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Structural Change in the Swine Industry

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Introduction

The future direction of the Minnesota swine industry is of keen interest and concern to pork producers, allied industries, policymakers, and consumers.[2] Proposed state limitations on livestock feeding and production contracts by processors and feed companies have sparked a lively debate over the past year.

Minnesota's corporate farm law currently prohibits corporations and limited partnerships from engaging in agriculture, including livestock production, except for farm corporations with a limited number of stockholders and meeting certain other standards. The environmental impact of larger farms is also coming under increased public scrutiny. This issue of the *Minnesota Agricultural Economist* summarizes and highlights issues related to the current policy discussion and reviews some of the economic concepts involved.

The term **industry structure** refers to the number, size, and kinds of business firms that make up an industry or market, as well as the nature of the products sold. The swine industry can be thought of as a series of stages, including feed supply, farrowing and finishing the market animals, slaughtering and processing, and food retailing. The stages in any industry must be coordinated to deliver the quantity and quality of products at the time and place that gives the maximum benefit to society from the resources available. The market price system, contracting, vertical ownership integration, and cooperatives are all coordination methods.

Concerns Growing Out of Recent Events

Much of the current concern grows out of reports of expansion by specialized, integrated, and contract swine operations in the South and Southeast. A report by Iowa State researchers showed that these operations may be able to produce at lower cost than most Iowa and other Midwest producers.

Despite the South's advantages, swine production has been shifting generally to the North and West. Minnesota's share of the nation's hogs has been increasing steadily to 8.5 percent in 1988, while Iowa is now up to 25.7 percent. The Northern Plains region including Nebraska, Kansas, and the Dakotas has a growing share of the nation's hogs. North Carolina's share is also growing, but its growth appears to be coming mainly at the expense of South Carolina, Georgia and the eastern Corn Belt. The eastern Corn Belt has been losing share until recent times. A recently announced new slaughter facility to be built by Central Soya and Mitsubishi in Indiana may help to stimulate a turnaround in that region.

How extensive is contracting and integration in the swine industry? Jim Rhodes, University of Missouri economist, recently conducted the most extensive survey to date on this question. He surveyed the readers of *Pork '89* magazine and estimates that a little less than 10 percent of the hogs in the United States are produced under contract or in facilities owned by the large contractors (over 50,000 head marketed per year). This is less than some independent producers have feared. Most of the large contractors and feed dealers are planning to expand their

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[2]*The term* ***industry*** *is used broadly in this paper to include swine producers, packers, and input suppliers, as it is commonly used in the popular press. Marketing textbooks define an industry as a group of firms producing a similar product using similar production processes. By that definition, swine producers, packers, and feed suppliers are separate industries, for example. They use the term swine* ***subsector*** *as we use the term* ***industry****, to encompass producers, packers, input suppliers, and allied industries. Swine is a part of the livestock* ***sector****, and the food* ***system****.*

contracting activities, so their share will probably continue to grow.

High productivity will be very important in maintaining Minnesota's competitiveness. Many of the swine facilities in the Midwest are aging, and it is widely believed that infusions of new capital will be needed to maintain and improve productivity in the coming years. Predicting the remaining life of these facilities is difficult.

A comparison of market and breeding hog numbers suggests that Minnesota has achieved some impressive productivity gains in the last ten years. The ratio of market hogs to breeding stock increased 29.7 percent in 1988 compared to 1979, second only to North Carolina's 31.2 percent increase among the major swine-producing states. We do not know if small and large farms are sharing equally in these productivity gains. Also, how much of the improvement in overall productivity is due to less productive farms getting out, and how much from the continuing producers getting better is unknown.

Horizontal Concentration and Vertical Coordination

Two types of structural change are occurring in the swine industry today: first, horizontal concentration into fewer, larger firms at each stage, and second, increased use of ownership and contracting integration to coordinate the stages.[3]

Traditional production stages and marketing activities in the swine industry are depicted in the lower part of figure 1 (from Hayenga, et al., *The U.S. Pork Sector: Changing Structure and Organization.* Iowa State University Press, 1985.) Recent developments in ownership and contract integration are shown by the larger rectangle on top of the flow diagram, demonstrating that the **contractor/integrator** bypasses traditional feeder pig and slaughter hog markets.

These changes raise questions about who has control over strategic decisions in the industry, and what the effects are on performance of the industry. Performance criteria include: (1) how well supply matches demand, (2) technical and operational efficiency, 3) equitable sharing of rights, risks, and returns, (4) market access and ease of entry, and (5) stability. A good source of information on the relationship between industry structure, conduct, and performance is *The Organization and Performance of the U.S. Food System* by Bruce Marion and the NC 117 Committee.

It is important to keep in mind the difference between horizontal concentration and vertical coordination, and the policy implications of each. U.S. and state antitrust laws are primarily aimed at restricting increases in horizontal concentration that restrict competition in the marketplace. Farmers throughout U.S. history have complained about a lack of active competition among local buyers of their commodities. There are two basic policy responses: (1) develop more competition (enforce the antitrust laws, form and operate farmer cooperatives, develop more price-competitive institutions such as electronic trading) or (2) develop countervailing power through bargaining associations, marketing orders, and government price supports.

It is frequently asserted that a few firms holding a large market share may charge higher than competitive prices for inputs sold to farmers and pay lower prices for farm products. Concentration is usually measured in terms of a ratio, the percent of the market held by the largest firms.

The four-firm concentration ratio is currently only 33 percent in pork packing, compared to a cattle slaughtering ratio of 70 percent. However, Clem Ward, Oklahoma State University economist, argues that pork packing is likely to become more concentrated. Bruce Marion and others at the University of Wisconsin studied the four-firm concentration ratio for cattle slaughtering. For every 10-percent increase of concentration ratio in a region, prices paid to cattle feeders fell 10 to 23 cents per hundredweight.

A change in vertical coordination methods away from market pricing and toward contracting or vertical integration does not necessarily imply increased concentration, if a relatively large number of contractors or integrated firms remain. Also, a policy of restricting integration and contracting may not necessarily reduce concentration.

Uncertainty about quality of pork obtained in the market is a major driving force behind packers' integration and contracting activities. This suggests that improved quality differentials and producer education about quality may be ways to help preserve the market system. In fact, swine carcass quality differentials under grade and weight marketing appear to be widening.

In 1974, 6.8 percent of the hogs in the U.S. were purchased on a carcass basis. By 1987 (the latest reporting year), 13.5 percent were purchased on a carcass basis. It is of special interest to note that in 1987 in Minnesota, 30.6 percent of all hogs were purchased on a carcass basis.

Another force behind swine contracting may be the difference in risk-bearing attitudes and abilities of contractors and other producers, as it relates to the adoption of new technology. Figure 2 shows that returns to Midwest pork producers have been quite variable since the mid-1970s.

A contractor may be willing to put up with a highly variable cash flow in return for potentially higher returns over the long term, and have the capital reserves to do so. Producers in a more precarious financial situation may find that the increased stability of cash flows

[3]*Contracts generally are offered by a large firm referred to as the integrator or the contractor and entered into by a number of independent firms referred to as growers or producers. Generally the contractor provides the livestock, feed, medication and veterinary services, management supervision, and markets the product. The grower provides the land, building(s) and equipment, labor, utilities, and waste disposal. The contractor usually pays the grower a specified fee per head or pound produced that may include efficiency bonuses based on factors such as feed conversion, mortality, and production rate.*

Figure 1. Swine Industry Production /Marketing Stages

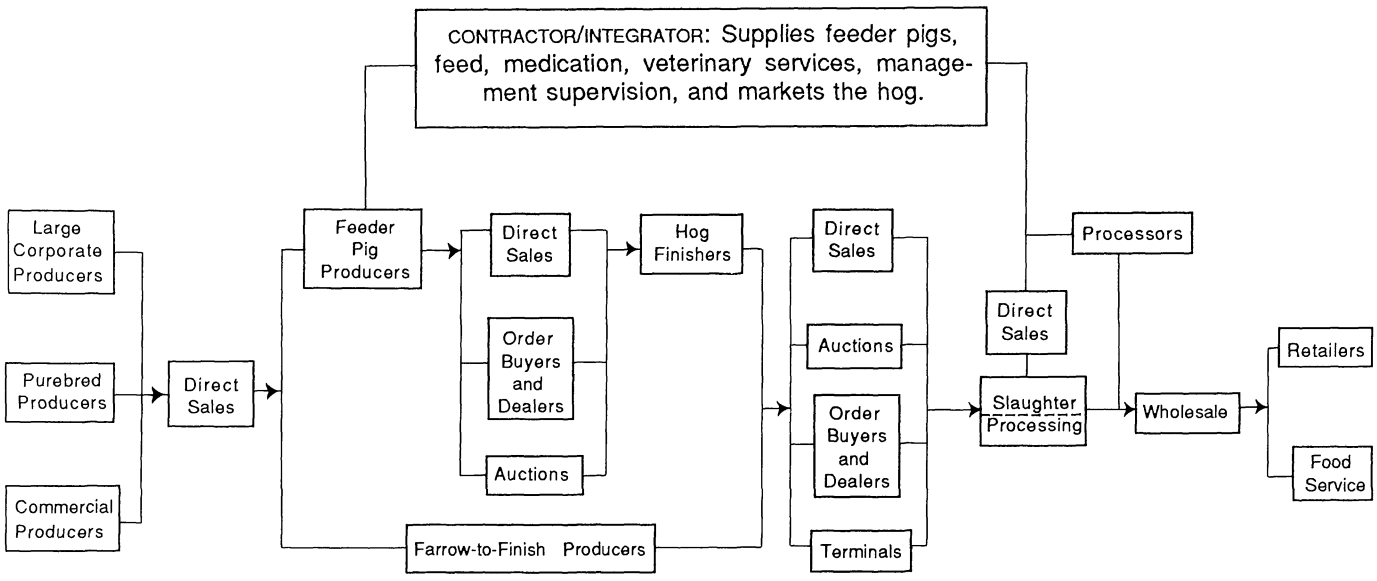
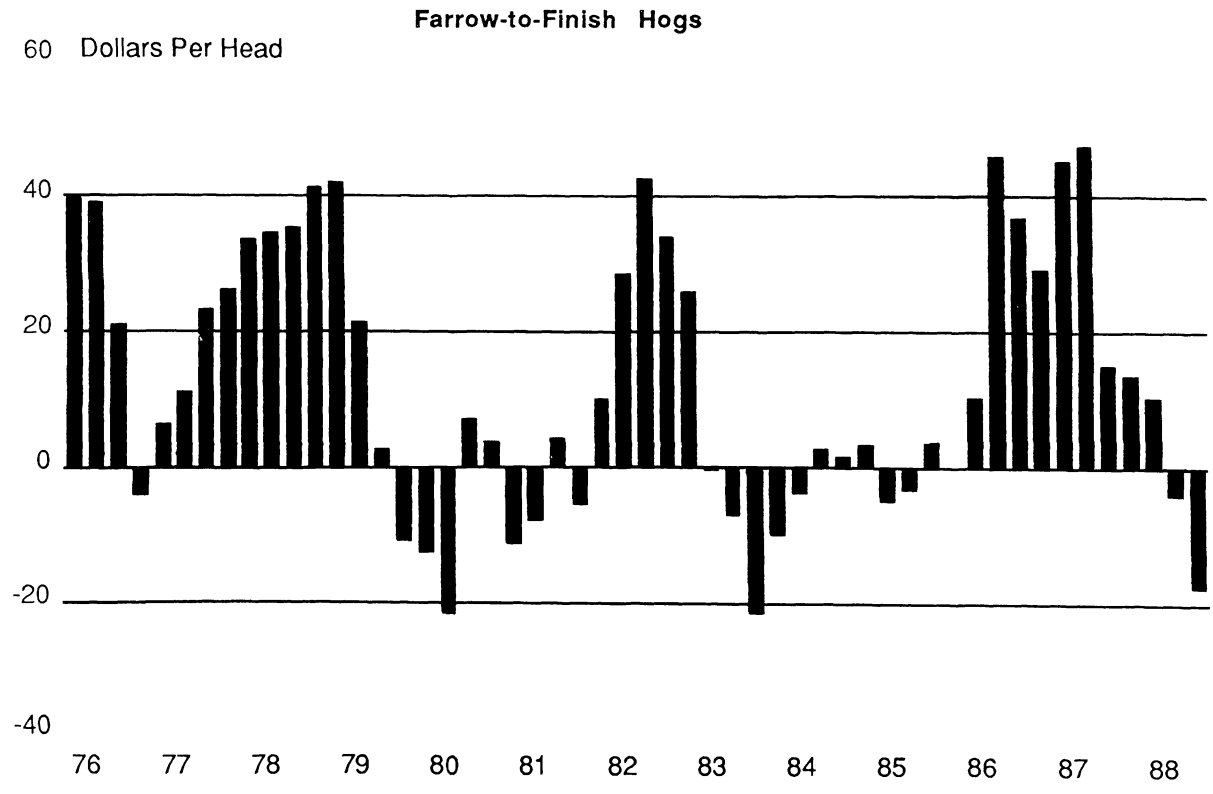


Figure 2. Quarterly Estimated Returns



SOURCE: Iowa State University Fact Sheet M-1254

under a fee-based contract arrangement offsets the loss of some upside income potential. This may be especially true if stability makes financing more available for upgrading facilities and improving efficiency. The reduced risk with contract production may be a major advantage when the producer is negotiating with a lender to borrow funds for expansion or new facilities.

A key problem arising with vertical integration and contracting is reduced access to markets and market information. For example, where would an independent producer market broilers today in that highly integrated market, and what are they worth? Many independent swine producers are concerned about losing their output markets. A recent study by the USDA Agricultural Cooperatives Service, "Market Access in an Era of Structural Change in the Livestock Industry," has documented a declining number of market outlets for hogs in Minnesota and other states. Feed suppliers are concerned about losing markets if their competitors lock up producer clients under contracting arrangements.

Roger Ginder, Iowa State economist, points out in a recent staff paper, "Changing Pork Industry Structure," that while livestock slaughter has been highly concentrated in the past, several of the same firms now have significant positions in input supply and actual production of livestock as well. For the first time they are in a position to coordinate across these stages, which could make it difficult to maintain the market price system centered around the pork producer.

The quality of life experienced by those involved in swine production is an emotional issue for many people. Does a contract structure combine the best attributes of family farming and corporate agriculture, or would the greater market power of the contractor lead to exploitation of the producer? The North Carolina experience suggests that the number of contractors competing in a local area is important. Where several contractors are actively competing for producers, or where markets for independent production are more available, contractors are likely to offer more favorable contract terms than where fewer contractors and markets exist.

Comparisons With Broilers, Fed Cattle, and Processing Vegetables

Structural Change in Agriculture: The Experience for Broilers, Fed Cattle, and Processing Vegetables, a USDA Economics and Statistics Service technical bulletin published in 1981, analyzes these three agricultural industries to determine why and how structural changes take place in agriculture. It lists technological, market, and government policy factors that contributed to the increasing specialization and concentration in these industries over the roughly 20 years from the mid-1950s to the mid-1970s. It draws from these three case studies to develop a general prototype of structural change, which it relates to swine, dairy, and other industries that have been changing at a slower rate.

The authors, Donn Reimund, Rod Martin, and Charles Moore, point out that change generally begins outside the industry itself, with the imposition of new or changed external conditions. The ensuing structural change is a process of adjustment--initially to exploit or accommodate new conditions, but later to better manage newly emerging risks.

They point out that in all three of these industries, adoption of new technology by innovators (including input suppliers, processors, and distributors, as well as farmers) was followed by a second stage in the process. The second stage was characterized by a shift in production of the commodity to new areas more amenable to changed methods than traditional ones. In the third stage there was a rapid rise in output using newly gained efficiencies. New institutions emerged in stage four, and relationships within the industry changed to better manage new risks.

Tax policies allowing for investment credit write-offs on single-purpose structures and for accelerated depreciation are one factor the authors point to as contributing to the past growth of specialized hog production units. They contributed to this growth by providing substantial tax savings to their developers. The 1985 tax law changes, which eliminated some of these tax benefits, may have benefitted the Minnesota swine industry relative to the integrated operations in other states by reducing the tax incentives for expansion of the large integrated units.

Environmental regulations may have also increased the comparative advantage of large feedlots over small ones because the fixed investment required to meet the standards is lower per animal in the larger lots. This seems important to consider in light of the current interest in improving water quality. How should environmental controls on swine facilities be set up with regard to size? Do larger operations generally create more or less pollution, on a per head produced basis, than smaller ones?

One characteristic of all three of the industries studied prior to their structural change was that their production stages were closely tied to the production of other commodities. Broilers were produced from the male chicks of heavy layer chicken breeds. Cattle were fed on grain farms, primarily to use off-season labor and as a means of marketing feed grains. Processing vegetables were largely off-grade and surplus fresh vegetables that were diverted to the processing market. These ties to other commodities were major causes of price variability.

After the structural change, the use of production contracts in the case of broilers and vegetables, and development of close working relationships between large cattle feedlots and packers, have reduced market price risks of producers by transferring these risks to the processing stage. A recent study of hog production contracts by Kelly Zering, North Carolina State University economist, showed that a large share of the price risk was shifted to the integrator in a similar fashion.

In the swine industry, about two thirds of all operations farrow and finish at the same location. A trend toward

separation of farrowing and finishing in different locations may have structural implications. Isolation for disease control is one reason for the separation, but there may be other reasons as well. Confinement farrowing requires expensive facilities, but relatively little feed. Finishing requires a lot of feed, but cheaper facilities.

Minnesota has relatively inexpensive feed, but the climate increases facility costs compared to the South. Some southern producers are experimenting with a return to year-round pasture farrowing, under the same intensive management as used in modern confinement facilities. If successful, the South's advantage in farrowing facility costs may increase.

If methods of shipping feeder pigs over long distances are perfected, could we see wider geographic separation of these production processes with farrowing in the southern states and finishing in Minnesota and other Midwestern states? After all, it is not considered necessary to finish cattle in the same state where they are born. Current swine disease quarantine regulations may pose problems for the long distance shipping of pigs.

The types of contracts (i.e., written agreements) used in vertical coordination vary significantly from one commodity to the next, and reflect the interests of the parties. Ronald Mighell and Lawrence Jones in their classic analysis, *Vertical Coordination in Agriculture*, identify three contract types: (1) market-specification contracts (where the producer transfers a modest degree of production risk and management to a contractor who is interested in product and supply uniformity), (2) production management contracts (which call for more direct participation by the contractor in farm production), and (3) resource-providing contracts (where the contractor participates in the vertical stages of production or marketing activity by supplying important inputs).

Resource providing contracts appear to be of most concern in relation to the Minnesota swine industry. They can assume various sub-forms that vary in the amount of cost and risk shared by contractors and producers. They can be profit-sharing arrangements, not unlike joint ventures. Joint ventures need not be undertaken only by parties with equal bargaining power. The farmer may find this type of arrangement attractive because it provides him with expensive inputs, utilizes his facilities and technical skills, and assures him a reasonable return.

Comparisons With the Minnesota Turkey Industry

An *Economic Analysis of Contracting Arrangements Used by the Minnesota Turkey Industry* was published by Calvin Dornbush and Michael Boehlje in 1988. They identified six categories of vertical coordinating arrangements known to exist in the Minnesota turkey industry in some form: (1) vertical integration, where the producer-processor owns all production facilities and hires labor, (2) cooperatives, (3) resource providing contracts, where an independent grower owns buildings and facilities and provides labor with payment on a per bird or per pound basis with performance incentives, (4) cost-plus contracts where the grower bears more of the production risks and may share price increases above a certain level, (5) independent growers with formula pricing, and (6) shared risk or joint venture contracts. The cost-plus and shared risk contracts are sub-forms of Mighell and Jones' resource-providing category. A 1983 survey showed that about 90 percent of Minnesota turkeys were marketed under contract in that year. Resource-providing and cost-plus contracts each accounted for 29 percent of turkeys sold for slaughter, and formula-pricing accounted for 32 percent.

In general, contracting has a much different connotation in the Minnesota turkey industry than other regions of the U.S. In Minnesota, contracting involves primarily independent growers who have signed a marketing agreement with a processor. The grower makes most of the production decisions. Cost-plus contracts, in particular, attract financial support from lenders for new producers and others who cannot or do not desire to bear the risk of low product prices.

In the Southeastern U.S., turkey contracts are mainly of the resource-providing type where the contractor supplies poults, feed, and makes most of the management decisions. The grower is paid on a per bird basis for his labor and facilities; the rate of payment is influenced by the grower's ability to meet certain efficiency goals.

Dornbush and Boehlje point out that coordination method may affect incentives for adoption of new technologies. This is relevant in light of the apparent need to upgrade many older Minnesota swine facilities. With independent production or formula-price contracts, the producer bears all of the production and price risk; he makes all of the management decisions. The market guides his planning decisions with regard to when changes should be made in production methods.

It is possible that technological adoption would be delayed with a cost-plus contract. The producer would bear all of the cost of the new technology but would share the increased returns with the contractor. However, contractors could encourage use of a particular technology in the contract. In fact, some resource-providing hog contracts pay producers at a higher rate if facilities meet standards specified by the contractor. If a new technology reduced production costs, contractors could "force" the adoption of technology by a downward adjustment of the payment.

Policy Choices

Harold Breimyer, University of Missouri Professor Emeritus, in *The Agricultural Marketing System*, by V. James Rhodes (John Wiley and Sons, 1987) gives a rationale for government intervention in markets:

"A market system will neither self-create or self-police. It is a legal creation that starts from enforceable laws of contract. From its beginning in England, it required legal protections such as those against practices called, in the

quaint English of the time, regrating, forestalling, and engrossing. Like democracy itself, the system rests on a reasonably equitable status for all parties. When any trader gains dominant power, a market system becomes an agent of subservience and exploitation, not of equity."

Mighell and Jones quote another view by Earl Butz:

"... political leaders will resist vertical integration in agriculture, in their oratory, in their congressional hearings, and in their legislation. The philosophy of the small, owner-operated, family farm is deeply ingrained in our sociological mores .... Political pressure will continue to be on the side of maintaining small family farms, even though modern technology dictates strongly that family farms become larger."

Several alternative policy directions can be identified to deal with the structural changes facing the Minnesota swine industry. One would be to do nothing, to let the changes take their course within the state and federal laws already on the books.

A second direction is to prohibit various types of activity that are deemed socially undesirable. Corporations including cooperatives are already prohibited from owning land and engaging in agriculture with certain exceptions. Processors and feed businesses could be prohibited from contract feeding or owning and feeding their own livestock, as is presently proposed (H.F. 984, Minnesota Packers and Stockyards Act). Some might prefer to expand the restrictions to prohibit any vertical coordination linkages other than spot market transactions between industry stages. Any legislative effort to restrict farmers from entering into this type of agreement may be supported by independent producers but opposed by producers wishing to contract.

A third direction is to impose better "rules of the game." These would level the "playing field" (or maybe even give some participants an advantage) or they could define the relative "rights" of contracting parties and those in similar situations where exploitation is a concern. The prompt payment and custodial account provisions of H.F. 984 fall into this category.

Other "rules" might relate to contract length, compensation if a contract is terminated early, and escape clauses for both the contractor and producer, for example. H.F. 984 would require packers to provide copies of contracts with livestock producers to the commissioner of agriculture. Perhaps study of these contracts will show areas where regulation is needed. Educational programs and low-cost legal advice to help the parties evaluate contract language might also reduce problems in this area.

Policymakers should consider several questions concerned with hog contracting and structural change in general:

(1) Do we want to prohibit certain of the activities discussed above by anyone, or do we only want to prohibit firms over a certain size from engaging in the activities? Would restrictions force firms already operating in the state to stop what they are now doing, or only prohibit them from doing something new and prevent other firms from moving into the state and engaging in these activities? The impact of restrictions on existing firms may turn out to be less than first thought. Firms already engaged in activities covered by the restrictions may be able to restructure in ways that circumvent the restrictions. The $50,000 limit on federal crop subsidies and the 160-acre limit on subsidized irrigation water in the western states are two examples of restrictions that some farms are reported to be circumventing through such techniques as setting up multiple business entities.

One way for the state to favor smaller swine enterprises over larger ones would be to enact some sort of progressive tax where the rate increases with size of the enterprise. Perhaps a progressive tax on volume of production could be used.

(2) What is a "contract?" How is "ownership" of livestock to be defined and rules about it to be enforced? Could a contractor circumvent a prohibition on ownership by selling the animals and feed to the producer with an agreement to buy back the market animals under some preset terms? Are "profit sharing" or financing arrangements to be prohibited or restricted? Market access is a key and legitimate concern.

(3) Are there other ways to protect market access for independent producers, other than restricting vertical integration? One way might be to require processors to purchase some minimum percentage of their daily kill on the cash-spot market.

(4) Is the important question whether the alternatives available to a producer are cash-spot markets or contract alternatives, or is it the number of alternatives available and the market power of each? In other words, is there really any fundamental difference between a producer choosing among two or three packers to sell to, or signing a contract with one of two or three contractors? One obvious difference is that the choice of packers is made every week or two, while the choice of contractors is only made once a year or once every few years, depending on the length of the contract. The U.S. antitrust laws are the main tools in place now for promoting fair and effective competition in the marketplace.

(5) Is it more desirable for cooperatives to engage in contracting with producers than other corporations or large privately held firms? One apparent concern with allowing existing cooperatives to contract is that they might use equity capital built up from independent producer members' contributions to help other contractee producers start or expand such that they compete with the independents. Would it be more desirable to al-

low new cooperatives to form which would take advantage of economies of size but using only contractee capital? A number of relatively small "sow corporations" were set up in the 1970s, mainly in Iowa. If there are efficiency advantages of larger operations, would it be more desirable for groups of farmers to own and operate the operations than others? Do farmers "wear whiter hats" than others, in some sense?

(6) What activities are to be restricted or prohibited? It appears that a major concern is who will be in control of strategic decisions in the industry. Specific activities should be evaluated in relation to their roles as instruments of control. How do owning livestock or buildings, financing, providing feed and other inputs, or marketing relate to control?

(7) Many producers are concerned about risk, and contract production is one method to manage risk. What other strategies might producers adopt to manage risk? Marketing contracts, futures and options trading, and contracts that simply guarantee access to a slaughter facility are possibilities.

(8) What are the constitutional limits on regulatory activities of this type? It is clear that the state may impose restrictions that limit activity which is contrary to the "public good." But what is "good" and for whom in this situation? How will pork commerce be affected? Should large hog producers who contract the feeding phase of their operations be restricted as well?

Conclusions

It is important for Minnesota policymakers and industry leaders to enhance opportunities for producers of all sizes to remain independent and have access to markets. The competitive situation nationally and globally compels all producers to improve product quality and production efficiency, and to cut costs. At the same time, we should recognize that for some producers, contracting may be one of the few opportunities they may have to remain in agriculture. There appear to be economic incentives for contractors to remain a part of the industry, if not in Minnesota, then in other states.

Glossary of Terms

Bargaining power -- the ability of one participant in a transaction to influence the terms of trade.

Contract integration -- the combining together of independent firms' economic processes and management decisions under a formal agreement.

Horizontal integration -- the combining of two or more firms that conduct the same types of economic processes.

Industry performance -- the results of industrial activity compared to certain criteria. Suggested criteria include 1) how well supply matches demand, 2) technical and operationalefficiency, 3) equitable sharing of rights, risks and returns, 4) market access and ease of entry, and 5) stability.

Industry structure -- the numbers, sizes and kinds of business firms engaged in similar production activities, and the nature of the products they sell.

Market power -- the ability of one participant in a market to influence terms of trade.

Market structure -- the numbers and sizes of buyers and sellers trading in a similar product.

Ownership integration -- the combining of two or more firms to form a single business entity, either horizontally or vertically.

Vertical coordination -- all of the ways in which the vertical stages of production are controlled or directed. The market price system, contracting, vertical ownership integration and cooperatives are all coordination methods.

Vertical integration -- the combining of two or more firms that conduct vertically-related production processes.

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