentrate on changes in output by individual firms, fail to recognize changes in functions performed internally by such firms which are associated with changes in output. These changes in functions performed internally are directly related to the extent of vertical integration in an industry.

Johnston suggests that, in order to formulate testable hypotheses about the effects of various exogenous changes and public policies on the organization of agricultural firms and the structure of agricultural industries, it is necessary to view the firm both in terms of the output which it produces and the functions internally performed by the firm. The effect of a given exogenous change on the output of a firm may yield quite different results than the effect on the number of functions performed internally by the firm.

As functions are split off as the firm grows, transaction costs are incurred for dealing with firms performing the functions. Such costs are due to using the price mechanism for transactions formerly handled internally.

To understand the differing effects of an exogenous change on growth of output and functions performed internally by a firm, consideration must be given to relationships between costs of growth in output and transaction costs. One of the tentative conclusions drawn by Johnston is that, as transaction costs are increased, rate of growth of a firm's output will be decreased and number of functions performed internally by the firm will be increased, thereby encouraging vertical integration.

The distinction elucidated by Johnston between viewing the firm in terms of output produced and viewing it in terms of <u>both</u> output produced and functions performed seems potentially useful for further use in industry structure analysis. By making use of the distinction, researchers can begin to extrapolate existing growth models to test hypotheses concerning the impacts of various exogenous changes on industry structure. It would have been helpful if Johnston had been able to present empirical results to substantiate some of the ideas which he presented.

Given the criticisms of research in industry and market structure as (1) too descriptive, (2) too much of a "numbers game" in which number of firms and percentage of total industry output supplied by the largest 4, 8, or 20 firms are central elements, and (3) having a lack of theoretical underpinning, Johnston's presentation is extremely welcome and will perhaps be a start toward allaying some of the criticism. There exists, of course, a continued need for further analysis to more closely relate changes in structural variables other than vertical coordination to existing economic theory.

Armbruster's paper reports results from a simulation model used to estimate the effects of a farmer bargaining board in the western late potato industry. Simulation models

have drawn increasing attention from economists in recent years as an analytical tool for modeling of relationships that comprise some economic system. Various changes in parameters can be imposed, and results of these changes on the system observed. Since the U.S. Congress will soon be debating legislation concerning the use of farmer bargaining boards, Armbruster's presentation is extremely timely.

In discussing Armbruster's paper, attention might be focused on three different aspects: (1) potential for bargaining boards in agricultural industries, (2) problems and procedures in the use of simulation techniques, and (3) use of simulation techniques as a policy tool. As presented, the paper is primarily concerned with problems and procedures in use of simulation techniques. Since the primary purpose of this study is to provide information for public policy formulation, I would have preferred to see much more attention given to the economic considerations surrounding use of bargaining boards in agricultural industries. With this background, the specific simulation model could have been presented to illustrate one approach to appraising the operation and effectiveness of bargaining boards.

The various goals which a bargaining board might pursue is one illustration in which an expanded discussion of economic considerations is needed. This is a fundamental question for consideration and not unique to the simulation approach used by the author. Several alternative goals are presented, but no consideration is given to the implications of trying to achieve each goal. For instance, one goal of a bargaining board for western late potatoes which is considered to be a plausible alternative is annual increases in price or income received. If such a goal were pursued, what would be the long-run implications for the industry? Which goal or goals seem most reasonable for a bargaining board to seek? Finally, how is "success" of a bargaining board to be assessed -- in the short run or in the long run? The author does briefly consider some of these topics in the concluding section of his paper, but more attention to such issues is still needed.

Since any simulation model requires quantification of supply, demand, and other relationships involving production, processing, and marketing decisions, a host of difficulties is faced by the researcher in formulating these relationships. As anyone who has set out to empirically derive a demand function or estimate supply response knows, the problems involved are great. To the extent that relationships among variables in the system being studied can be properly specified and estimated, simulation models seem to offer considerable potential for policy-oriented research.

If authorized by Congress, farmer bargaining boards are expected to significantly influence the organization of agricultural industries. Economic research is needed to guide public policy on this issue. To be most effective for use in policy formulation, economic research must satisfy several conditions. First, it must be addressed to relevant questions which are confronted by policy-makers. Second, assumptions made to facilitate analysis must be realistic in terms of actual conditions. Third, results obtained and implications drawn must be effectively communicated to policy-makers. Failure to accomplish the latter task probably means the research will have little impact on policy. Economics represents only one aspect of policy consideration, and unless the economic considerations are advanced effectively, other considerations will take on more importance in the final policy decision. Much of our research has probably fallen short in one or more of the three areas mentioned, but perhaps we are most guilty of failing to advance our contributions in competition with other considerations for policy formulation.

Armbruster's study is addressed to a relevant policy question, and while little technical detail is provided, the procedures used seem sound. It remains to be seen how effective the study will be for policy use.

ORGANIZATION OF AGRICULTURAL INDUSTRIES: DISCUSSION

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The main theme of Professor Johnston's paper is that present models, both theoretically and quantitatively, are not adequately developed for studying the growth of the "real world" firm, and a more realistic model that considers all factors, both internal and external, is needed for accurate analysis of the firm's growth over time. However, the author does not specify the theoretical and quantitative formulation of such a model. The author also claims lack of empirical works on economies of size that simultaneously consider output rates and the so-called "performance rates" of certain functions such as delivery, processing, etc.

The problem in studying the growth of the firm is not the lack of theoretical and analytical tools but is the application of these tools to certain commodities in a specified production and marketing environment. Many empirical works on economies of size that incorporate "in-plant" average cost and assembly cost have been conducted on certain agricultural commodities [2, 5, 6]. The theoretical formulation of the firm's growth incorporates three functions: (1) "in-plant" average operating cost, (2) average cost of assembly, and (3) demand for the final product. The researcher's task is to minimize the first function subject to assembly cost and demand constraints.

In-plant average operating cost is a function of the quantity of the product handled and may take any shape depending on the product being handled. In the grain industry, for example, we have found that "in-plant" average cost is asymptotic to the output axis [2]. Considering this function alone, economies of scale suggests no limit to the growth of the firm. However, average assembly cost which is a function of transportation cost (bu./mi.), including loading and unloading, and density of the product marketed off farms (bu./sq. mi.) imposes limitations on the in-plant economies of scale. In this case average assembly cost was a positively sloping function which limited the extent of the firm's growth. Change in the shape and position of in-plant average cost and average assembly cost functions over time depends on the future prices of the variables used in estimating these functions, which are influenced by the nature of competition in the factor market. The above formulation could be used in estimating the optimum location of the firm in relation to its competitors.

The shape and position of the demand facing the firm will depend upon the nature of competition in the market and the position of the firm in that market. Any change in the nature of competition and/or the position of the firm will affect the demand facing the firm and thus its growth. It is the investigator's job to estimate the demand function for the product and the firm's share. Change in the demand function over time will depend upon the changes in the variables used in estimating the demand function, and the firm's share depends upon how its position in the market is changing relative to other firms.

The exogenous variables suggested by the author, such as sales tax, transaction costs, etc., as being associated with the growth of the "real-world" firm, should be incorporated within costs functions. Their effect on the growth of the firm depends upon the extent to which they alter the shape and/or position of the costs and/or the demand functions. Similarly, contractual arrangements, integration, merger, etc., are means by which the policy makers influence the shape and/or positions of costs and/or demand functions they are facing, and their effects differ from one commodity to another.

The author raises an interesting question relative to a situation where producers selling through bargaining boards and the processor's incentive for backward integration. I will elaborate on this point in my discussion of the paper on "Farmer-Bargaining Boards".

My concluding remarks on this paper are rather brief. The present body of theoretical and analytical tools is well developed for application to the growth of the firm. However, it is the investigator's ingenuity and understanding of the reality of the problem that underline the success and the prediction power of the model being developed. This emphasizes the researcher's complete knowledge of the industry being investigated rather than an acquaintance with models for cook-book application. Many models, incorporating many of the factors suggested by the author, are developed for application to specific commodities. The paper's contribution may be summarized as follows: "Understand the problem and be aware of the reality surrounding it," which is a positive step in the right direction.

Accepting the assumption that farmers succeed in organizing and in bargaining collectively with the producers through a bargaining board, the question that remains to be answered, which Dr. Armbruster overlooked in his three-stage simulation model, is: How successful the bargaining board will be in achieving the goals set in this paper and what factors should be considered in the bargaining process to maximize utility over time? I will try to extend the Zeuthen-Nash approach of collective bargaining in the labor market for application in agricultural bargaining.[1/]

Consider a bargaining board (party 1) negotiating higher prices with processor (party 2). Party 1 would like to achieve the terms A_1 but party 2 is willing to offer the less favorable terms A_2. The question is, will party 1 accept A_2 or will he insist on A_1? This will depend on the view of party 1 of the probability that party 2 would definitely reject A_1, and that his own insistence on them would lead to conflict.

Let $U_1(A_1)$ and $U_1(A_2)$ be the net utility gain that party 1 would derive from A_1 and A_2 respectively. Let P_2 be the probability that party 2 would reject A_1. Then, if party 1 accepts A_2 he will obtain $U_1(A_2)$ with certainty, while if he rejects A_2 and insists on A_1 he will have the probability $(1 - P_2)$ of obtaining the higher utility $U_1(A_1)$ and the probability P_2 of obtaining nothing. Therefore, on the assumption that party 1 tries to maximize his expected utility he will accept the terms A_2 if $U_1(A_2) > (1 - P_2) \cdot U_1(A_1)$, that is, if $\{U_1(A_1) - U_1(A_2)\}/U_1(A_1) < P_2$, and will reject A_2 and insist on A_1 if $U_1(A_2) < (1 - P_2) \cdot U_1(A_1)$. Consequently, the utility quotient $\{U_1(A_1) - U_1(A_2)\}/U_1(A_1)$, which may be written as $\Delta U_1/U_1$, expresses the maximum risk (maximum probability of conflict) that party 1 is prepared to face in order to secure the terms A_1. Similarly it can be shown that the maximum risk party 2 would take in order to achieve the terms A_2 is equal to $\Delta U_2/U_2 = \{U_2(A_2 - U_2(A_1)\}/U_2(A_2)$. Then the two utility quotients $\Delta U_1/U_1$ and $\Delta U_2/U_2$ decide the strength of each party's determination to insist on the alternative more favorable to him. Each party will make concessions to his opponent in the following manner: party 1 will make a concession if $\Delta U_1/U_1 < \Delta U_2/U_2$, party 2 will make a concession if $\Delta U_1/U_1 > \Delta U_2/U_2$, and both will make a concession if $\Delta U_1/U_1 = \Delta U_2/U_2$.

The two parties follow the rule of behavior expressed above, and it will be profitable to increase the cost of a conflict to one's opponent if the cost to oneself fails to increase or increases only in a smaller proportion. Due to the nature of the product and the political-economic structure of the industry, determining the maximum risk $(\Delta U_1/U_1)$ the bar- bargaining board is prepared to take in order to achieve its goals is much more complicated than the case with the labor union.

Bargaining strength in most agricultural commodities, that is the maximum risk the bargaining board is prepared to take $(\Delta U_1/U_1)$, is a function of: (1) the bargaining board attitude toward risk-taking, (2) cross elasticities of demand between the product involved and other closely substitutable products, and (3) the probability of backward integration by the processors. A bargaining party reaches better terms the greater his risk preference and the smaller the risk preference of his opponent [3, p. 155]. The major segment of agricultural producers, whom the bargaining board will represent, manage small and diversified operations. We have found that managers of large-size, specialized operations differ significantly from managers of small-size, diversified operations in their risk preference [1]. Most agricultural commodities have close substitutes with high cross elasticity of demand. Assuming the bargaining board succeeds in enforcing high prices for the commodity being negotiated, some or all of the price increase will be passed to the consumer. Shift in demand from this product to a close substitute is very possible.[2/]

Furthermore, with a consumer-conscious politician, increase in imports may be expected. Thus, the bargaining board's success in obtaining a higher price is of short-run duration, and a negative result may be forthcoming. Backward integration is another real possibility. Processors are faced with two production functions -- one in obtaining the product through a bargaining board, Y_1, and another by engaging in the production themselves, Y_2. Processors may be willing to offer the higher price demanded by the bargaining board as long as $Y_1 \geq Y_2$. Technical and thus economic efficiency becomes an essence of bargaining power. The bargaining board should be aware of its production cost vs. the opponent's production cost, and the bargaining process should incorporate this factor to minimize the processor's incentive for backward integration.

Demand elasticity, production functions, and risk preference should be incorporated in a bargaining model to facilitate the bargaining board's success in maximizing net utility over time. While I am willing to accept the assumption of the producer's success in selling collectively through a bargaining board, the bargaining board's ability to increase and stabilize prices, increase production, etc. under the prevailing socio-economic-political environment is somewhat a heroic assumption. Thus, a simulated model based on supply control without due consideration to the bargaining process has a straw foundation, and its realistic application is very much in doubt. Any such model should include the bargaining process in order to enhance the model's prediction power in a dynamic sense.

FOOTNOTES

1/ For a critical discussion of the Zeuthen-Nash theories, see [3].

2/ Empirical research shows the demand for potatoes to be fairly inelastic and the cross elasticity coefficient between potatoes and processed vegetables is insignificant [4]. However, no empirical evidence is available for potatoes vs. starchy food items such as rice, macaroni, etc. Cross elasticities of demand should be included in the bargaining board model for general application.

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