PROCUREMENT CONTRACTING AND SOW LEASING AS VERTICAL COORDINATION ARRANGEMENTS IN THE HOG-PORK SUBSECTOR

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
GERALD R. CAMPBELL
1973

This is to certify that the

thesis entitled

PROCUREMENT CONTRACTING AND SOW LEASING AS VERTICAL COORDINATION ARRANGEMENTS IN THE HOG-PORK SUBSECTOR

presented by

Gerald R. Campbell

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in **Agricultural Economics**

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Date **February 20, 1973**

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O-7639

ABSTRACT

PROCUREMENT CONTRACTING AND SOW LEASING
AS VERTICAL COORDINATION ARRANGEMENTS
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By

Gerald R. Campbell

The objectives of this study were: 1) to examine sow leasing programs and packer procurement contracts as they evolve in the hog-pork subsector; 2) to analyze the incentives and disincentives for these arrangements; 3) to project the evolutionary patterns of these arrangements and the implications to adopting firms, their competitors, suppliers, and customers; and the overall performance of the subsector; and 4) to identify future research needs and possible approaches to vertical coordination research on the hog-pork subsector. In order to accomplish these objectives an in-depth case study of the contract procurement activities of a major meat packing firm was completed. This case study was supplemented by a survey of four other major meat packers who had had contract procurement experience. In order to examine sow lease programs a survey of the three leading feed manufacturers leasing sows was completed.

The meat packers interviewed were all offering some variation of a procurement contract where payment for future delivery of slaughter hogs was related to prices of live hog futures contracts for the delivery month. Two firms were experimenting with or considering procurement contracts which would offer a price floor approximating out of pocket production cost combined with a flexible price ceiling in which packers and producers would split any increase in prices above a certain negotiated level. These contracts would also involve grade and yield buying and in some cases precise delivery specifications within a particular quarter. The fairness of several pricing arrangements examined and their potential effect on the cyclic nature of hog production were found to be related to the length of contract and the point in the hog cycle at which the contract was entered.

Incentives for contracting involved: 1) savings through contract pricing, 2) savings from improved scheduling and regularity of hog supplies, 3) savings from improved quality of contract hogs, 4) savings from improved procurement strategy, and 5) savings from market leverage. Contract costs involve mainly bookkeeping and accounting costs which were estimated by firms interviewed to be approximately the same as for grade and yield programs.

Savings or increased earnings from contract procurement are generally contingent on the ability to coordinate contracted hog volume and quality with the corresponding demand for pork products. Meat packers and feed manufacturers had found that contracts in which they owned the livestock typically resulted in poorer production results than occurred when farmers owned the animals. Management problems, excessive requests for service, and high capital requirements were major problems reported by feed firms leasing sows. On the benefit side, feed firms estimated that ninety percent of the sows leased were fed their feed and fifty percent of the sows leased represented new feed sales for their firms.

Two firms had switched their emphasis from leasing to selling because of the problems cited above and the expectation that feed sales would be about the same as under the lease program. Opportunities for contract procurement to substantially alter the cyclic nature of hog production may be limited by the tendency of industry managers to emphasize current market conditions in their decision making. Current operating procedures produce a preference for flexibility which may contribute to system instability.

In general an increase in packer procurement contracting can be expected. Much of this activity will be centered on marketing contracts with emphasis on establishing

equitable pricing formulae which encourage the desired quantity, quality, and timing of hog deliveries. These contract efforts may be limited by possible farmer reaction, relatively high accounting costs, possible efficiencies in procurement through other methods, and the inability of firms to stabilize the subsector at other levels.

Sow leasing seems to be declining, at least on a large scale basis. Firms who have been leasing sows are now selling them, possibly altering the competitive situation in breeding swine markets.

Improved vertical coordination through packer procurement contracting could result in a more efficient and progressive production and marketing system. This results partially from the potential increase in stability for the system which can be achieved without inequitable payoffs to participants, if efforts are made to insure that bargaining power is evenly distributed.

Major research needs highlighted by this study include: 1) a better understanding of the current and developing market for breeding swine, 2) a study of farmer reaction to current and future price information, 3) a study of major swine market areas and factors encouraging or limiting contracting in each area, and 4) a study of efforts by meat packers, wholesalers, and retailers at improved vertical coordination in the market for fresh and processed pork products.

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1973

ACKNOWLEDGMENTS

The author wishes to express his appreciation to all those who assisted him in the preparation of this dissertation. The author is especially indebted to the personnel from the several meat packing and feed manufacturing firms who cooperated in the study.

Special thanks are extended to Dr. Marvin Hayenga who served as thesis supervisor and Dr. James Shaffer who served as major professor. Thanks are also due to Dr. Warren Vincent, Dr. John Allen, and Dr. Bruce Allen who served on the guidance committee and helped direct my studies.

Appreciation is also expressed to Dr. Harold Riley and the Department of Agricultural Economics who provided the financial support for this study. Thanks also go to Ms. Janet Munn and Ms. Sandy Mouser for their good natured clerical assistance throughout the project.

I am also extremely grateful for the kindness, understanding, and empathy of my friend Ms. Karen Goebel. Without her, the thesis would not have been bearable.

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CHAPTER I

INTRODUCTION

The Problem Situation

Meat prices have been a major issue in recent economic policy. Rising meat prices have plagued efforts to slow down inflation. Increasing meat prices have also created interest in the way in which our food system is organized. An important part of this food system is the livestock-meat sector. Within this sector, there have been substantial technological and organizational changes in recent years. These changes have produced competitive conditions which encourage firms to seek new methods to accurately match their products with changing consumer demands. In the past, the livestock meat sector has relied on market price signals to guide investment and operating decisions. While the market price system has functioned fairly well in this capacity, it is apparent that there are some flaws in coordinating production and marketing of meat.

These flaws have been particularly apparent in the production and marketing of pork products. For example, the continued existence of a cyclical pattern of pork production and prices coexisting with a fairly stable demand for pork

products indicates some lack of coordination. In addition, for many years, the "fat hog" was produced while consumers demanded lean pork. The perfect coordination system would accurately match changes in consumers demands for pork products with adjustments in resources allocated to pork production and marketing. This perfect market may not be physically attainable. Its cost may make it economically infeasible. However, the current situation does stimulate industry interest in alternatives which may lead to improved coordination and better allocation of resources.

Problem and Objectives

Many firms within the hog-pork subsector--from feed manufacturer to retailer--are experimenting with new forms of vertical coordination. This search for new vertical coordination arrangements is both the consequence and evidence of dissatisfaction with the market price system currently in use. These arrangements have taken many forms and have occurred at all levels within the subsector. Some examples of these arrangements include: feed firms leasing sows to farmers, meat packer hog production contracts, production of breeding stock by meat packers, contracts for pork procurement, ownership and operation of meat packing plants by farmers and farmer cooperatives, etc. Each of these new vertical coordination arrangements has potential benefits and/or costs for the participants in the arrangement, for the subsector, and for society.

In an earlier subsector survey it appeared that most new vertical coordination arrangements were initiated by two industry groups--feed manufacturers and meat packers [11-p. 14]. Several of the major feed manufacturers were operating sow leasing programs at either commercial or experimental scales. While meat packers were involved in a multiplicity of new arrangements, contracting for live hog procurement was the area where the potential for increased activity appeared greatest. Thus, these two coordination arrangements were selected for further study and evaluation.

The specific objectives of this study are:

1. To examine sow leasing programs and meat packer procurement contracts as they are evolving in the hog-pork subsector.
2. To analyze the potential incentives and disincentives for these arrangements as compared to existing vertical coordination systems.
3. To project the possible evolutionary pattern of these arrangements and the implications to adopting firms, their competitors, suppliers and customers, and the overall structure and performance of the subsector.
4. To identify future research needs and possible approaches to vertical coordination research on the hog-pork subsector.

The accomplishment of these objectives will provide insight into several kinds of problems facing decision makers. For management personnel in feed manufacturing and meat packing firms, the study will provide a view of developments in their industry, as well as a new perspective on

their firm's vertical coordination efforts. The study will highlight for farmers the implications which contracting may have on their short and long run production and marketing decisions. The study should aid them in evaluating particular contracts and understanding the concerns and motivations of the feed manufacturers or meat packers who might offer those contracts. For meat processors, wholesalers and retailers, the study will point up potential improvements in vertical coordination at their levels in the subsector. For government policy makers, the study will provide additional insight into possible conflicts over contract conditions or questions of equity. The issues of vertical integration, market control, and monopoly power, as they relate to the production and distribution of pork, are often hot political topics. It is hoped that this study will aid in a more enlightened consideration of market rules or regulations which might prohibit or limit certain types of vertical coordination. For other researchers, this study will provide new research questions about vertical coordination and its effects on the organization of the hog-pork subsector.

Procedure

The primary determinants of the research procedure used in this study are: (1) the limited number of firms having experimented with or used the two vertical coordination

arrangements being considered, and (2) the in-depth analysis required to generate a comprehensive picture of the incentives and disincentives surrounding these arrangements. It seemed that the most productive approach would be an in-depth case study of one firm in a particular industry combined with parallel interviews with firm managers in competing firms. It was felt that this procedure would provide the degree of depth necessary while providing some estimate of the generality of results. It was anticipated that this procedure would build on existing literature, supplement an earlier broad industry survey [11], and provide a clearer picture of the economics of these arrangements.

A selective review of the substantial bodies of literature on vertical coordination and the hog-pork subsector provided the setting for collection of primary data. The concerns about and motivations for improved vertical coordination which have been expressed in previous literature are presented in Chapter II. Then the recent market structure changes in the hog-pork subsector are briefly described in Chapter III to provide the backdrop for our analysis.

Analysis of Packer Procurement Contracts

In order to examine the incentives and disincentives surrounding the contract procurement of slaughter hogs,

five firms were selected from those surveyed earlier. All of these firms had some experience with procurement contracting, all were within the top eight firms in hog slaughtering, and all had indicated some degree of willingness to cooperate with further research on vertical coordination. One of these firms had broader experience than the other four firms in procurement contracting. This firm was approached and agreed to cooperate in this study.

Management within the case firm was interviewed in depth in several relatively open-ended interview sessions. From these sessions, information was generated which indicated that interviews with personnel at the plant level would be desirable. Open-ended interviews were then conducted with personnel at one of the case firm's plants where contract procurement had been extensively used. These interviews at the firm and plant level provided the bases for an analysis of the possible purchase price advantages of selected contracts. The evaluation of savings from improvements in quantity, quality and timing was carried out using an extensive linear programming model of plant operations in use by the case firm. In addition, the impact of extensive contract procurement in a market on prevailing market prices was statistically estimated. These interviews also provided insights into the real world of pork procurement which tend to modify the results of more simplified

theoretical analyses. The results of these interviews and the analyses resulting from them are the substance of Chapter IV.

After completing the interviews with the case firm, the four remaining firms were interviewed either in person or by phone. These interviews provided perspective to the results of the case firm interviews. This made possible the generalization of some of the case firm results and provided the basis for speculation on long and short run implications of the results.

Analysis of Sow Lease Programs

Sow lease programs were examined through personal interviews with the top three sow leasing firms in the feed manufacturing industry. The data was not available from the firms involved in sow leasing in the same degree of detail as was the procurement contract data. This is in part due to the unwillingness of firms to disclose information regarding particular operations and in part due to their lack of knowledge regarding particular aspects of their sow lease operations. The descriptive analysis of current sow lease programs operated by these firms, along with an analysis of changes occurring in these programs, is presented in Chapter V.

Implications for Industry Organization and Needed Research

The examination of current and potential evolution of sow lease programs and packer procurement contracts suggests several implications for subsector participants. An attempt was made to describe those implications which might particularly affect the structure and performance of the subsector. The competitive and organizational implications for individual participants are then considered within this broader industry organization framework.

CHAPTER II

VERTICAL COORDINATION: MOTIVATIONS AND CONCERNS

Introduction

The literature relating to vertical coordination and vertical integration is extensive. This chapter briefly integrates the literature related to these aspects of economic organization. The central policy questions surrounding vertical coordination relate to the potential control of one participant by another; at the same time, the coordination of decisions and actions is central to the efficient organization of the subsector. This concern about efficiency and control is central to societies' decisions regarding the rules under which the hog-pork subsector is organized. In this chapter, we consider factors affecting the efficiency of different vertical coordination arrangements and the concerns which have been voiced about the potential control of economic activities arising from these vertical coordination arrangements.

Vertical Coordination Within the Firm

Vertical and horizontal coordination are the principle tasks of firm management. The organization of the

factors and processes of production required to produce any product is generally quite complex. The basic organization of firm activities is generally broken down into "stages". French, Sammet, and Bressler define a "stage" as consisting "of all productive services durable and non-durable that cooperate in performing a single operation or group of minor closely related operations" [10-p. 545].

Figure 2.1 illustrates the concept of a "stage" and its relationship to other "stages". The production process begins with the receipt of some material A at stage 1. The material is then transported to another "stage" where another transformation occurs. At various points other materials may be received, then transformed and fed into the main line of production. Some partially completed products may be split off at different stages and given different treatments through a new series of stages so that several types of completed products emerge from the production line.

It is important to note that such a production process involves transportation between stages and temporary storage between stages. This transportation and storage strategically affect the flow of materials through the plant; and thus, they are important parts of the vertical coordination of the several stages in production.

In most instances the inputs at each stage are related to the flow of a single physical volume variable. In

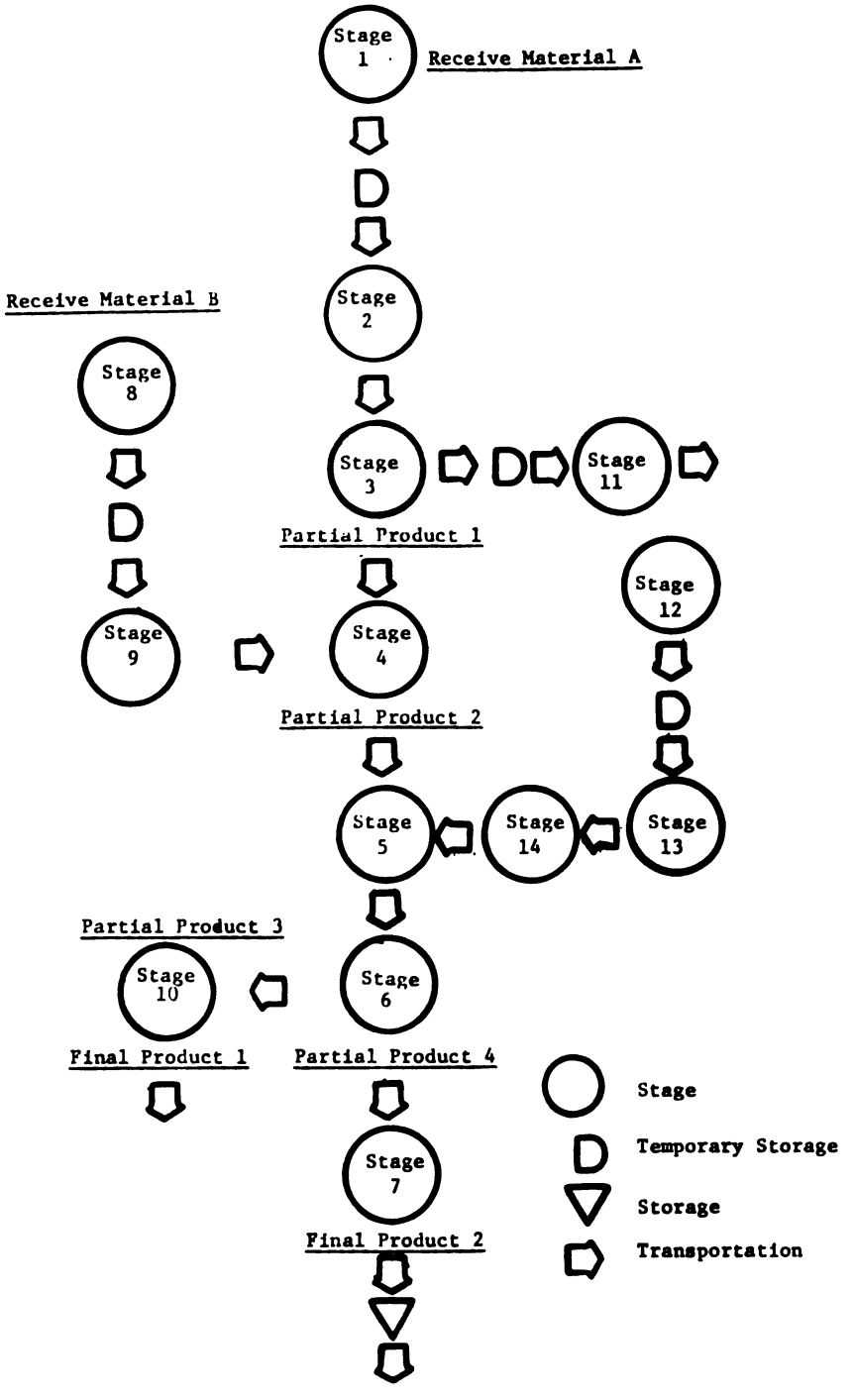

Figure 2.1. Hypothetical Plant Process Flow Diagram.

Source: French, B.C., et.al., Economic Efficiency in Plant Operations With Special Reference to the Marketing of California Pears, Hilgardia, University of California, Berkeley, California, Volume 24, Number 19, July, 1956, p. 546.

the case of hog slaughtering firms, this volume variable is the flow of hogs, carcasses, and partially processed pork through the plant. As the various stages become more directly connected (as transportation and storage between stages are reduced), the flow of materials and partial products becomes highly integrated. Unless rates of output can be varied simultaneously, the impact of such integration is to lessen the possible range of rate variation at any particular stage. In the extreme, this may reduce to virtually a single rate or perhaps several discrete rates [10-p. 597]. It is possible to overcome this inflexibility by operating several plants and by operating the plant for different lengths of time at the same rate.

The organization of firm production stages into specialized functions permits increased productivity. This increase in productivity may be offset by the relative inflexibility imposed by highly specialized stages. The range of possible volumes or rates at which these stages can be efficiently operated may prove a disadvantage to firms facing input or output markets where product flows are highly variable over relatively short periods.

French, Sammet and Bressler consider the problems surrounding harmonizing plant stages to be essential needed modifications of marginalist economic theory. In discussing these modifications, they state:

> Each of the many stages which in the aggregate forms a plant has a cost function. The total cost curves along with certain overall cost components not associated with specific stages form the total cost functions for the entire plant. The integration and aggregation of these stages lead to several problems. First is the problem of finding harmonious combinations of capacities for the units of fixed (but discretely divisible equipment used at each plant stage). This involves finding a common denominator representing the rate of output that minimizes average total unit cost of operation. A second problem is the choice of appropriate types of equipment or the most harmonious technology at each stage and in the aggregate [10-p. 555].

A third problem is that of determining how many stages will be included within the firm. All three of these problems are long run planning problems. A currently operating firm is faced with many other vertical coordination problems which occur due to day-to-day uncertainty. The firm thus faces both long run and short run decisions regarding the optimum vertical organization of their firm.

Improvements in vertical coordination may result in economies to the firm and to society. These economies are associated with: 1) bringing technologically complementary productive processes together in a single plant; 2) elimination of expenses of purchase and sale transactions incident to moving goods from one stage to the next; 3) elimination of profit to customer or supplier firms; and 4) improved coordination of rates, amounts, and quality of output at successive stages [17-p. 26]. These potential economies are not apparent in all forms of vertical coordination but are most evident in those firms which own

successive stages of production (or approach complete "integration"). The economies or cost savings possible through improved vertical coordination are generally thought to offer potential increases in firm profits. There are, however, other possible incentives for firm adoption of new vertical coordination arrangements.

While profits are an important factor affecting firm decisions, they are often not the only factor considered. Absolute firm size, sales volume, market share, and long term firm survival are also possible firm goals. In this context, Logan [14-p. 835] suggests that economies of vertical integration are more realistically considered in a framework of multiple firm goals. Two variables seem most relevant to analyzing new vertical coordination opportunities, return on investment and risk. Logan's proposed framework would emphasize the joint consideration of these two variables as the essential decision making process.

Risk may result from internal as well as external sources. Some examples may include fluctuations in the quantities and qualities of inputs available to the firm, price fluctuations for inputs and outputs, variation in the quantity and quality of output demanded [14-p. 843]. It is clear that reducing risk as a goal is not more important than return on investment, but is sufficiently important to be considered as an additional variable affecting many decisions.

The consideration of risk avoidance or control as an incentive for vertical integration or improved vertical coordination may represent no real resource savings. If the risks and losses of resources attributed to variability in certain input, output, and production characteristics are passed along or shifted to others within the total production system then there is no gain in efficiency from a system point of view. However, if improved vertical coordination of production stages throughout the system results in a saving of total input used or an increase in system output, then a real cost saving has occurred. The determination of which of these has occurred may often depend on the degree of acceptance of the coordination practice and its relative effect on system variance. Thus, real system cost savings may not be realized during the transition from one mode of vertical coordination but may require a more general or system-wide acceptance for realization. This does not mean savings to individual firms at various stages in the system will not occur during the transition. It should be emphasized that these individual firm savings may be losses to others in the system. The desirability of particular arrangements from the perspective of other subsector participants does depend on how savings from the new arrangements are distributed.

Vertical Coordination Between Firms

The boundary separating that activity which is between firms and that activity which is within firms is sometimes unclear. The degree of control of one firm over another may be such that many of the critical management decisions are made by the controlling firm. This lack of clarity does not exist where the customer-supplier relationship occurs through an organized market with competitive bidding. As there is more and more bilateral negotiation over terms and conditions of transfer, the boundaries of control become increasingly confused. The extent of one firm's control over its suppliers or buyers and over the subsector as a whole is the crucial policy issue raised by new vertical coordination arrangements. Issues of efficiency also surround the effect of new vertical coordination arrangements between firms and their effects on the allocation of societies' resources.

Degree of Vertical Coordination

The degree of administrative vertical coordination which exists between firms is often compared to the norm of market price competition. Competitive bidding in organized markets to establish prices and exchange property rights would evidence a low degree of administrative vertical coordination. Ownership and management of two

stages of production[1] would indicate a high degree of administrative vertical coordination. It is important to point out that the degree of vertical coordination as commonly used in reference to firms is very industry-specific. For example, to say that a single meat packing firm is highly vertically integrated and to say that a steel manufacturer is also highly vertically integrated does not generally imply that their relationships with suppliers or customers is similar. Rather this means that compared to other meat packing or steel firms, these firms have more administrative control over suppliers or customers.

Sichel [22] has recently argued that vertical integration or the degree of vertical coordination should be viewed as a "dynamic industry concept". He points out that to have any relevance, the degree of vertical coordination must be measured against some industry norm over time. It is easy to see how what would have been highly vertically integrated poultry firm twenty years ago would be considered normal today.

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[1]For purposes of clarity, vertical integration is considered in this thesis to be a term which describes the particular form of vertical coordination in which a single firm owns and exercises management control over two successive stages of production.

Vertical Coordination in Market Structure Research

Market structure research has been an important part of the study of economic organization for many years. Market structure research concerns itself with inter-firm relationships, how these relationships affect firm's behavior and the economic performance which flows from these relationships. In this context the degree of administrative vertical coordination is part of market structure in its effects on the organization of a market and part of market conduct when firms change their behavior, especially their degree of administrative vertical coordination, in reaction to their rivals.

Vertical Coordination and Competition

The purpose of trying to classify vertical coordination or integration as part of market structure or market conduct is to enable us to more readily see how this aspect of market organization relates to competition and performance. Corwin Edwards [8] attempted to identify possible linkages between internal vertical structure and the external relationships that are relevant to competition and monopoly:

> Each difference in scope between enterprises in the same line of business means that one enterprise has undertaken to coordinate successive activities through administrative decisions, whereas a rival relies upon purchase and sale in the market to dovetail its more specialized performance with that of other more specialized concerns. Alternative types of business organization are thus brought into competition with each other.

> The coordinating function of the administrator is tested against that of the market. Specialized activity is tested against activity less specialized [8-p. 405].

He illustrated the economies possible in certain instances from administrative vertical coordination and discussed its market power effects. Some market power effects are closely related to the relative size of the firm in question; they include price discrimination, greater risk for other firm's operating in thin markets, preferential access to supplies and markets, extensions of monopoly power at one subsector level to another, and the squeezing of independent customers.

Price discrimination may be the result of the exceptional buying power of large vertically integrated firms. This buying power rests in the firm's potential and actual ability to produce its component requirements at an economically efficient scale. This ability gives the firm a threat not available to other firms in negotiating with component suppliers. Because actual or potential integration may give the buyer the advantage of lower input prices, it may give firms an incentive to grow large enough to gain this advantage.

Problems of competition in thin markets arise when there is a limited supply of product or inputs available to non-integrated firms. Edwards cites two problems which occur in these markets:

> First, the disappearance of alternative customers and sources of supply exposes concerns that must continue to rely upon the market to unusual risks. . . . supplies and market outlets are precarious, and the continued operation of a business dependent on them is insecure. Second, this lack of alternatives may have effects upon bargaining power similar to the effects of monopoly or monopsony. If both sides of the market have become thin to the same degree, neither sellers nor buyers have attained predominant bargaining power, and the relation between these groups is likely to resemble that of bilateral oligopoly or bilateral monopoly. If one side of the market has become thin more rapidly than the other, the concerns that have the least adequate alternatives open to them may be unable to protect themselves as to price and quality [8-p. 407].

Preferential access to supplies and markets occurs because the integrated firm has control of supplies through its own contracted production when other firms do not. Thus, in short supply situations the vertically integrated firm has access to supplies; and in times of long supply, it reduces its outside purchases of inputs. The vertically integrated firm thus transfers the impact of demand fluctuation to its independent rivals. Edwards says,

> Thus either boom or depression permits a vertically integrated concern, by preferring self-supply to purchase and sale in the market, to transfer risks to independent enterprises, enhance its own integration, and reduce the relative importance of the non-integrated [8-p. 408].

Extensions of monopoly power occur when a firm which possesses monopoly power at one level extends that power to earlier or later levels through vertical integration. The firm can favor itself over its independent suppliers or customers without fear of competition.

The squeezing of independents occurs when the integrated concern charges a low end product price relative to the price of inputs. The firm chooses to take a lower margin on the final stage while it takes the same margin on earlier stages. This reduction in margin at the last stage is often impossible for independent competitors since they operate no earlier stage at which to make up thier possible losses.

The conclusions of others, including Mueller, Caves, and Kaysen and Turner [18, 6, 13] are basically the same, vertical integration associated with large relative size may have detrimental effects on market competition and ultimately on market performance. It is important, I think, to emphasize the potential as opposed to actual nature of this conclusion. Each situation involving vertical integration must be examined closely to determine the extent to which these possible results have occurred.

The other important point to note is that the detrimental effects possible from large relative size combined with vertical integration may be detrimental to competition long before the power gained by the firms is substantial enough to give them complete control over price. This combined with the incentive for further integration and the tendency toward increasing market power makes these size-integration relationships important in industries which have not yet become ologopolistic or monopolistic in structure.

While the degree of control involved in ownership integration is generally considered greater than the control under other coordination possibilities such as contracts, it is possible for contractural coordination arrangements to have the same economic advantages to firms and the same potential for detrimental effects to competition. Crucial dimensions in contract vertical coordination are relative firm sizes, degree of competition among suppliers or customers, firm goals, management abilities, profitability and financial stability, applicable legal regulations, and other factors influencing relative bargaining power. These relationships will determine the extent of control of one party over another and the cost in terms of contracted rewards necessary to achieve a certain level of performance. The terms of the contract as affected by bargaining relationships will also indicate the distribution of contract costs and benefits and the degree of administrative control involved. Thus some contracts may only involve very general agreements while other contracts may involve detailed specifications as to quantity, quality, timing, and price of delivery. It is clear that some contracts are distinctly different in coordination potential from the internal communications of the vertically integrated firm. In other cases contract specifications may produce closer vertical coordination than that which exists between vertically related divisions of a single firm.

Vertical Coordination and Economic Performance

In the final analysis vertical coordination is an important component of the overall economic performance of our economy. Returning to a market structures framework we define economic performance as "the strategic end results of market adjustments engaged in by sellers and buyers" [2-p. 340]. In simpler terms this means how well does a sector of the economy accomplish the overall goals society sets out for it.

For the Hog-Pork subsector the goals set by society could be looked at under the following categories:

Efficiency: Society expects resources used in production of pork products to be used with as little waste as possible. Society also expects that pork production decisions as to quantity and quality of products produced will be responsive to consumer demands.

Equity: Society expects that participants in the Hog-Pork subsector will share gains or losses from system adjustments in proportion to their contribution to these gains or losses.

Stability: Society expects a reasonable degree of stability in the quantity and quality of pork products produced. While reasonableness may be difficult to define, it implies the absence of wide daily or weekly fluctuations in price or availability and the absence of rampant price inflation.

Progressiveness: Society expects participants in the Hog-Pork subsector to take advantage of new technology which increases the efficiency of pork production and marketing and to make available to consumers new and improved pork products.

While these categories are not exhaustive in their description of the possible goals which society has for the Hog-Pork subsector, they probably do represent the major areas of concern.

Vertical coordination arrangements can affect economic performance in several ways. Improved vertical coordination has the following potential benefits in terms of the performance dimensions listed above:

1. Improved vertical coordination can result in savings of scarce resources through better timing and synchronization of production processes within and between firms.

2. Improved vertical coordination can result in more accurate and more rapid communication of consumer preferences to participants in the Hog-Pork subsector. Improved vertical coordination implies the transfer of information in addition to market prices which may increase the accuracy of producers decisions.

3. Improved vertical coordination may produce a more stable flow of products to the marketplace by reducing the time required for changes in consumer demand to be communicated to producers.

4. Improved vertical coordination may improve market stability by reducing the amount of risk and uncertainty facing producers because of increased information.

5. Improved vertical coordination may increase the speed at which producers adopt new technology and develop new products because of the more rapid dispersion of information.

6. Improved vertical coordination may result in more or less equitable transfers of products between subsector participants, depending on the nature of the arrangements and the relative strength of the participants.

These potential benefits of improved vertical coordination are not costless. The development of new and improved methods of vertical coordination between and within firms requires substantial time, physical resources, and energy. We have also seen that some efforts to improve vertical coordination through administrative control can be detrimental to competition to such an extent that any performance benefits are lost.

In order to examine the effects of packer procurement contracting and sow leasing on the performance of the Hog-Pork subsector it is necessary to determine what firms using these coordination arrangements see as the benefits and costs of these arrangements. Our earlier discussion pointed out that these arrangements may result in technologically more efficient production, reduced transactions costs, elimination of profits to suppliers or customers, more accurate coordination of rates, amounts, and quality of output, and reduced input prices or improved product prices because of changes in competitive relationships. At the same time these contractural attempts at improved vertical coordination could result in price discrimination, increased risk for firms operating in thin markets, preferential access to supplies and markets, extensions of monopoly power, and squeezing of independent customers.

It is in the light of these potential advantages and disadvantages of increased administrative vertical

coordination through packer procurement contracting and sow leasing that we will proceed in a more detailed analysis of current experiments in these areas.

In order to establish the setting in which these new vertical coordination arrangements are being attempted the next chapter gives a brief overview of the Hog-Pork subsector.

CHAPTER III

THE HOG-PORK SUBSECTOR

The hog-pork subsector is a system composed of specific production, processing and distribution stages linked through various vertical coordination systems. The vertical coordination arrangement linking most of the stages or industries in the hog-pork subsector is an open market where prices are arrived at through competitive bidding. The prices arrived at in this way serve several functions. First, prices allocate resources used in production and marketing. Secondly, prices allocate or ration goods and services among consumers. Thirdly, prices serve to balance the forces of demand and supply. Lastly, prices produce and allocate income payments among various recipients. The traditional market pricing system in the hog-pork sub-sector coexists with the system of physical functions and stages necessary to produce and market pork products. These systems are outlined in Figure 3.1 which shows the various vertical stages of production and the markets linking them. To illustrate some of the physical and pricing relationships which have existed between the various stages, let us consider more thoroughly the vertical sequence from feed manufacturing through retailing pork products.

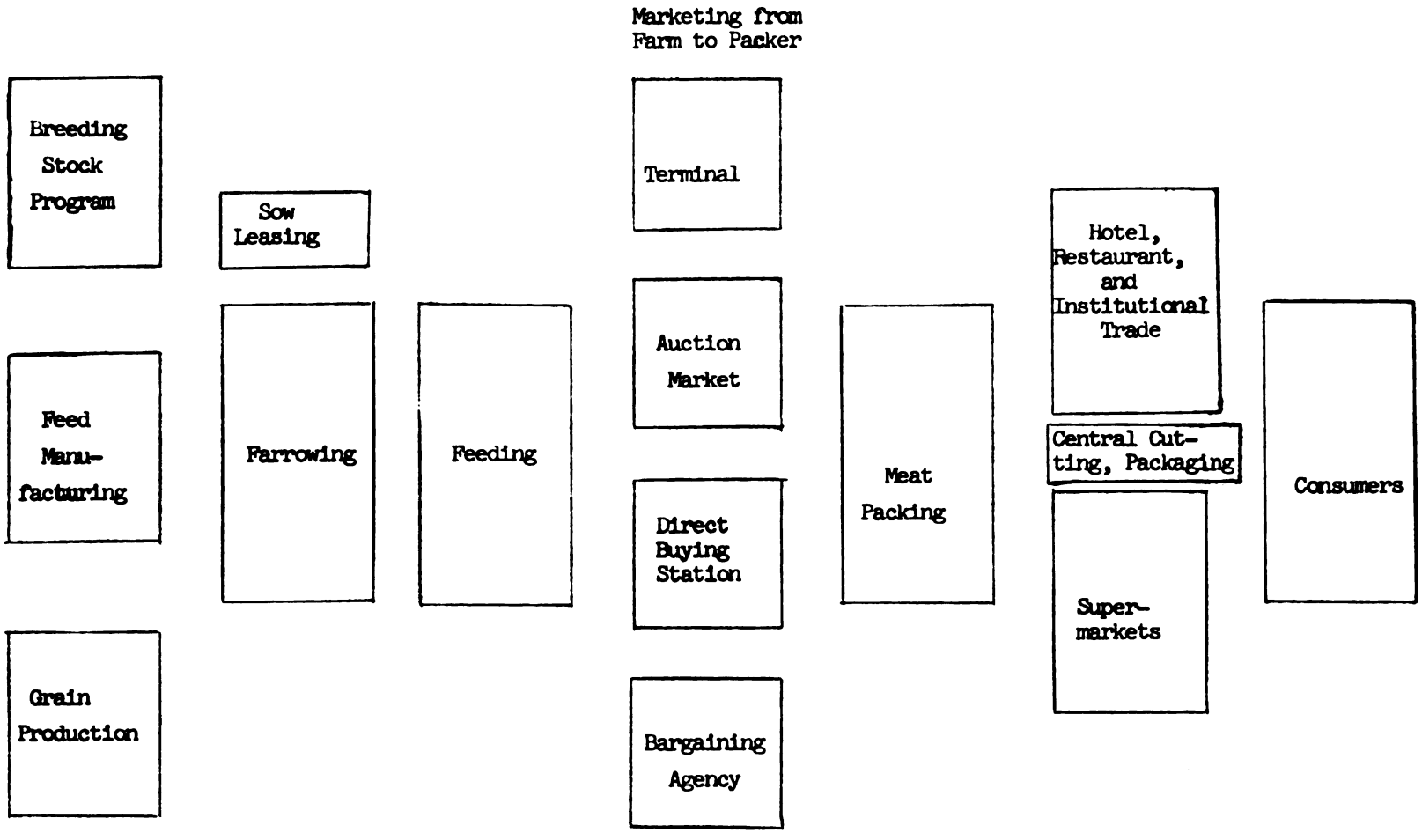

Figure 3.1. Major Activities in the Hog-Pork Subsector

Feed Manufacturing and Distribution

While traditional industry studies would exclude feed manufacturing from a consideration of the pork industry, the concept of a subsector implies the examination of all vertically related activities in the production of pork. Corn is still the main ingredient in many hog feed rations, but the use of protein supplements, feed additives, and complete formula feeds has grown as their contribution to efficient conversion of feed to pork has been demonstrated. This has resulted in gradual growth of the feed manufacturing industry.

In 1967 the value of shipments of prepared feeds was $4,796,900. This feed was produced by 1,835 firms throughout the United States. The four largest feed manufacturers accounted for 23 percent of the feed shipped while the fifty largest firms accounted for 58 percent. For the four largest firms this was an increase in market share from 22 percent in 1958 and 19 percent in 1947 [27-p. 9-10].

In 1967 feed manufacturers produced over eleven million tons of complete feed. Over two and one-half million tons of complete swine feed were produced. There were over six and one-half million tons of feed supplements and concentrates produced in 1967. Nearly half of these (3,008,000 tons) were for swine [26-p. 20D-19].

Data from a preliminary report of a feed industry study by the U.S.D.A. show that production of primary formula feed for hogs accounted for 14.2 percent of total feed produced by mills producing 1,000 tons or more. This formula feed for hogs was accounted for by 8.0 percent complete feed, 5.9 percent supplement and 0.3 percent premix [28-p. 14].

Data from this same study indicates that there is substantial excess milling capacity in the feed industry. Using a base of a forty-hour week for forty-eight weeks firms in the one-thousand to ten-thousand ton range were using less than one-fourth of their capacity. Larger firms (over 100,000 tons) were using 150 percent of capacity on the forty-hour base [28-p. 5].

Table 3.1 shows that for the major hog producing regions there was substantial excess capacity when production for 1969 was compared to rated capacity in that same year.

This relatively high degree of excess capacity indicates that many feed firms could produce substantial additional feed tonnage without adding additional facilities. This implies that the marginal cost per ton would be low. Thus firms with excess milling capacity have an incentive to increase feed sales and production through a variety of promotional devices. These promotional efforts have sometimes involved the offer of services such as feed delivery,

ration formulation and nutritional consulting, and other management services in addition to feed.

TABLE 3.1

FORMULA FEED PRODUCTION AND MILLING CAPACITY
SELECTED REGIONS OF THE UNITED STATES
1969[a]

Region	Formula Feed Production	Milling Capacity	Production
	tons	tons	Percent Of Capacity
Lake States	8,683,432	11,183,760	77.6
Corn Belt	20,167,202	29,060,928	69.4
Northern Plains	8,656,915	12,875,664	67.2
Total	37,507,549	53,129,352	70.6

[a]For firms producing 1,000 tons or more

Source: The Formula Feed Industry in 1969, A Preliminary Report, Economic Research Service, U.S.D.A., ERS - 494.

Formula feeds are sold directly and through local dealers to hog feeders and breeding firms. These firms are generally faced with several alternative sources of feed ingredients, mixing, and grinding services. The market for formula feeds consists of different pricing arrangements depending on the feed firm, the local dealer, and the farm firm in question. For many small scale hog producers, the

purchase of feed is a direct transaction with the price of feed ingredients, mixing and grinding services being established by the local dealer. The price the farmer pays is usually subject to discounts for cash payment or charges for additional services, such as financing, mixing and grinding. Larger scale hog producers may be able to negotiate directly with feed companies and gain further discounts for large-scale purchases and direct delivery of feeds.

In describing the system of feed pricing in Illinois, Bursch [4-p. 13] states that where differential pricing systems were found to exist, they could be viewed as related to selling cost differences, at least to some degree. Pricing of services varied a great deal between dealers, while feed processing and delivery of processed feed carried a charge in addition to feed price in nearly all cases, prices of formula feed included delivery. Credit was priced with either a cash discount, a service charge, or both by over 75 percent of dealers interviewed. Technical assistance and informational services were rarely priced separately but were considered an integral part of the product.

Bursch suggested that differential pricing schemes which now exist afford livestock producers opportunities for economies in feed purchasing [4-p. 17]. These economies

are based on technical economies achieved by feed manufacturers and dealers as the result of large purchases. Whether these purchase economies are great enough to stimulate increased size of agricultural production units is not clear.

Competition among feed manufacturing firms at the local level is very service oriented. The homogeneity of many major feed ingredients leads to a high degree of substitutability between feed products. Manufacturers have reacted to this feature by developing complete formula feeds with unique combinations of ingredients. They have also attempted to differentiate their retail outlets based on services available along with feed products. These services may include many forms of managerial assistance, nutritional consulting, veterinary consulting, financing, delivery, and other services. The high degree of service competition has set the stage for some of the new vertical coordination arrangements being offered. Feed firms who have previously helped farmers to locate breeding stock or feeder pigs have a potential market for their own livestock programs.

Swine Production

Swine production of farms involves the husbandry of live swine including breeding animals, piglets, and market barrows and gilts. While the care and feeding of all these

swine classes generally takes place under the management of a single farm firm, there are many farm firms specializing in the production of either feeder pigs, breeding animals, or market animals.

On farm production of swine was carried out by about 900,000 producers in 1970 as opposed to 3 million producers in 1950 [30-p. 4]. The number of pigs on farms ranged from 87,563,000 in 1966 to 102,270,000 in 1971. While these figures represent the boundaries of recent inventory fluctuations, there has been a slight upward trend in pig production in the last twenty years. A recent projection by the U.S.D.A. indicates that there could be as few as 500,000 hog production units producing pig crops of 90 to 110 million head annually by 1980 [30-p. 4].

There has been a trend toward separating farrowing and feeder pig producing units from finishing units. In 1969 seventeen percent of all hogs and pigs sold were sold as feeder pigs [30-p. 5]. Additional evidence of the importance of feeder pig production is the recent development of new marketing arrangements for sale and pricing of feeder pigs.

Hog production units have continued to be concentrated in the Corn Belt, with the 10 major corn belt states producing about 75 percent of the United States pig crop. The significant seasonal pattern in hog production has smoothed somewhat in recent years; the distribution of

farrowing is now: December to February, 22 percent; March to May, 31 percent; June to August, 24 percent; and 23 percent during September to November [30-p. 5]. Efficiencies in hog production have come through improved genetic characteristics which have increased litter sizes, resulted in better feed conversion rates, and improved the yield of meat products. Disease remains a major problem in hog production and appears to be a deterrent to very large production units. The incidence of disease in a single production facility may wipe out the firm's entire herd. This has resulted in some large firms having several separate confinement operations on a single farm to increase firm scale without the risk of being wiped out in a single season [30-p. 8].

Hog Markets

Trading in breeding swine is relatively unorganized compared to slaughter hog markets. The unique nature of the animals and, thus, the inherent product differentiation along with concern about disease make large volume markets somewhat infeasible. This has resulted in a market and pricing system which consists of auctions held by breed associations and/or individual breeding stock producers, directly negotiated sales between individual farmers, and some (relatively new) attempts to sell or lease breeding stock in large quantities.

The uncertainties that surround the question of quality of breeding animals makes the pricing of these animals extremely imperfect. The lore that surrounds the different breeds and the breeding animals selection and evaluation process complicates efforts to objectively evaluate an animal. Precise prediction of the animals' worth in production is quite difficult and the subject of many arguments within the breeder groups; this clouds accurate pricing of breeding animals. Further, the prices at which breeding animals sell are clearly related to the prices of slaughter hogs; however, the exact nature of this relationship is clouded by the lack of information on breeding stock characteristics and prices over a fairly long period of time.

There are only a few large-scale markets for feeder pigs. These have been started relatively recently, as have U.S.D.A. grades for feeder pigs. In general, feeder pigs are marketed through auctions. In most cases, these auctions are of the ascending bid type, although there is one system in Missouri which is of the Dutch or descending type. There are also some contractual arrangements for feeder pig sales; these tend to be individually negotiated. The market for feeder pigs is currently evolving rapidly, accompanied by a wide range of marketing arrangements and much experimentation. This makes it difficult for the farmer or researcher to establish what the current marketing methods

and market prices are, either from the buyer or seller side of this market. Prices tend to be determined without substantial market information available about current supply and demand conditions, prevailing prices, and premium and discount patterns.

The movement of finished hogs from farm firms to slaughterers and processors is accomplished through several methods. These include direct sales, auction market sales, terminal market sales, sales to local dealers, and sales through producer marketing agencies. In 1950, 40 percent of the hogs purchased by packers moved through terminal markets. In 1950, 40 percent of the hogs purchased by packers moved through terminal markets. By 1970, only 17 percent of the hogs purchased by packers moved through terminal markets; 69 percent were purchased direct or through country dealers, and 14 percent through auctions [30-p. 6].

Meat Packing

Hog slaughter is concentrated in the Corn Belt in close proximity to hog production. This reflects the lower costs of shipping carcasses and primal cuts (rather than live animals) very long distances. Iowa was the leading state in hog slaughter in 1971 with 25.2 percent of total U.S. slaughter. More than half of all hogs slaughtered were slaughtered in the six leading states: Iowa, Minnesota, Illinois, Ohio, Indiana and Pennsylvania [30-p. 6].

There has been decreasing concentration in hog slaughtering nationally. The four largest firms accounted for 41 percent of the slaughter in 1950 and by 1970 the four largest firms accounted for 21 percent [36-p. 7]. Concentration of hog procurement is more relevantly measured at the state than national levels because high transport costs limit the market for live hogs to fairly localized areas. In six of the twelve most important hog producing states (Kansas, Minnesota, Missouri, Nebraska, South Dakota and Wisconsin), the four largest buyers buy more than 90 percent of the hogs. In Indiana and North Carolina the four largest buyers buy more than 75 percent. In Georgia and Illinois, the four firm buyer concentration ratio is more than 65 percent while in Iowa and Ohio this same ratio is less than 50 percent.

Meat packers buy hogs from several sources using different pricing procedures. Hogs purchased at the packer's plant, buying station, or through local dealers are generally purchased based on quoted prices with differentials for various weight categories. These quotes are established on a daily basis and are usually coordinated through a central procurement officer who tries to balance dressed meat demands from major consumer market areas with supplies at their plant and market locations. Packers also buy hogs through terminal markets where their buyers (either salaried or order buyers) negotiate with commission men in

competition with other packers and packer order buyers. Packers also buy hogs through auctions where prices are determined by open competitive bidding.

As we can see from the above, farmers have a vast array of outlets for their hogs, although not all types of outlets are available in all areas. It is often difficult for farmers to assess the actual market opportunities open to them and the costs of the alternatives. The U.S.D.A. has made substantial efforts toward keeping farmers informed of hog prices through their market news service. Even with this news service available, it is still a difficult task to keep informed about prices available from alternative sources. Another confusing aspect of pricing at the farm level is the continued predominance of live average weight pricing. This method of sorting hogs into relatively uniform weight groups, weighing the sorted lot, and establishing their value based on the average weight seldom accurately determines the real value of the hog. Carcass grading or grade and yield is a system where hogs are identified by tattoo prior to slaughter and the carcass is graded and yield calculated after slaughter. This system can much more accurately reflect value of the hog in terms of final cuts, but this system has been slow to catch on among farmers and packers. The National Commission on Food Marketing found that in 1964, the four largest packers were buying less than one-tenth of one percent of hogs on a

carcass basis. The packers ranking five through ten in size bought 7.4 percent of their hogs on a carcass basis and overall the top 40 packers bought 2.6 percent of their hogs on a carcass basis [20-p. 135]. While these percentages have increased slowly, they are still very low (perhaps 10 percent) in terms of the desirable goal of accurate pricing of live hogs.

There have been limited efforts by the National Farmers Organization and other farmer bargaining groups to establish contract selling arrangements for their farmer members. These efforts have had varying degrees of success. The pricing provision in these contracts have generally related to some market price reported by the U.S.D.A. market news service, often with premiums or discounts for hog quality or meeting specified delivery schedules.

After slaughter, the hog carcass is transformed into various fresh or processed pork products. The hog carcasses are broken down into primal cuts which are further trimmed, ground, smoked, and/or mixed with other meats to arrive at fresh pork, bacon, ham, sausage, hot dogs and other pork products. These processes take place under the management of several different kinds of firms and through various marketing channels before appearing at the retail counter or in the restaurant or institutional kitchen.

It is clear from Table 3.2 that the largest meat packers sell a major portion of their fresh and frozen pork

TABLE 3.2

PERCENTAGE OF FRESH AND FROZEN PORK SOLD BY SELECTED GROUPS OF FIRMS TO SPECIFIED CUSTOMER CLASSES 1964-1965

Firm Group	Top 10 Food Chains	15 Largest Wholesalers	Mass Feeding Institutions	Manufacturers and Processors	U.S. Government	Exports	Other
4 largest meat packers	9.0	0.2	1.7	28.7	0.7	0.7	59.1
Second 4 largest meat packers	15.1	1.4	1.1	29.5	0.6	1.8	50.6
Other meat packers with less than 1 million pounds of sales per month	20.8	2.5	4.7	9.8	12.3	0.1	49.8
Meat processors with 1-5 million pounds per month sales	9.6	—	3.2	38.7	1.8	—	46.7

Source: National Commission on Food Marketing, Technical Study No. 1, Organization and Competition in the Livestock and Meat Industry, June 1966, p. 51, Table 5-8.

to large food chains and to manufacturers and processors. Smaller meat packers seem to depend less on manufacturers and processors and more on food chains. The smaller packers with sales of one million pounds of meat or less per month rely more heavily on sales to the government and mass feeding institutions. Meat processors also rely on sales mainly to food chains and manufacturers and processors.

A similar situation exists for sales of cured hams, picnics, and bacon [20-p. 52]. In this case, the four largest packers sold 17.6 percent to the 10 largest food chains, 5.0 percent to mass feeding institutions, 2.8 percent to the U.S. government and 2.8 percent to manufacturers and processors. The meat packers with sales under one million pounds per month sold 34.9 percent of cured products to the ten largest food chains, 5.9 percent to the U.S. government, 4.4 percent to mass feeding institutions and 2.6 percent to manufacturers and processors. Meat processing firms with under 5 million pounds of monthly sales sold 36.8 percent of cured products to the ten largest food chains, 17.3 percent to mass feeding institutions, 1.8 percent to the U.S. government and 1.5 percent to manufacturers and processors. In contrast to meat packers who exported less than one percent of cured product sales, meat processors exported 10.5 percent of their cured hams, picnics and bacon.

The complexity of the channels of distribution for the meat industry is pointed out in a study done by McKinsey and Company for the National Association of Food Chains and the American Meat Institute. They cite the following as examples of practices which make meat distribution complex.

1. Branch houses distributing to jobbers who distribute to other jobbers who in turn sell to retailers.
2. Sausage manufactured at all levels of the distribution system.
3. Packers competing at the retail level with wholesalers selling the packers own beef and pork.
4. Plants competing with their own branch houses.

They conclude that these practices lead to duplication of effort and add significantly to the cost of distribution, and that distribution practices in the meat industry are still geared largely to the requirements of the grocery industry of twenty-five years ago [19-pp. 40-41].

Pork Retailing

On the consumer side, an examination of some data from the U.S. Department of Agriculture 1965-66 household consumption survey (Table 3.3) shows that the majority of pork consumed was in cured form. Further, it is clear that ham, bacon, and pork chops are by far the most popular products, accounting for a combined 57.7 percent of weekly household pork consumption. Fresh hams and loins accounted for only 7.6 percent of weekly consumption, while fresh

sausage accounted for 10.5 percent of weekly consumption. These statistics show fairly clearly that pork is consumed mainly after either grinding and blending, as cured ham or bacon, or in the traditional form of pork chops.

TABLE 3.3

AVERAGE PORK CONSUMPTION PER WEEK FOR UNITED STATES URBAN HOUSEHOLDS 1965-1966

	Pounds Per Household Per Week	Percent of all Types
Fresh Pork		
Chops	.55	17.0
Ham	.09	2.7
Loin	.16	4.9
Sausage	.34	10.5
Other	.36	11.1
Total	1.50	46.4
Cured		
Ham	.61	18.8
Bacon	.71	21.9
Salt Pork	.08	2.4
Canned/Cooked	.12	3.7
Other	.21	6.5
Total	1.73	53.5
All Pork	3.23	

Source: Food Consumption of Households in the United States, U.S.D.A., Agricultural Research Service, Household Food Consumption Survey, 1965-1966, Report No. 12, p. 23, Table 8.

At retail, pork prices fluctuate in response to consumer demand and the relative supply of various cuts of pork. Pork does not seem to be used as a "special" item by meat retailers as often as beef. This is perhaps due to its limited importance in consumers' menus and, thus, the more limited drawing power of pork specials.

Retailers purchase pork from a number of sources. This market for dressed meat at wholesale has been called the "most significant and sensitive" in the livestock meat economy [20-p. 55]. Buyers of dressed meat rely on either direct negotiation or formula pricing to establish the price of sale. The formulas are usually based on quotations as reported in the "National Provisionner Daily Market and News Service" commonly known as the "yellow sheet". This daily commercial market report quotes end-of-day car lot prices f.o.b. Chicago. In the National Commission on Food Marketing study, packers indicated that 41 percent of their sales of fresh and frozen pork and 29 percent of their sales of cured hams, picnics and bacon to their five largest customers were on the basis of a formula tied to a quotation [20-p. 58]. Many packers also issue periodic price lists which may serve as starting points for specific price negotiations but are seldom representative of actual sale prices. Other major meat buyers shun formula pricing and rely on long-term, close contacts with their suppliers, negotiating each sale separately.

Conclusion

It is clear that the hog-pork subsector is a highly complex system of product and information flows. The complexity of this system creates the potential for misunderstanding the price signals which flow through the system. The misunderstanding of price signals has allowed the cyclic swings in hog volume and prices to persist. The slow evolution away from producing the "fat hog" long after consumers had tried to indicate a preference for lean pork also is evidence of misunderstanding. In attempts to improve the understanding or coordination between themselves and hog producers, meat packers and feed manufacturers are experimenting with procurement contracting and sow leasing.

CHAPTER IV

PACKER PROCUREMENT CONTRACTING: A CASE FIRM COMPARATIVE ANALYSIS

Live animal procurement is an extremely important part of the meat packing business. Since raw material costs constitute about three-fourths of the sales dollar, profit margins are dependent upon efficiency in acquiring live hogs. Live hog purchases have been estimated to be 85-90 percent of raw material cost [16-p. 166].

As was pointed out earlier, meat packers have several channels through which they purchase hogs. The importance of each source of hogs varies between packers and over time, but a rough estimate of the relative importance of the various sources is shown in Table 4.1.

While auctions and direct buying channels have increased in importance, terminal markets have declined. This decline in terminal marketing has generally meant an increase in direct contact of hog producers and meat packers. It has also led to some suspicion among market participants that terminal market prices are no longer accurate indicators of supply and demand conditions.

Competition among meat prackers for hog supplies is fairly localized due to the high cost of transporting

live animals. Most slaughter livestock is sold out of first hands by the producer to a buyer located within 50 to 100 miles.

TABLE 4.1

PERCENT OF SLAUGHTER HOGS SOLD THROUGH VARIOUS OUTLETS SIOUX CITY AND UNITED STATES

	Sioux City[a]		U.S.[b]	
Outlets	1957	1967	1960	1964
Terminal Markets	49.2	31.5	30.3	23.8
Auctions	10.8	11.3	8.7	13.1
Packing Plants (Direct)	11.3	11.9	61.0[c]	63.1[c]
Buying Stations	23.8	35.5		
Dealers and Others	4.9	9.8		

[a]Source: NCR Research Publications 199, Long-run Adjustments in the Livestock and Meat Industry, p. 53.

[b]Source: National Commission on Food Marketing, Tech. Study No. 1, Organization and Competition in the Livestock and Meat Industry, p. 3.

[c]Includes buying stations, dealers and others.

Most meat packers can be said to be purchasing slaughter hogs in markets where their rivals are readily identifiable. These packers face a fluctuating supply of hogs on daily, weekly, seasonal and cyclic bases. These fluctuating hog supplies cause packers considerable uncertainty, expecially in short range planning.

From Table 4.2 the seasonal fluctuation, as well as the annual fluctuation in potential capacity utilization, is obvious. These fluctuations reflect in part the seasonal farrowing pattern discussed earlier, as well as some lags due to farmers' variations in feeding efficiency. The unused slaughter capacity illustrated in Table 4.2 indicates a potential for vastly increased slaughter volume without addition of new equipment and facilities.

Major variable production factors in meat packing are raw materials and labor; and labor is somewhat restricted by union agreements. Many labor contracts in the meat packing industry contain the "thirty-six-hour rule", which generally requires the packer to notify the union of its labor requirements for the coming week. Once the packer specifies the number of workers he will need for the coming week, he is required to pay those workers for at least thirty-six hours of work whether they are needed or not. Thus, the packer is faced with calling in too many workers and under-utilizing them or calling in too few workers and being forced to pay these workers overtime if supplies exceed his estimates.

These labor regulations make labor a relatively fixed component in the production process. Since the packer is limited in varying the amount of labor used (or paid for) in response to variation in raw material supplies, this makes the accurate prediction or control of raw material supplies critical to plant profitability.

TABLE 4.2

FEDERALLY INSPECTED HOG SLAUGHTER
AS A PERCENT OF RATED CAPACITY
1964-1965

	Percent	
Month	1964	1965
January	83.4	71.3
February	70.7	62.5
March	77.0	77.0
April	77.7	68.4
May	65.6	55.6
June	60.4	55.6
July	59.1	52.2
August	58.0	56.0
September	67.5	64.5
October	81.6	63.9
November	78.5	64.8
December	79.7	59.0
Year	71.6	62.6

Source: National Commission on Food Marketing, Tech. Study No. 1, Organization and Competition in the Livestock and Meat Industry, p. 3.

Raw material procurement and the variability in raw material supplies presents the packer with four main problems:

1) how to get the most raw material for his procurement dollar given different markets, different grades and weights of hogs, and different product transformation rates from these various grade and weight categories;

2) how to best utilize available plant and equipment;

3) how to utilize labor most efficiently with variable supplies; and

4) how to match raw material quantities and qualities, with prevailing product demands at reasonable profit margins.

Each of these problems represents a potential for increased firm profits. The solutions to these problems all result in firm acquisition of the desired quantities of live hogs. Several solutions are possible. First, firms can use their current market sources and adopt pricing policies which reward producers for specific delivery times and weight and grade specifications. It may be difficult for firms to alter substantially short run quantities or qualities by offering high or lower prices, given the time lag required for farmers to adjust their hog production schedules. However, short run price policies may result in shorter or longer feeding by farmers attempting to market at higher prices. It may also be difficult for firms to indicate with prices their desire for specific types of animals given the traditional average weight pricing system

which fails to accurately reflect quality price relationships. Some firms have gone to a carcass grade and yield pricing system to avoid this problem. Here again, firms are relying on a greater use of supplemental communication with the producer to indicate their preference.

Secondly, firms could enter into production of hogs themselves. In this way, they could presumably modify the fluctuations in the quantity, quality, and timing of hogs from their traditional sources through their direct control of marketing from their herds. This alternative has been tried by some firms; but limited management experience in hog production, substantial capital investment, adverse public opinion and other factors have discouraged firms from this alternative.

Third, meat packing firms could enter into contracts with hog producers or marketing intermediaries which specify the timing, quantity and quality of hogs to be supplied. The degree of control the firm exercises over its supply depends both on contract terms and performance of the contractor in meeting those terms. The contract alternative, however, supplies a potential advantage over the pure pricing alternative. It allows the firm to exercise an increased degree of control over its raw material supply, and it provides the mechanism through which supplemental market information can be transferred.

It will be the purpose of the remainder of this chapter to explore the evolution of contracting for hog supplies. First, procurement contracting will be examined in relation to a single case firm and then in relation to several other firms and the subsector as a whole.

Procedure

In order to gather empirical data on the way in which meat packers had actually used contracting arrangements for hog procurement, the following procedure was followed: First, the results of an earlier pork industry survey were reviewed in consultation with one of the major investigators. In reviewing these results, it was determined that five major meat packing firms had at least limited experience with procurement contracting of some type. Because of the depth of information required to evaluate the incentives and disincentives for procurement through contracts, it was decided that a case analysis approach was required. It was also decided that it would be desirable to supplement the data gathered in the case analysis with a comparison survey of several large meat packers who also had some experience with contracting.

The case firm was selected from the five firms surveyed earlier because of the depth of experience in procurement contracting and the indicated willingness of this firm to cooperate in further research. After data

was collected from the case firm, a survey using personal or telephone interviews of the remaining four packers was conducted.

Profile of the Case Firm

The case firm was among the top eight meat packing firms in the United States in 1964. It is a part of a conglomerate firm in the food industry listed on the New York Stock Exchange and among Fortune's list of 500 largest corporations. The case firm operates livestock slaughter facilities throughout the United States which kill and process hogs, cattle, and sheep.

The case firm purchases hogs through a central manager of hog procurement. The central manager consults daily in joint telephone conversations with plant managers and hog procurement managers at each plant to balance the corporate demand for pork products with supply and demand conditions at the several plants. While these conferences occur on a daily basis, the central hog procurement manager and the plant managers are also responsible for longer range planning for hog procurement. This generally consists of evaluating various sources of hogs, including their own buyers, evaluating the various pricing systems for hogs which they employ, and planning and evaluating any longer term procurement commitments which the firm or its plants may make.

The central manager of hog procurement is responsible to a vice-president for pork operations. This vice-president is responsible for both sales and procurement and exercises responsibility for coordinating these functions.

Interviews with the vice-president in charge of pork and the manager of hog procurement were conducted to gain data on contract procurement. It should be pointed out that while the experience with procurement contracting by the case firm was broad, the particular contract arrangements provided only a small portion of total firm supplies.

Potential benefits from contract procurement as seen by case firm management were: 1) possible savings through new pricing arrangements, 2) possibilities for procurement leverage if part of their raw material supply was guaranteed through contract, 3) possible savings gained by replacing some of the more costly current sources of hogs with more efficient contracted hogs, 4) possible improvements in scheduling fixed and labor facilities at various plants, 5) improved hog quality and more equitable payment procedures, 6) possible merchandising of specific high quality products when there was an increase in the availability of high quality raw material, and 7) better service to farmer suppliers.

Case firm managers were not as specific in their estimates about possible costs of operating contract

programs. They recognized that there were some additional administrative and enforcement costs associated with contracting. A major concern was the potential for cost increases due to price formulas which guaranteed prices to be paid producers over time. It was believed that the number of buyers at a particular plant was relatively fixed by plant volume within a fairly broad range; thus the buyers needed by serve the hog contracts would be serving other sources of hogs if the contracts did not exist. Case firm personnel believed, based on past experience, that producer groups tended to over-value the contribution of contract procurement arrangements and guaranteed delivery times. This, they said, resulted in requests for pricing premiums unjustified by product or delivery characteristics, producing a situation where further contracting became undesirable.

Management also saw some internal firm obstacles to contracting for hogs. This resistance took two forms. Lower management personnel sometimes were unwilling to take the responsibility for price commitments made by those above them, and resisted efforts on the part of the corporate procurement manager to negotiate contracts with producer groups which would involve their plants. Some buyers at the plant level resist contracting because of the increase in administrative duties associated with contracts compared to more traditional sources of hog supply. Management above

the corporate vice-president level seemed to resist contracting because of its relative inflexibility. The general need for flexibility is deeply ingrained in many levels of the meat industry. The day-to-day fluidity of prices and supplies has produced a situation where time horizons are short and flexibility commands a premium. This produces an atmosphere where the evaluation of a particular procurement strategy by corporate management may weigh heavily the possibility of a disastrous quarterly loss.

Contract Arrangements Attempted by the Case Firm

In most of the contracts attempted by the case firm, the primary objective has been to facilitate desired producer sales relationships while reducing procurement costs. These arrangements have not been offered at all of the firm's plants, but on a selective and situation-specific basis.

"Futures Contract"

The case firm's largest volume procurement contract is geared to the futures market. Unlike the other contracts, this contract is offered by the case firm at several of its plants in slightly different form. In this contract, the farmer agrees several months in advance (possibly at the time he places feeder pigs on feed) to deliver hogs to the case firm during a designated month. He promises to give the case firm a one-week notice prior to delivery. The

case firm in turn agrees to pay the farmer the Chicago Mercantile Exchange live hog futures contract price for that delivery month, plus some market adjustment based on the relationship between the local markets cash price and Chicago cash prices. The farmer is given some "earnest money" at the time he signs the contract usually about $5.00 per head. Final payment is made at the time he delivers the hogs.

An example might be a farmer who wanted to sign a contract on January 9, 1973, to deliver hogs in April, 1973. The farmer would receive the January 9, 1973 Chicago Mercantile Exchange live hog futures closing price of $29.35 per hundred weight for April delivery [34-p. 26] less, say, $1.00 per hundred basis for the differential between local and Chicago markets. The farmer thus was guaranteed a price of $28.35 per hundred. Five dollars of this would be paid to him today to demonstrate the case firm's commitment to purchase.

These contracts have been offered selectively at several of the firm's plants. Whether or not they are offered is generally determined by farmer interest, which usually is conditioned by the recent trends in hog prices and price expectations. These contracts would not be expected to have been very popular during the last six months when prices have trended upward fairly steadily.

Buyers at one of the case firm's plants found that this contract arrangement was in demand most by farmers who needed the security of a previously fixed price to secure feeder pig financing or financing of other production supplies. These same buyers stated that there had been few problems of default on these contracts (less than 5 percent of the contracts were not delivered on); in those cases where there were problems, they were generally due to unavoidable circumstances. The case firm took a fairly easy but concerned posture with respect to unmet contract commitments trying to settle the situations as quietly and as equitably as possible.

These contracts give the case firm only limited assistance in reducing uncertainty because of their delivery specifications (farmers determine the exact date of delivery during the delivery month). This type of contract merely places the case firm in a position of intermediary between the farmer and the futures market. Instead of the farmer hedging his hogs, he sells them to the case firm for future delivery; and they usually hedge the hogs they have purchased.

This contract does leave the case firm with the option of hedging the hogs or becoming a speculator if they assume the risk of price fluctuations by not hedging. The case firm had followed this strategy in the past and saw the returns from such speculation as a possible benefit to

hog contract procurement. It is apparent, however, that this return to speculation is not a real return to hog contracting and could, in fact, be generated by simply entering the live hog futures market as a speculator independent of hog contracting operations.

"Production Contract"

Another type of contract which the case firm had tried was one in which the firm owned the hogs and contracted with the farmer to feed them. This contract specified that the case firm would deliver to the farmer a specified number of hogs periodically over a two-year period and in a specific pattern within that period. The farmer would be paid according to the total pounds gained by these hogs. The compensation was to be paid in a fixed payment per hundred pounds of gain adjusted for changes in feed costs which increased the payment if corn and SBOM prices increased, and decreased the payment if these prices decreased. There were also provisions for death loss adjustments and payment in compensation if the case firm chose not to deliver the specified number of feeder pigs. This contract is similar to poultry contracts which pay on a per pound of gain basis.

This contract was continued for a very short period due to management problems at the feed lot level which made the hogs from this contract extremely expensive. Management

in the case firm seemed very reluctant to enter further contracts of this type due to management difficulties they had experienced. They felt that while the contract specified that good husbandry practices would be used in the care and feeding of the animals, these had not been carried out. This resulted in poor rates of gain, high death losses, and other production problems.

"Bargaining Group Contract"

The case firm also had some experience with contracting with a farmer bargaining group. This contract lasted over a period of about three years. The contract made the bargaining group responsible for delivery of a specific number of hogs over a six-month period at a specified daily rate. These hogs were purchased on a grade and yield program using a specified price quotation as a base. The case firm paid a 15 per cents per hundred service charge to the bargaining group plus five cents if the hogs were delivered to a buying station in time for that day's slaughter. In addition, the case firm paid a 10 cent premium for delivery of the specified number of hogs on a daily basis. This premium was held in escrow for a six-month period and was to be defaulted to the case firm if the bargaining group failed to deliver the specified number of hogs any three days in a row during any three-month period. In this way, an extended diversion of hogs to other markets was penalized.

This contract was by far the most specific on price premiums and delivery incentives, as well as controls that the case firm had. It was allowed to lapse because in re-negotiations the bargaining group was asking for an increase in the service charge beyond what the case firm felt justified for the services provided.

It was this type of contract which the case firm believed was large enough in volume and gave it sufficient supply security that its demand for hogs from other sources was reduced. Firm management believed that this reduced demand would reflect itself in lower prices paid by the case firm for other supplies due to its ability to "ride out" short term fluctuations at other markets.

"Marketing Contracts"

The case firm had experimented with several types of marketing contracts with individual large volume producers. These contracts all took a similar form. The seller guaranteed delivery of a specified number of hogs over a specific period of time, usually one year or more. These hogs were to be delivered over that year and were to be purchased on a grade and yield basis with base price determined in one of several ways. The contract price was determined from a formula which related it to a published market quotation. The several formulas all involved lower prices to the packer when market prices were very high in

exchange for higher prices to the farmer when market prices were very low. The exact boundaries specifying high and low prices varied. The case firm management saw an advantage from this type of contract especially when rapidly rising hog prices squeeze meat packer profit margins. They felt farmers would be attracted to this type contract because it would enable them to trade very high prices during a few periods for the security of a price floor during periods of low prices.

The case firm's major objection to this type of contract was the possibility for sustained losses relative to open market prices during a period of low prices. Management thought this type of contract was desirable to both farmers and packers as it reduces potential losses to both parties from either extremely high or extremely low market levels. This would tend to stabilize profits in both industries.

"Feed Firm Contracts"

The case firm has also participated in a contracting scheme through a feed manufacturing subsidiary. This contract involved promotion and servicing of hog purchase contracts by the feed firm. The contracts provided for hogs sales to the feed firm for future delivery to the case firm's plant. Delivery was specified within a twenty-day period selected by the producer with the requirement that

the case firm be given three days advance delivery notice. The contract gave the producer the option of a fixed forward price or case firm's delivered price quotation on day of delivery. Producer had the option of selling all or part of his hogs on either basis to be specified at time of contract. The feed firm would advance a fixed percentage of the feeder pig cost to the producer in partial payment for the market hogs. The feed firm also agreed to furnish to the producer feed, supplement and supplies up to a set dollar amount per head after the producer signed a feed contract with the feed firm. Payment under this contract was made to the feed firm who in turn paid the local dealer for items delivered to the producer during the contract.

After delivery of the market hogs, the feed firm retained an amount equal to that advanced to the producer plus interest at an 8 percent annual rate. The remainder was paid to the producer. This contract was in essence a financing contract which tied the financing of feed and feeder pigs to a forward sale agreement. The forward sale was on a partially fixed price basis (depending on what proportion of the hogs sold were sold at a fixed forward price), such that producers risk was decreased to a limited extent. The contract did, however, specify that control over all monies from sale of market hogs remained in the hands of the feed firm until all feed and interest expenses incurred were paid. It removed the possibility of

producers defaulting on feed contracts. This type of contract is being used by the case firm on a limited basis.

Analysis of Contract Benefits

Selected contract benefits accruing to the case firm from various contracts and contract provisions were evaluated. This evaluation involved several types of benefits. These benefits include benefits from certain pricing formulae, price leverage benefits from market security, scheduling benefits from contracted supplies during seasonally low supplies, quality improvement benefits from improved quality of hogs purchased under contract, and product merchandising benefits resulting from improved availabilities of high quality pork cuts.

Benefits From Certain Pricing Formulae

Pricing benefits from contracting for future delivery of hogs occur when the prices paid for a certain grade and weight of hogs are lower than those paid for the same hog under normal market arrangements. The case firm has tried or considered several different pricing formulae for their contract purchases. Three of these pricing formulae were considered in a simple analysis of the savings or losses accruing to the case firm under different market conditions.

Using data from the United States Department of Agriculture "Livestock and Meat Statistics" annual Summary [29], the cost of hogs with and without contracts was analyzed. Data from the case firm on their market share was used in combination with data on federally inspected hog slaughter to give monthly estimates of case firm slaughter from December 1965 through March 1972. This time period contains the most recent full cycle in hog prices and facilitated the examination of a wide range of market conditions.

It was assumed that the case firm would be contracting ten percent of their market share and that all hogs contracted were purchased according to the contract pricing scheme under analysis. It was further assumed that the average weight of hogs purchased, both under contract and in other markets, was equal to the average weight for all hogs under federally inspected slaughter; and that all non-contracted hogs were purchased at an average price equal to the seven market average used in the analysis. The average or base price appropriate for all hogs was assumed to be the U.S.D.A. No. 2-3, 220-240 pound price as reported in "Livestock and Meat Statistics" [29].

Thus, in order to determine the gain or loss from a particular contract pricing scheme during a particular month, the weighted expenditure of all hogs purchased at the market price was compared to the expenditure when ten percent are purchased through contracts.

Pricing Formulae Examined

The first pricing formula examined (Formula I) was a fairly simple formula with an upper and lower limit with contract prices equal to prevailing market prices between these limits. The limits considered in this case were $19.00 for the lower limit and $25.00 for the upper limit. The lower limit is arbitrary for purposes of illustration; the upper limit is also arbitrary, although it was chosen with some reference to case firm experience. In possible bargaining over these limits between packers and farmers case firm personnel felt the lower limit should equal out of pocket production costs. The upper limit would represent the point at which meat packer profits began to be squeezed. In this case, the pricing formula becomes:

$CP = MP$ if $\$19.00 \leq MP \leq \$25.00$

$CP = \$19.00$ per hundred if $MP < \$19.00$

$CP = \$25.00$ per hundred if $MP > \$25.00$

where CP = Contract Price and MP = Market Price.

The second pricing formula examined (Formula II) was one containing a floor price with a fixed percentage of the difference between the floor price and the market price going to the contractor whenever market price was greater than the floor price. Again, the floor price considered was $19.00 with the percentage figure at 75 percent. In this case, the pricing formula becomes:

CP = \$19.00 if MP < \$19.00

CP = \$19.00 + 0.75 (MP - \$19.00) if MP $\geq$ \$19.00

where CP = Contract Price and MP = Market Price.

The third pricing formula considered (Formula III) is a sort of compromise between the first and second. In this case, there is a floor price \$19.00 and a ceiling price \$22.00; but above the ceiling price, there is a variable split between the contracting parties. The pricing formula in this case is:

CP = \$19.00 per hundred if MP < \$19.00 per hundred

CP = MP if \$19.00 $\leq$ MP \$22.00

CP = \$22.00 + 0.90 (MP - \$22.00) if 22.00 $\leq$ MP < 24.00

CP = \$22.00 + 0.80 (MP - 22.00) if 24.00 $\leq$ MP $\leq$ 26.00

CP = \$22.00 + 0.75 (MP - 22.00) if 26.00 $\leq$ MP < 28.00

CP = \$22.00 + 0.70 (MP - 22.00) if 28.00 $\leq$ MP < 30.00.

These pricing formulae are illustrated with reference to market prices in Figure 4.1. It is clear that none of the pricing formula is to be preferred from a packers point of view in all situations. With market prices below \$25.00 per hundred Formula I gives the least savings over market prices; while above \$27.00, it gives the greatest savings.

Figure 4.2 illustrates the relationship between actual seven market average prices and contract prices under Formula I. Visual inspection indicates that this sceme

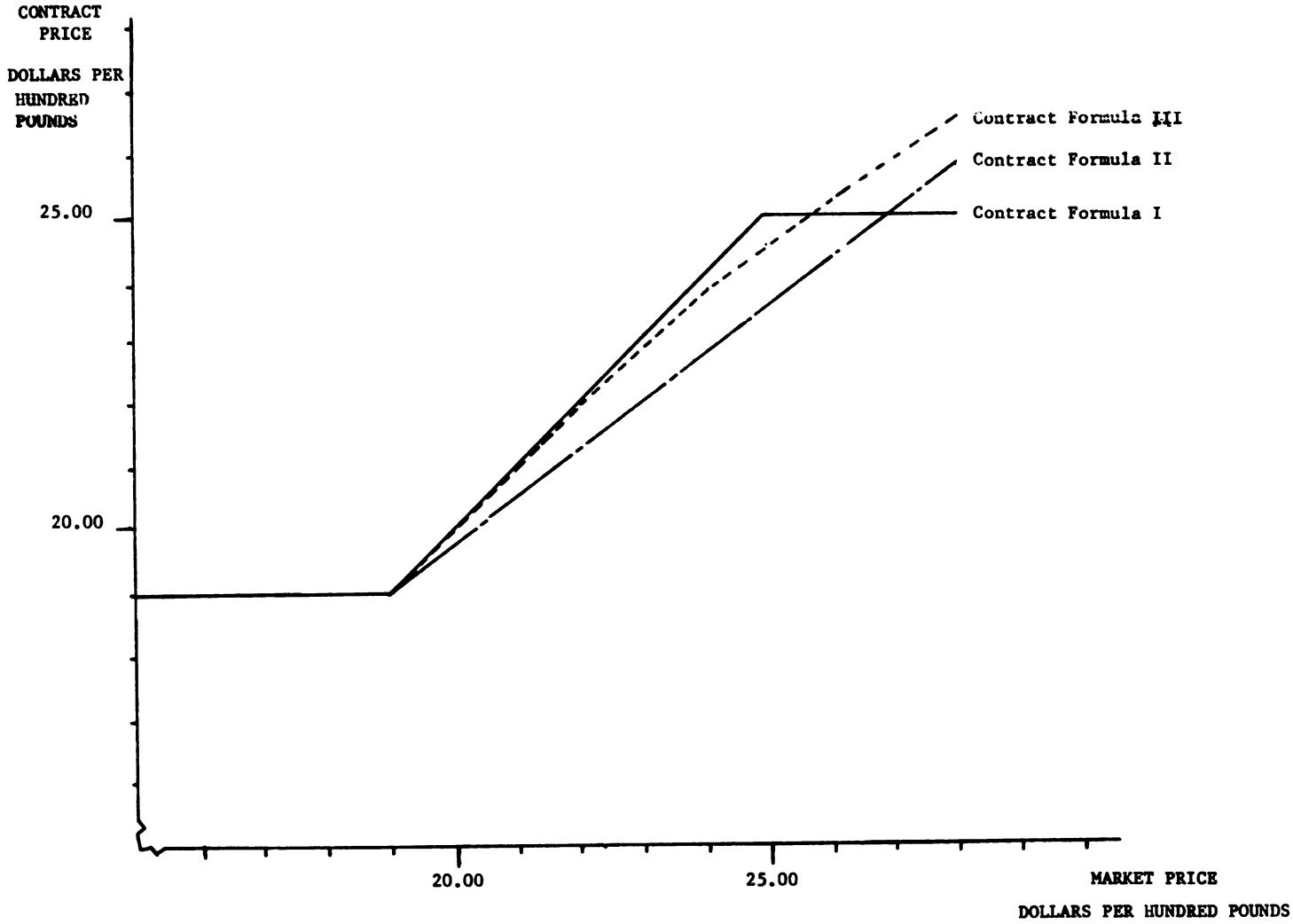

Figure 4.1. A Comparison of Market and Contract Prices for Three Selected Formulae.

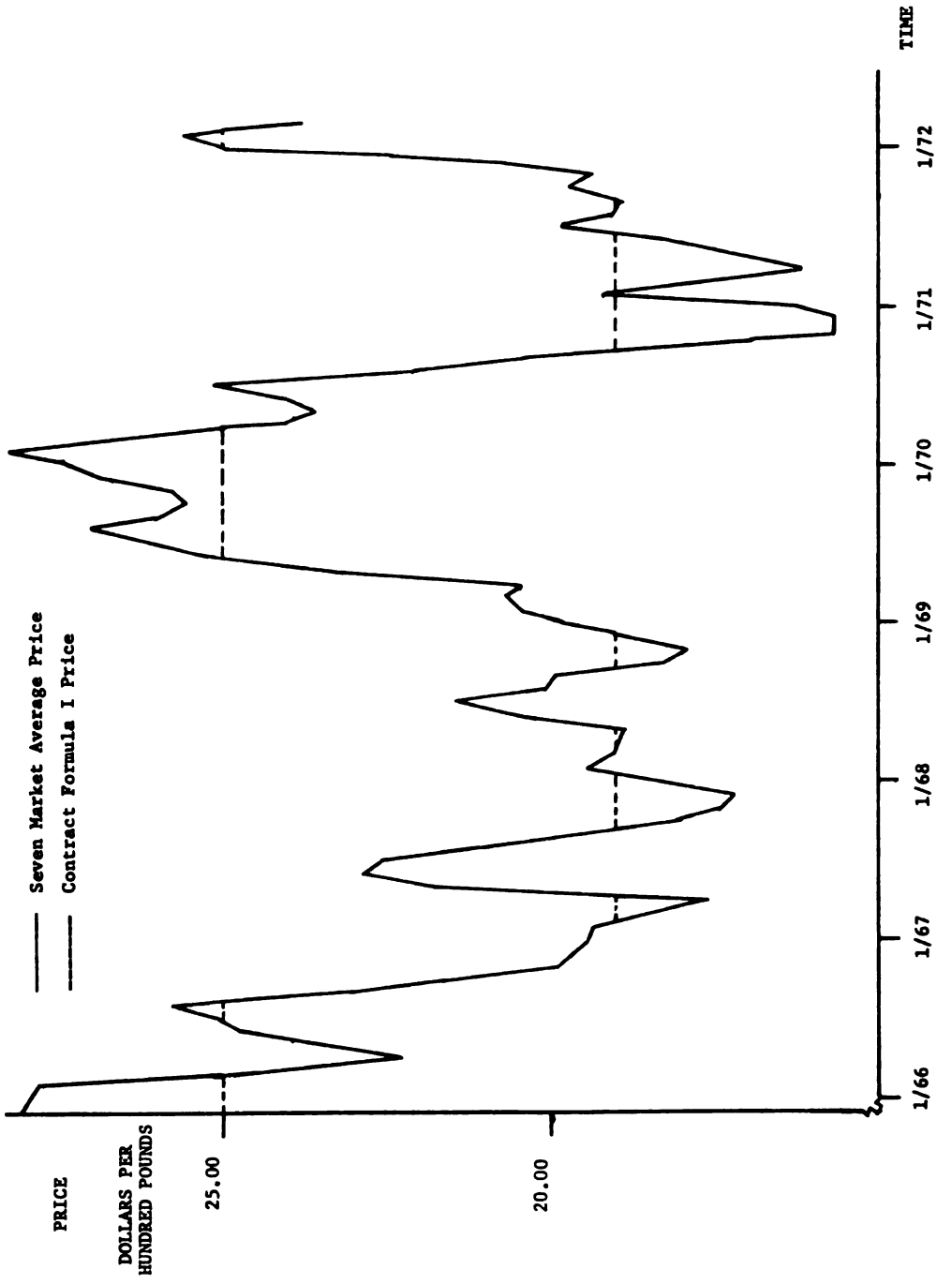

Figure 4.2.Seven Market Average Price and Contract Formula I Price.

Source: See Appendix Table A.1.

might be approximately fair[1] if the contracting parties were both in the contract for the entire period from 12/65 through 3/72. Contracts of shorter duration, depending on their starting date, could be highly biased in terms of gains to one party or the other.

From a meat packer's perspective, this fixed floor and ceiling contract would appear to be unwise because of the length of time necessary to balance out gains and losses. Stockholders and Boards of Directors may not be persuaded of the longer term desirability of contract procurement if it involves high losses during several successive quarters.

Figure 4.3 shows potential losses and gains from a contract with pricing Formula II. In this case, the fact that contract prices follow market prices more closely in the above $25.00 range and less closely in the $19.00 to $25.00 range more evenly balances gains over time. This arrangement also limits the absolute amount of gains during any one period. The more even balance of gains over time may alleviate to some degree the risks of major losses occurring in consecutive quarters. The period of January 1967 to January 1968 would be one entirely of losses under pricing Formula I (see Figure 4.2); but under Formula II, some gains

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[1]Here we mean fair in the sense that over time, the sum of the gains and losses to the parties is zero.

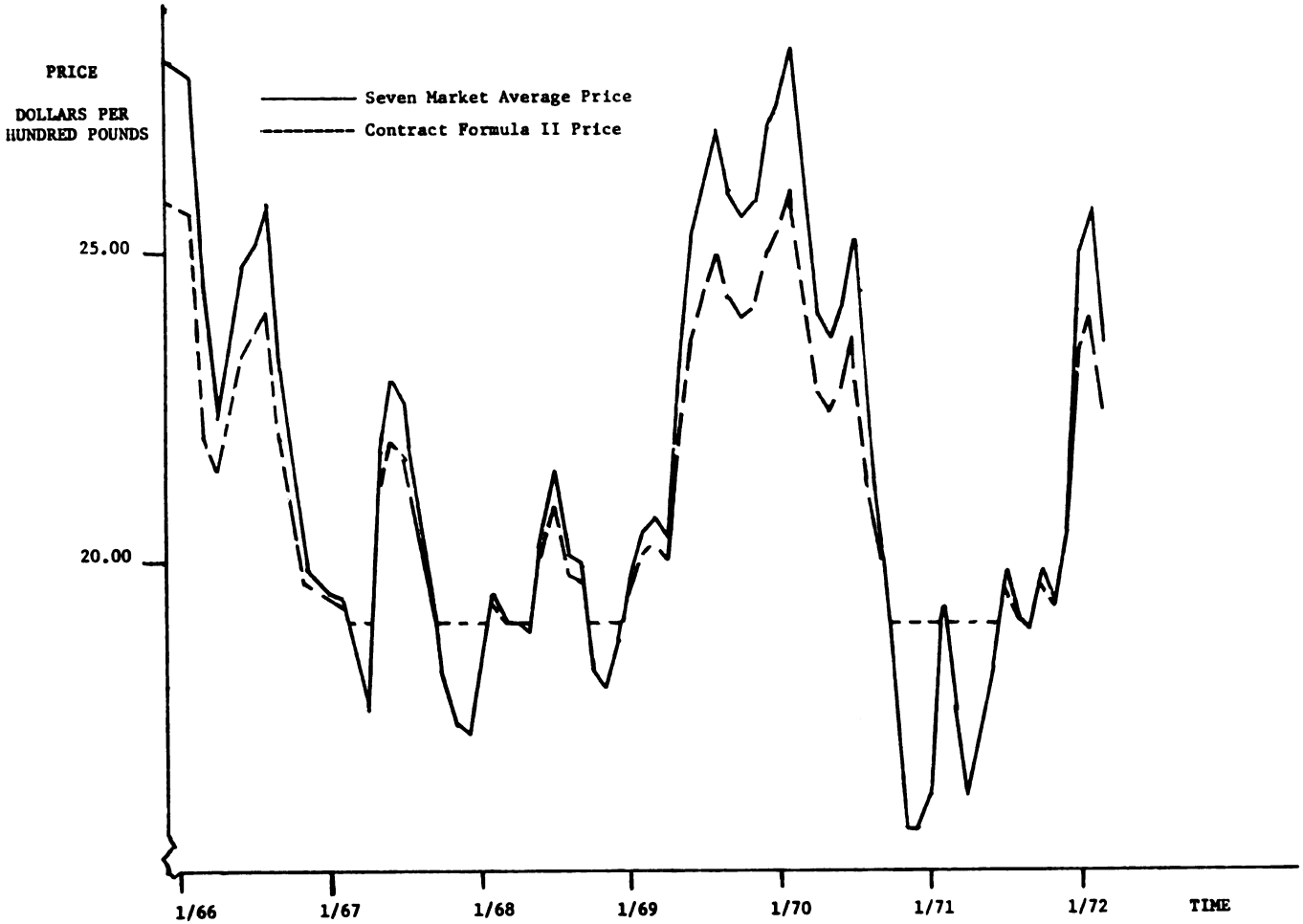

Figure 4.3. Seven Market Average Price and Contract Formula II Price.

Source: See Appendix Table A.1.

are registered which offset to some extent the losses occurring during this period.

A major possible drawback to a pricing scheme, such as Formula II, is that it seems salable to farmers only in periods when market prices are at or near the $19.00 base level. While the arrangement may be fair over time, it may appear unfair to farmers who see that they begin to lose immediately after prices reach $19.00 per hundred.

This obstacle to Formula II is partially alleviated in Formula III. As illustrated in Figure 4.4, Formula III combines a floor price with a range where market and contract prices are equal, followed by a range of diminishing shares going to producers. This formula decreases the possibility that farmers will feel cheated by the immediate incidence of a sharing arrangement, but raises the price level at which packers begin to gain from the contracting arrangement. It also distributes the gains to packers more evenly over the hog cycle than Formula I.

An almost infinite number of possible pricing formulae could be explored. The three discussed above were selected because they were typical of those which had been used or were being considered by the case firm. Each of the formulas discussed represent a philosophy expounded by the case firm and basic to their approach to long term contracting. This philosophy is best described by saying that the case firm feels that below a certain price, farmers are

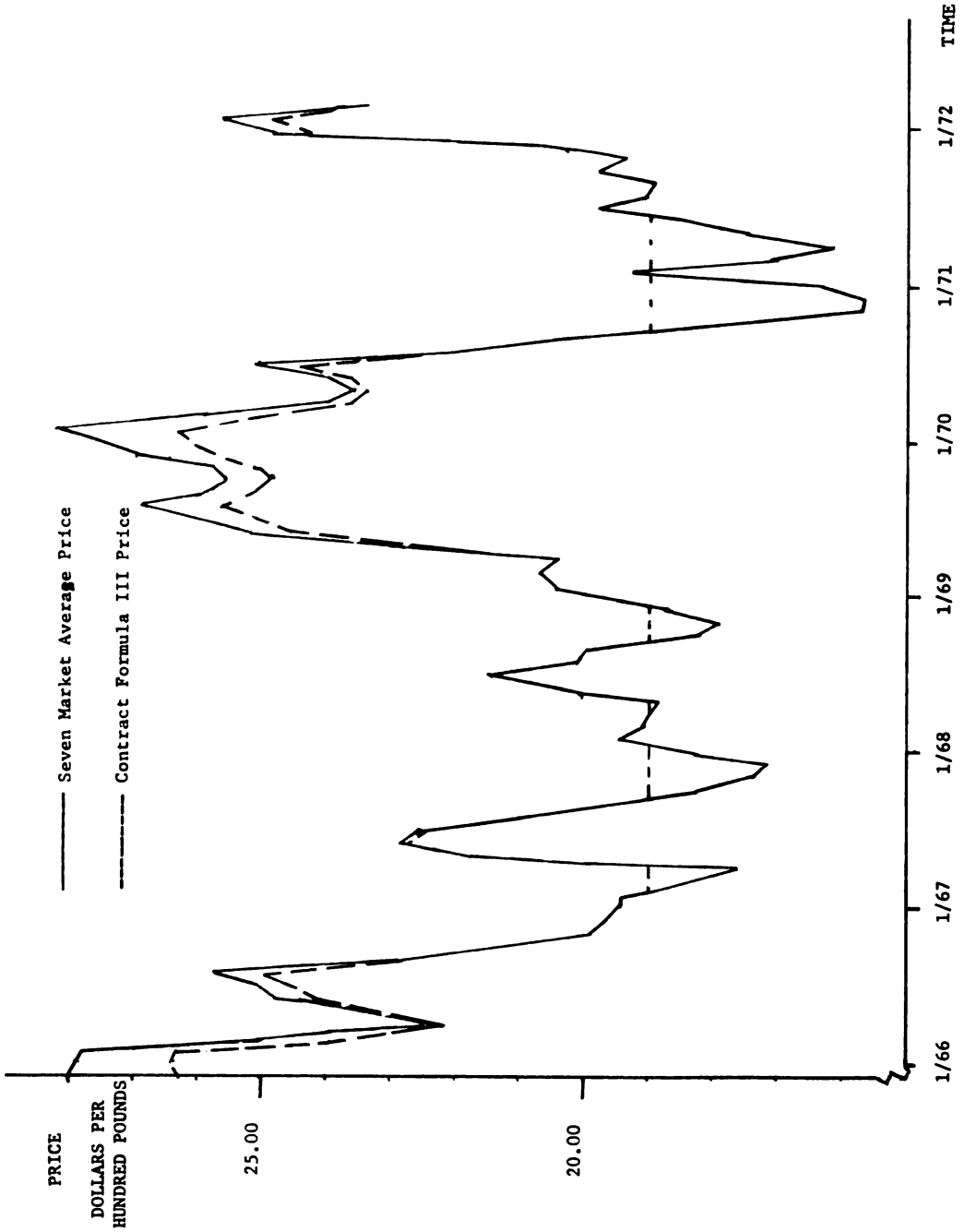

Figure 4.4. Seven Market Average Price and Contract Formula III Price.

Source: See Appendix Table A.1.

not making a fair return on their investment; and above a certain price, meat packers are not making a fair return on investment. Between these pricing levels, the market should provide the pricing mechanism. The case firm personnel thought that a contract of the Formula III type represented an opportunity for producers to share their benefits from very high prices in exchange for packers accepting the risk of very low prices. This type of contract makes it possible for the parties of this longer term agreement to negotiate a lower and upper bound and a sharing arrangement beyond these points which distributes the risks more evenly between the parties. It should be pointed out that this may not mean an exact split of price gains and losses, such that the net gain or loss to each party is zero. The fact that either farmers or meat packers may perform additional services associated with the contract agreement will also affect the equity of any specific pricing formula. It is important from an equity viewpoint that both parties to the contract be made aware of the possible gains and losses to them from entering into this agreement.

While these comparisons of contract versus market prices over time give a preliminary view of the pricing benefits and costs of contracting, a more detailed comparison was felt desirable. In this comparison, the possible starting dates and duration of contracts containing the different pricing formulae were examined under the assumption

that the case firm would contract for ten percent of its market share. The cost of buying all hogs at the seven market average price was matched with buying 10 percent of the firm's supply through contract and 90 percent at the seven market average price. The difference between these costs was the loss or gain from contracting. These losses or gains were computed monthly and summed over different possible contract periods: 12 months, 24 months, 36 months, and the entire four-year period.

The results of this analysis are presented in Table 4.3. The time periods chosen represent two periods of gradually falling market prices (starting 12/65 and 5/66), a period of stable prices (starting 4/67), a period of generally rising prices (starting 12/67), a period of rapidly falling prices (starting 6/70), and a period encompassing an entire hog cycle (12/65 to 2/70). It is clear from Table 4.3 that all three contracts produced losses in the short run period from June 1970 to June 1971. This illustrates what could happen if a firm entered such fixed floor price contracts during a period of rapidly falling prices and terminated its commitment after only one year. All three of the contract pricing formulae produced gains when the contract was for an entire cycle of high through low to high hog prices. The only time period in which all three contracts were unprofitable was the two-year period beginning April 1967. This period of roughly stable prices

TABLE 4.3

PRICING LOSSES AND GAINS FROM THREE PRICING FORMULAE OVER SELECTED TIME PERIODS 10 PERCENT CONTRACT LEVEL[a]

Contract Length	Starting Date	Dollar Gain or Loss		
		I	II	III
All Periods	12/65	-836,177.54	1,845,597.01	-1,068,725.04
36 Periods	12/65	-137,238.93	809,007.79	-288,753.54
36 Periods	5/66	-801,261.66	275,580.02	-695,907.56
36 Periods	4/67	452,074.99	1,521,787.41	164,408.59
36 Periods	12/67	335,104.24	1,717,531.18	171,396.39
12 Periods	6/70	-1,981,224.67	-1,631,774.24	-1,900,664.13
24 Periods	12/65	278,678.78	1,089,785.68	127,164.17
24 Periods	5/66	-589,207.35	234,082.39	-483,853.25
24 Periods	4/67	-807,810.28	-322,667.78	-796,408.86
24 Periods	12/67	54,573.03	890,928.62	47,181.31
Hog Cycle	12/65-2/70	1,009,298.53	2,558,296.54	573,159.46

[a]Calculated based on the assumption that firm share of federally inspected slaughter remained con-over time and that 10 percent of firm purchases were at contract price. Applicable contract prices are found in Table A.1.

produced losses because the contract floor was at or near the mean price level for this period while the contract ceiling was, in two cases, above the range of price fluctuations during this period. All of the three-year contracts that started on the 4/67 date produced gains. It is clear that the last year of this three-year contract contained sufficient periods of high prices to more than balance the low prices during the first two years.

It should be clear to both meat packers and producers that a simple analysis of the type presented above indicates the equity of longer term contracts. When pricing formulae are used which place floors or ceilings on contract prices, there is always danger that a short-term contract will isolate one of the parties on the losing or winning side relative to opportunities in other markets.

Production Contract Economies

As was mentioned above, the case firm had been involved in one type of contract where they owned feeder pigs and paid individual farmers to fatten these pigs to market weights. In order to compare the price of hogs purchased under this arrangement with the price of hogs purchased through other market channels, it was necessary to estimate a price paid under the production contract. The estimate was arrived at using a combination of secondary data and cost estimates furnished by the case firm.

Data on feeder pig prices was collected from weekly Livestock, Meat and Wool Statistics as published by the U.S.D.A. [33] for the period from February 1966 through March 1972. This data would have been collected from December 1965, as was the data for the other contract analyses, but feeder pig prices were not reported prior to the February 1966 cutoff date. These weekly estimates were converted to monthly estimates using a simple averaging procedure. This procedure involved averaging the weekly price quotations equally weighted, to arrive at the monthly average. Weeks ending on the first, second or third day of any month were included in the previous month for averaging purposes. The feeder pig prices used in the analyses were those for U.S. 1-2 (a few 3) grade feeder pigs weighing 40-50 pounds for the Illinois reporting area. It was assumed that these pigs would be fed in feedlots in the Missouri or Illinois area.

Given the cost of feeder pigs to the packers as the prevailing market price as indicated by the above data, the contract specified that the packer would be responsible for several other costs. These included: transportation to the feedlot, interest expense on capital invested in feeder pigs, veterinary cost, transport cost, feed adjustment cost, transportation to market, and feeding charge.

Transportation to and from the feedlot was estimated by personnel at the case firm to be $1.00 per animal each way. Veterinary costs were estimated at $0.75 per animal by case firm personnel. The case firm personnel considered the prime rate to be the appropriate cost of capital tied up in feeder pigs. Feeding charge was fixed in the contract at $14.65 per hundred weight, but a feed adjustment cost was calculated according to the terms of the contract based on a base price for 44 percent unrestricted soy bean oil meal of $72.00 per ton and a base cost of corn at $1.15 per bushel. These were to be mixed in a ration of 80 percent corn and 20 percent soy bean oil meal. The total pounds of feed used was to be certified by the feeder to the case at the end of each month. Based on this feed consumption rate and prevailing feed prices at designated points, the feeder was further compensated or penalized depending on the movement of feed prices. This contract provision prevents the feeder from gaining if feed prices fall during the contract or losing if feed prices increase. The feed adjustment provision insures that the operator is compensated for changes in his production cost.

In order to include fluctuations in the price of feed in the cost of hogs produced under this contract, price estimates for 44 percent unrestricted soy bean oil meal at Decatur, Illinois as reported in Feed Market News [32] and prices of Number 2 yellow corn at St. Louis, Missouri, as

reported in Gran Market News [31] were used. Fluctuations in the prime interest rate were accounted for using the historical Prime Rate Charged by Banks as reported in the Federal Reserve Bulletin [9]. Feed price estimates used were monthly. The prime rate was adjusted in accordance with the historical pattern of its movements.

Using these data and data on case firm market share, federally inspected slaughter, average weight of barrows and gilts sold under federal inspection, and prices for U.S. No. 2-3 market hogs at St. Louis, a comparison of market prices and contract prices was accomplished. The first step in this comparison was estimating the contract price of hogs produced under contract. This contract price was estimated by the following equation:

$$\text{Contract price} = \frac{(FP+T+V+D+I+FC+FA)}{\text{Contract Volume in Pounds}} \times 100$$

where: FP = feeder pig cost based on the assumption that all pigs are purchased at 50 pounds, and that the number of pigs purchased is determined as 10 percent or 20 percent of the plant market share of federally inspected slaughter four months in the future.

T = transport cost calculated as $1.00 per head times the number of feeder pigs purchased plus $1.00 per head times .965 times the number of feeder pigs purchased.

V = veterinary cost calculated as $0.75 per head of feeder pigs purchased.

D = death loss calculated as 3.5 percent of feeder pigs purchased for purposes of calculating the effects of this death loss; it was assumed that half of the death loss occurred during the first month and half occurred during the second month.

I = interest cost for money invested in feeder pigs calculated as the prevailing prime rate times total feeder pig cost times one fourth.

Contract Volume = was calculated assuming that the case firm knew several months in advance what its plant volume would be and that they would contract for 10 percent of that volume. It was further assumed that they would not estimate death loss as part of this volume and therefore actual contract volume would be less than desired volume. Thus, final contract volume is .965 times number of feeder pigs times average weight of barrows and gilts under federally inspected slaughter.

FC = feeding charge calculated as 14.65 per hundred times the net gain. Net gain was calculated as the difference between the total weight of

starting feeder pigs at fifty pounds each and .965 times the starting number of feeder pigs times the average weight of barrows and gilts under federally inspected slaughter for the appropriate month.

FA = feed adjustment calculated based on the assumption that feed per pig consisted of the following monthly amounts:

	1	2	3
	Pounds Consumed[1]		
Corn	120.96	170.08	264.96
SBOM	30.24	47.52	66.24

[1]These estimates were calculated based on consumption pattern estimates furnished by Roy Black, Extension Economist, Dept. of Agricultural Economics, Michigan State University.

These data were expanded by the appropriate number of pigs on feed during each month taking death loss into account. Total monthly feed consumption was calculated and market prices for corn and soybean oil meal were applied to the total consumption each month. This was compared to the base feed cost times monthly consumption. The difference between the market cost over the period and the base feed cost over the period.

Figure 4.5 shows the relationship between contract prices and market prices over the time period from April 1966 to March 1972. It is again clear that the production contract is a source of savings in periods of rapidly rising prices, but results in losses during periods of declining or steady prices. A comparison similar to that used for the three pricing systems examined is contained in Table 4.4 Again, in the results presented, we see the case where two-year contracts which show losses (those starting 5/66 and 4/67) became the source of gains when another year was added to their duration.

TABLE 4.4

COMPARISON OF LOSSES OR GAINS FROM A PRODUCTION CONTRACT FOR SELECTED PERIODS AT 10 PERCENT CONTRACT LEVEL FOR ONE PLANT OF THE CASE FIRM[a]

Time Period	Starting Date	Loss/Gain
36 Periods	5/65	-293,148.32
36 Periods	4/67	439,313.90
36 Periods	12/67	322,015.89
24 Periods	5/66	-311,348.40
24 Periods	4/67	-137,173.97
24 Periods	12/67	319,920.11
12 Periods	6/70	-479,896.15

[a]Calculated from data found in Tables A.2 and A.3.

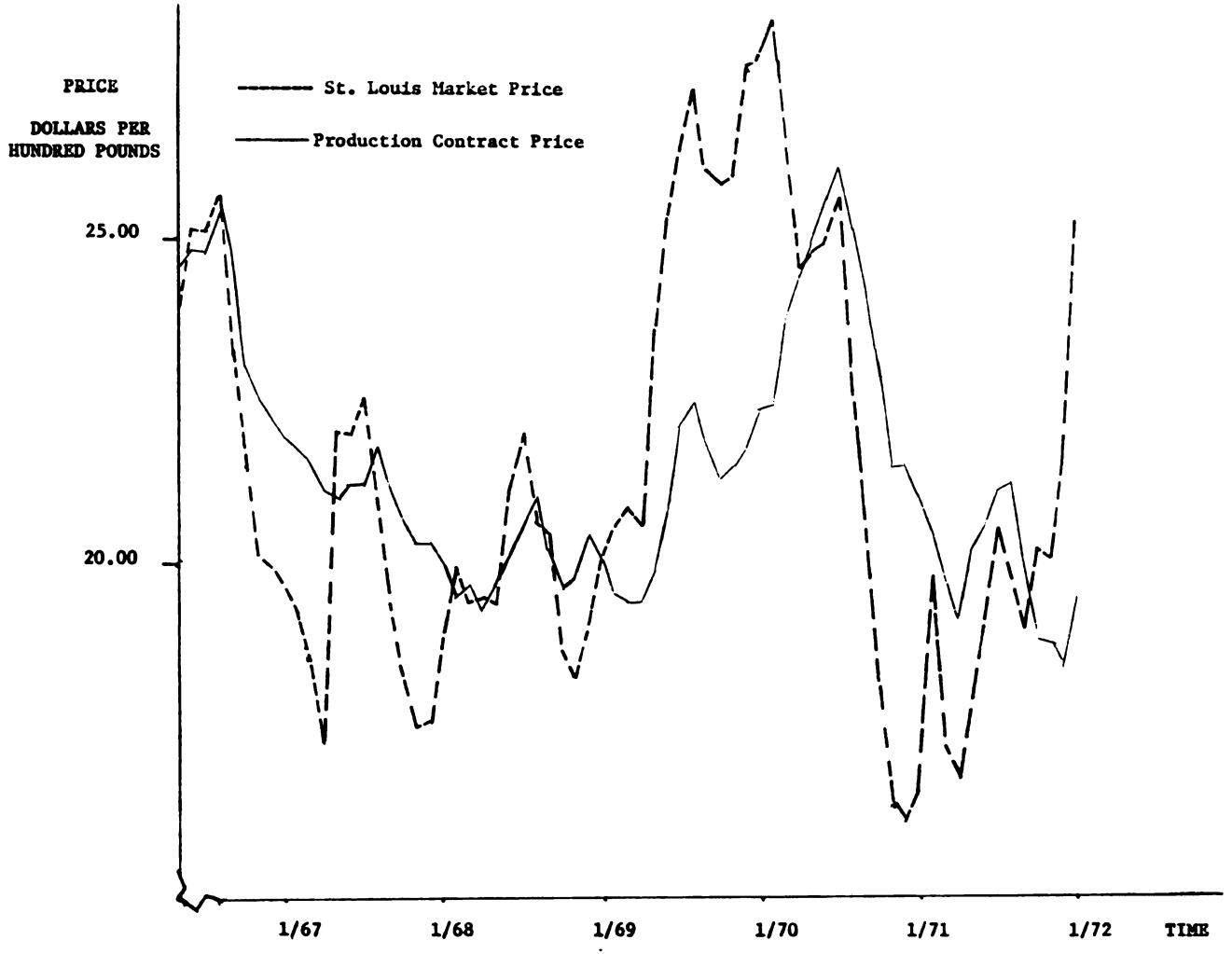

Figure 4.5. St. Louis Market Price and Production Contract Price.

Source: See Appendix Table A.2.

As was stated earlier, this contract was terminated by the case firm because of management problems. These problems involved higher rates of death loss and lower feed efficiency than was calculated. This resulted in significantly higher costs than were anticipated by the case firm. It was the general belief of case firm personnel that this contractural procedure would not succeed for them. They felt from their initial experience that the management of feeding operations was better handled by individual farmers who owned the livestock and had a vested interest in efficient management.

Benefits from Procurement Leverage

Personnel with the case firm thought that other possible benefits from purchasing hogs through contracts were effects this might have on the price paid for hogs purchased in other markets. Their reasoning was that, with a given volume of hogs contracted for delivery during a certain week, they could enter the market under less pressure to purchase hogs. This, they believed, would enable them to hold back when prices were rising or to be more selective in their hog purchasing. This might be illustrated graphically as in Figure 4.6 where the daily hog supply is fixed at Qo. The market demand for hogs before the firm began contracting was Do and the market clearing price is Po. The case firm enters contractural agreements for 20

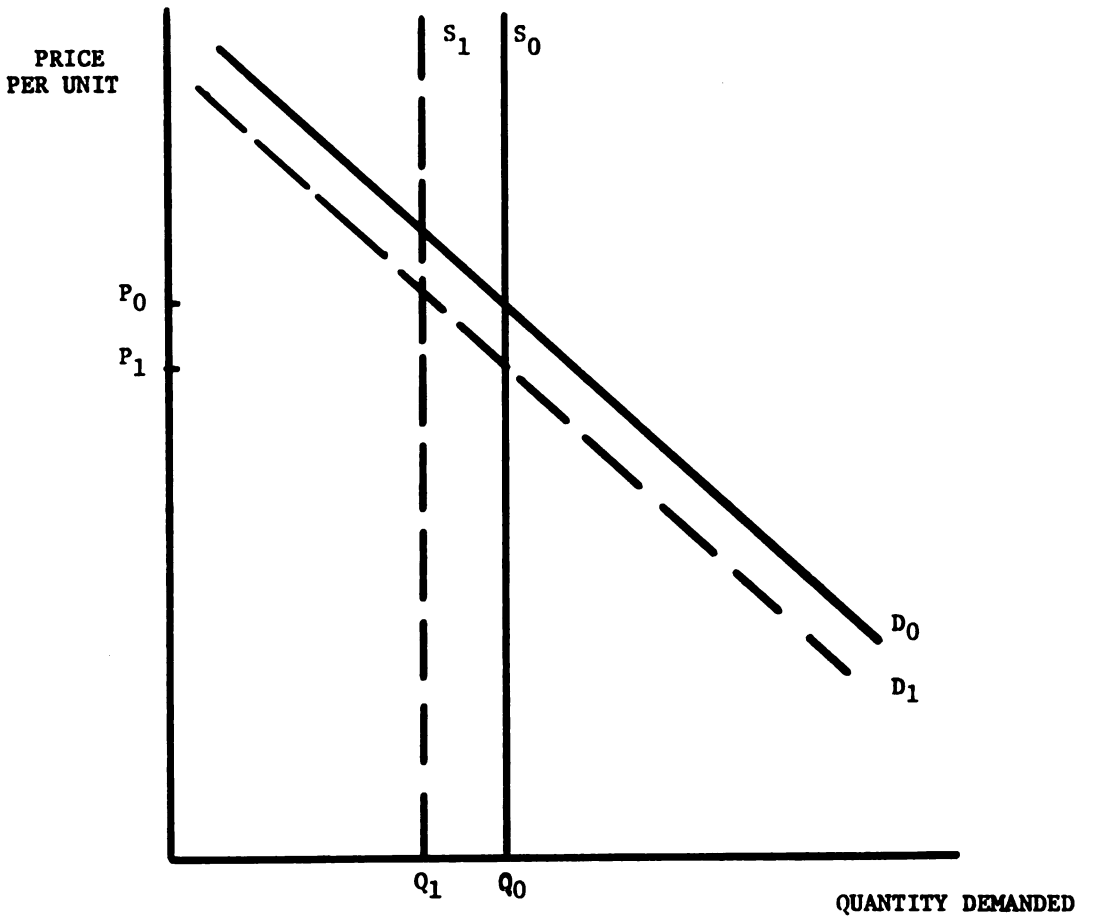

Figure 4.6. Hypothetical Supply and Demand Curves for a Local Hog Market in the Short Run.

percent of its daily supply. This may cause market demand to shift downward to D_1, resulting in a new equilibrium price at P_1. The case firm reasoned that this shift in market prices results in a lower hog cost on those hogs purchased outside the contract.

This analysis assumed, of course, that the contracting by the case firm had no effect on market supply. In fact, if the hogs contracted for were contracted in the firm's normal market area, there is a good possibility that market supply also shifted as a result of contracting. For example, if the firm's contracting efforts resulted in a supply shift from So to S_1, then the market clearing price remains at Po. The only thing that changed in the second situation was the channels through which hogs moved.

An attempt to test the existence of procurement leverage as explained above was undertaken. A market in which the case firm had done substantial contracting (contract volume reached over 20 percent of plant purchases in some weeks) over a three-year period and in which a terminal market also served as a major source of hogs was used. The procedure adopted was similar to that used by Love and Shuffet in their attempt to examine the effects on market prices of a shift in market structure [15]. It was expected that if procurement contracting had an effect on market prices in this case, the relationship of prices in this market to prices in other markets would be

significantly altered. Weekly price data were collected from "Livestock Meat and Wool Market" news on prices of U.S. 1-2, 200-220 pound market hogs for 104 weeks preceeding and 105 weeks after the incidence of contracting. The time period covered by this analysis was March 1966 to March 1970. Price differences were calculated between the case market and three other major terminal markets. These other markets were chosen because of their presence as centers of pricing, their proximity to the case market, and the availability of data on price movements. A comparison of the price differences among the markets is found in Table 4.5.

It is clear from Table 4.5 that there were no economically significant changes in price relationships between the markets considered. In only one case would the price relationship change between the two periods have been statistically significant at the five percent probability level. In this case, the (market 1 versus market 3) difference between periods was only 5.3 cents per hundred pounds. This does mean that market prices in the case market were lower relative to those in market 3 during the period of contracting. The amount of difference (5.3 cents per hundred pounds) is not economically significant in markets where price movements generally occur on 25 cent intervals. The accuracy of data reporting and the system of computing averages also could account for a difference of this size.

TABLE 4.5

AVERAGE DIFFERENCE BETWEEN PRICES OF HOGS
BY MARKETS AND BY PERIODS
MARCH 1966 TO MARCH 1970[a]

Markets Compared	Average Price Difference Per Hundred Weight in Cents		Price Difference Between Periods	t	Probabilities Of Difference
	104 Week Period Before Contracting	105 Week Period After Contracting			
1 vs 2	-25.8	- 30.1	4.3	1.7160	0.0877
1 vs 3	-19.0	- 24.3	5.3	2.4474	0.0152
1 vs 4	-96.7	-105.5	8.8	1.6326	0.0141
3 vs 2	- 6.8	- 5.8	1.0	-0.4730	0.6367
2 vs 4	-70.9	- 75.4	4.5	0.8756	0.3823
3 vs 4	-77.7	- 81.2	3.5	0.6669	0.5056

[a]Calculated from weekly average prices for U.S. No. 1-2 market hogs 220-240 pounds as reported by U.S.D.A. for the four markets. Market identities are not specified in order not to reveal the identity of the case firm.

In the case of market 1 versus market 2, the difference would have been significant at the ten percent level. Again, the absolute amount of the difference could be considered economically insignificant. In the case of market 1 versus market 4, the probability of a difference of this size (8.8 cents per hundred pounds) occurring by chance alone is just over ten percent.

An examination of the differences among the three conparison markets supports a contention that there was no significant alteration in their relationships between periods. This also may lend support to our contention that any alterations in relationships between market one and the other markets were due to changes within market one. A complete historical sketch of these four markets would be desirable to eliminate the possibility that some other structural change has affected prices more than the incidence of contracting.

The strongest conclusion that can be drawn from the analysis is that there was a difference in pricing patterns when a period of contracting was compared to a period without contracting. Further, the difference was of insufficient magnitude as to be economically significant. An examination of case firm records on the location of contractors indicates that most of the hogs contracted for did come from the normal market 1 market area. This may have resulted

in the situation described earlier where not only was market demand reduced, but market supply was reduced, thus limiting the price effect of contract procurement.

Benefits from Supply Scheduling, Improved Quality, and Increased Sales

To examine possible benefits from improved scheduling and improved quality of hog run, a linear programming model of plant operations was used. This model is in use weekly by the case firm. The model utilizes weekly estimates of the prices and availability of inputs and estimates of the potential sales volumes and prices. The model determines the profit maximizing combination of hogs to buy in several weight and grade classifications given certain transformation functions and the forcast sales.

This linear programming model maximizes within the constraints of limited hog supplies, estimated product demand, available labor and facilities (including a fixed chain speed specified by the model operator), and the technical relationships which specify the rates at which each grade and weight category of hogs produce specific primal cuts. These rates or transformation functions from live hogs to primal cuts are updated periodically as the case firms hog supply changes. Thus an effort has been made by the case firm to keep the model technically up to date.

In order to operationalize the model results in decision making weekly "model meetings" are held by plant personnel. At these meetings industrial engineering personnel explain the optimal operating strategy as indicated by the model and compare the previous week's results with actual results in the previous week. Other firm personnel (plant manager, hog evaluation officer, chief buyer, product manager, and others) are then given an opportunity to discuss the model results and interject their estimates of the reliability of the supply and demand assumptions which conditioned the model results. In this way the case firm has built a high degree of confidence in the model as a management aid. Industrial engineering personnel also indicate that a comparison of actual operating margins and model operating margins over time indicates a high degree of accuracy.

An initial examination of the case firm model indicated that there were several ways to reflect potential contract benefits in the model: 1) Increased available supply of high quality hogs, 2) Improved transformation functions or yield of primal cuts from selected grade and weight classes, and 3) increased available sales because of higher quality and more consistently available products.

Available resources at the case firm limited the use of their model to evaluating the effect of an increased available supply of high quality hogs. It was possible to

use the results of other modeling efforts to examine other potential contract benefits.

After initial consultation with case firm personnel at the corporate headquarters, it was determined that it would be desirable to discuss proposed model alternations with plant personnel who were running the model. Included in these sessions were the manager of pork evaluation, the industrial engineering personnel who ran the model, the head hog buyer for the plant, and the corporate chief of operations research. In consultation with these individuals, a plan was formulated for running the model to simulate possible changes occurring due to increased contract procurement of market hogs.

Initial adjustments in the model involved changes in the available supply of hogs in selected categories. The model was first run using actual weekly receipts for a representative week in July. July was chosen because of the generalized scarcity of market hogs in this month; thus contract supplies would likely be most beneficial at this time. When the week to be used had been determined, historical data on actual weekly receipts of market hogs and sows was collected. In addition, appropriate data on prices and sales quantities were also collected. These data were used to simulate a profit maximizing solution for the week selected, given actual receipts for that week. This optimal solution was used as a benchmark for the modifications made relative to contract procurement.

The benefit of contracting to be tested using this model was an increased availability of hogs in certain grade and weight categories. It was reasoned that a major motive of contracting is to smooth out the seasonal fluctuation in hog supplies. Further, case firm personnel indicated that they could see no reason for contracting without improving quality. Given these factors, it was determined that to simulate the effects of contracting, the availability of market hogs was increased and concentrated in specific high yield grade and weight classes. Table 4.6 shows the distribution of the hypothesized increase in availability of 4,000 head of high quality hogs per week. Using estimates by the firm's hog evaluation officers, based on experience with past contracts, it was expected that 75 percent of the contracted hogs would be in the 200 to 240 pound range with the remainder in the 240-270 pound range. It was further expected that 90 percent of the hogs contracted for would be grade number 2 with the remainder grade 3.

When the raw materials available to the model were increased in the manner described in Table 4.6, several important changes in the optimal procurement mix occurred. These changes (Shown in Table 4.7) were approximately what was anticipated. The model found that with an increased supply of high quality butcher hogs available, it was profitable to replace some of the sows purchased in the

earlier period with butchers. Thus, the optimal solution reflects a decrease in sow purchases of 866 head. The largest portion of these sows came from the medium weight grade 2 to 3 animals. The model also found it more profitable not to purchase as many light weight butchers or lower grade butchers in the medium weight categories. While the model did not find the optimal increase in butcher purchases to be the full four thousand head, it was profitable to purchase an additional 3,224 head. Thus, 776 head would not be required from traditional supply sources because of contract supplies.

TABLE 4.6

DISTRIBUTION OF ADDITIONAL AVAILABLE HOG SUPPLY
RUN 2, CASE FIRM HOG MODEL

Grade	Weight	Number
#2	201/220	1350
#3	201/220	150
#2	221/240	1350
#3	221/240	150
#2	241/270	900
#3	241/270	100

TABLE 4.7

DIFFERENCES IN OPTIMAL HOG PROCUREMENT MIX
WITH ADDITIONAL AVAILABLE HOG SUPPLY,
CASE FIRM MODEL

Grade-Weight Category	Number to Buy		
	Run #1	Run #2	Difference
Butchers			
#3 - 181/200	916	750	- 166
#4 - 181/200	11	0	- 11
#2 - 201/220	3465	4815	1350
#3 - 201/220	1428	1000	- 428
#4 - 201/220	44	30	- 14
#6 - 201/220	37	30	- 7
#2 - 221/240	4162	5512	1350
#3 - 221/240	1104	1254	150
#2 - 241/270	3823	4723	900
#3 - 241/270	1214	1314	100
Butchers Total Head	20307	23531	3224
Sows			
#3 - 361/400	250	80	- 170
#4 - 361/400	21	10	- 11
#2 - 401/450	520	500	- 20
#3 - 401-450	248	80	- 168
#2 - 451/500	836	400	- 436
#4 - 451/500	60	20	- 40
#2 - 501/over	807	786	- 21
Sows Total Head	5864	4998	- 866

An examination of the changes in sales and expenses in the two solutions provides further understanding of the possible contributions of additional high quality hog supplies (Table 4.8) It is apparent that the change in operating margin is small at 0.33 percent; but it is an increase. The most drastic changes from Run #1 to Run #2 are the decreases in inter-company and outside purchases made available by these additional hogs. The increase in surplus accumulation indicates that the firm was unable to turn some of the increased supplies into current sales. This causes a lower increase in operating margin than would have been the case had the firm been able to boost sales through advertising or promotion. The sales estimates built into the model are not geared to this increased availability of raw materials and thus unfairly limit the contribution to sales available from the increased supplies. With all other things held equal, the increased availability of four thousand high quality butcher hogs produced an increased return of only 21 cents per head. This assumed that these animals could be purchased at prices equal to those prevailing for hogs not purchased under contract with the same weight and grade characteristics. As we have seen earlier, this assumption depends on the particular contract being considered.

TABLE 4.8

COMPARISON OF SALES, EXPENSE, AND OPERATING MARGIN
WITH ADDITIONAL AVAILABLE HOG SUPPLY,
CASE FIRM HOG MODEL

Category	Run #1	Run #2	Difference	Percent Change
Sales Contribution	$1,164,463.66	$1,197,967.79	$ 33,504.13	2.87
Byproduct Credits	385,502.34	390,368.68	4,866.34	1.26
Surplus Accumulation	362,464.43	390,905.87	28,441.44	7.84
Total	$1,912,430.42	$1,979,242.33	$ 66,811.91	3.49%
Livestock Costs	$1,372,294.07	$1,467,382.11	$ 95,088.04	6.92
Inter-company Purchase	97,250.61	73,593.15	-21,657.46	-22.26
Outside Purchase	19,532.60	6,971.75	-12,560.85	-64.30
Total	$1,489,077.28	$1,547,947.00	$ 58,869.72	3.95%
Labor Cost	$ 157,505.33	$ 164,404.49	$ 6,899.16	4.38
Non-meat Ingredients	3,291.97	3,406.48	114.51	3.47
Packaging Expense	3,751.77	3,825.90	74.31	1.97
Total	$ 164,549.06	$ 171,638.87	$ 7,087.81	4.30%
Operating Margin	$ 258,804.08	$ 259,658.46	$ 854.38	0.33%

Studies at Purdue University using a similar linear programming model synthesized from industry-wide data tested several possible contract benefits [23]. Included were benefits from improving the quantity and quality of hog run, better scheduling of hogs, and improved sales due to higher quality branded products. When hog availability was 80 percent of their base solution return on investment was negative 4.7 percent while with hog availability at 120 percent of the base situation return on investment was 19.3 percent [23-p. 37]. This profit volume relationship is consistent with statements made by case firm personnel and bears out their concern over low profit levels during the low volume periods of the hog cycle. Further efforts to simulate the relationship between profitability and weekly scheduling resulted in the following: if the simulated plant could be operated for a full 52 weeks at 100 percent of the base schedule volume, return on investment was 10.4 percent; if the firm operated at 100 percent of base volume for 25 weeks, 90 percent of base volume for 13 weeks, 80 percent of base volume for 12 weeks and 70 percent of base volume for 2 weeks return on investment dropped to 4.2 percent [23-p. 41]. Both of the above analyses took the final product profile as given. To simulate the possibility of branding certain products it was assumed that certain branded products could be sold at a higher price. Under the assumptions used, branding increased the value of a

grade one 200-220 pound hog from $20.75 to $25.14 [23-p. 43]. Carcass quality and product branding are closely interrelated. Improvements in hog quality through improved contract purchasing would increase the possibility of product branding.

An unpublished study at Michigan State University used a synthetic firm model constructed from engineering design data to evaluate the change in total unit cost of slaughter with varying degrees of control over seasonal and daily fluctuation in hog supply [3]. The study considered a full line slaughter processing plant and used historical data on seasonal supply patterns to estimate a generalized pattern of seasonal and daily fluctuations in hog supply. The study examined the effect of systematically reducing both the daily and seasonal variation in supply in varying plant levels. At the plant capacity similar to that for one case firm plant in this study, the results (Table 4.9) show that the elimination of daily variation without a reduction in seasonal variation is worth only $0.21 per head. While an elimination of seasonal variation without a reduction in daily variation is worth $0.84 per head. This may indicate that the uniform utilization of facilities over a longer run is the source of economies in excess of short run optimization. Elimination of all variation seasonally and daily lowered total unit cost by $1.02 per head indicating that a packer in circumstances similar to

those simulated could afford to pay up to $1.02 per head more for the hogs purchased if he could eliminate variability in supply.

TABLE 4.9

TOTAL UNIT COST OF 600 HEAD PER HOUR SLAUGHTER PROCESSING PLANT AT SELECTED LEVELS OF SUPPLY VARIATION

Percent of Normal Seasonal Variation	Percent of Normal Daily Variation			
Seasonal Variation	1.000	0.707	0.500	0.000
	- - - - -Dollars Per Head- - - - -			
100.0	10.47	10.39	10.34	10.26
70.7	10.23	10.10	10.04	9.96
50.0	9.99	9.90	9.85	9.77
00.0	9.63	9.53	9.50	9.45

Source: Unpublished Ph.D. thesis, Hernan Barreto, Michigan State University, Department of Agricultural Engineering, in process.

The study did not consider the costs of implementing a supply control system which would result in the reduced variability tested. Nor did the study consider the costs of changing consumption patterns sufficiently to meet the new hog supply pattern. Given the results of the study, these costs would have to be less than $1.02 per head for the zero variability case in order for this plan to be profitable.

A more realistic short run reduction in variability may be the reduction of seasonal and daily variation to half of their present levels. In this case, the savings in total unit cost would allow up to $0.62 per head to be spent on supply control and demand alteration programs.

The importance of demand fluctuations in plant profitability was illustrated in a study at Iowa State University [7]. Plant slaughter costs were compared with various conditions of weekly slaughter variation. A yearly slaughter capacity was determined and a fixed weekly slaughter rate calculated. This weekly slaughter rate was then varied corresponding to fluctuations observed in federally inspected plants in the northwest subregion of the North Central Region. Researchers found cost savings of from 7 to 13 cents per head for a 310 head per hour slaughter plant. They conclude that consistent with previous studies, slaughter cost was reduced when fluctuation in weekly supply was reduced. They go on, however, to examine the profit impacts of slaughter stabilization considering demand fluctuations and supply availabilities. Density of available livestock supplies, the price of live hogs at the plant, and the wholesale carcass price were considered. When these factors were coupled with a fixed optimal weekly output determined without consideration for the above variables, profit reductions of $0.26 to $0.46 per head resulted. These profit reductions resulted because of the

inability of the firm to adjust to changes in these demand and supply factors.

The important conclusion of the Iowa study is that without stabilization of supply markets and product markets, the profit maximizing firm may rationally choose a position of instability over one of stability. This may limit drastically the efforts of any one firm toward stabilizing plant throughput. The researchers in the Iowa study conclude that a firm would only want to stabilize plant operations if the industry were stabilized.

From study of the case firm and the other studies mentioned above, it is clear that there are limited economies to be gained in hog slaughtering with improved scheduling of throughput under current industry conditions. From conversations with personnel at the case firm, it became apparent that they implicitly recognize the need for flexibility in their industry. Case firm personnel interviewed were unanimous in their feeling that twenty percent of supply was the maximum contracted supply they would consider. This was based on what they felt was an industry norm that twenty percent tied to any single source either for supplies or sales was a limit beyond which it was unsafe to go. The safety of such commitments was related to their ability to adjust to the dynamic markets in which they operate.

This twenty percent rule of thumb may well reflect the oligopolistic structure of meat packing, wholesaling, and retailing. The firms operating at these levels in the Hog-Pork subsector are very conscious of their interdependence. Thus they stress the desirability of operating policies which allow them to react rapidly to actions of their competitors, suppliers, and customers. These flexible operating procedures reduce the possibility of short term losses if normal operating arrangements are disrupted by unexpected market behavior, but at the expense of longer run planning and corresponding potential profits.

Meaningful estimates of the operation of a system completely coordinated by contracts were beyond the experience of case firm personnel. While they felt that contract procurement would continue to grow, they did not conceive that it would become the dominant method of marketing live hogs.

Economies Through Improved Procurement System

The case firm personnel also believed that a source of possible economies from contract procurement was the ability to replace their more costly sources of supply. It was expected that hogs purchased through contracts could be purchased less expensively than hogs from some other sources. An examination of firm records on procurement patterns and cost of different sources indicated a wide range of

procurement cost. In Table 4.10 there is a difference of nearly $2.00 per hundred between those hogs purchased most effectively and those hogs purchased least effectively. A comparison of the buying margin for futures contract hogs and hogs purchased through the bargaining group contract shows the differential possible in procurement cost between different types of contractual arrangements. It was the case firm's expectation that with contracting they could replace some or all of the hogs purchased from sale barns or the terminal market. Relative savings by replacement of terminal market hogs with hogs purchased under a contract whose buying margin was equal to that of the bargaining group contract would be $0.24 per hundred pounds live weight. For hogs purchased at sale barns, the replacement savings under similar circumstances would be $0.28 per hundred pounds live weight.

It is easy to understand why the case firm has tended to prefer more direct purchasing given the relative buy margins for less direct sources of hogs. It is also apparent that while there are potential cost savings through elimination of poor procurement sources, these cost savings could be achieved with or without contracts. It is further clear that in the case of the bargaining group contract in which the case firm was involved, the hogs could have been more efficiently purchased through direct plant purchases than through the procedure used.

TABLE 4.10

RELATIVE PROCUREMENT COST FOR DIFFERENT SOURCES OF LIVE HOGS CASE FIRM 1971

Category	Total Buying Margin[a] Dollars/Hundred Live	Average Weight
Grade and Yield Including Futures Contract	1.00	227
Plant Purchase	- .38	234
Country Buying Stations	- .41	235
Dealers	- .48	239
Bargaining Group Contract	- .58	231
Miscellaneous	- .77	235
Terminal Market	- .82	250
Sale Barns	- .86	243

[a]This represents the cost gain or loss due to differences in yield, price, sorting, grading, and rate of dead and condemned for a particular procurement source relative to firm standards which change over time.

Summary of Case Firm Analysis

The experience of the case firm indicates that the following benefits from contracting were possible: price savings through advantageous longer run pricing formulae, more efficient purchasing, reductions in slaughter cost through more even product flow through the plant, increase in profit through improved yield of hogs purchased, and improved sales and possibility of branding products because

of a higher quality, more even flow of pork products. It was found that procurement leverage (price savings because of the ability to wait out market fluctuations) had not been significant for the case firm. The limitations to contract procurement were found to involve costs of record keeping on contracted hogs (generally associated with grade and yield buying), premiums required to obtain specific delivery dates, lack of specialization in hog raising which prevents farmers from delivery at specific busy farming periods, the industry rule of thumb not to contract for more than twenty percent of supply, the inability of meat packers to control product demand while controlling supply, and (in the case of the feeder pig production contract) the inability to secure the degree of management necessary at the production level.

Comparison and Contrasts With Other Meat Packers

In order to determine if the conditions and opinions found for the case firm were typical of major meat packers, a comparative survey was undertaken. This survey involved interviews in person or via telephone with personnel at four major meat packing firms. All of these were among the top eight hog slaughtering firms in the nation in 1965 [20]. The interviews were structured so as to determine the extent of changes which the firms had made in contracting since

an earlier survey was completed and to derive comparisons to current activities of the case firm.

Changes in Contracting Patterns

Two of the meat packing firms contacted in this survey had not changed their posture toward contracting. They remained generally uninterested in expanding their current contract operations. These consisted of offering futures market contracts similar to those offered by the case firm and other firms in the hog slaughtering industry. An executive from one of these firms expressed the opinion that for his firm "contracting is a very expensive way to buy hogs." His reasoning was that the bookkeeping function was currently quite costly. He believed, however, that when computerized accounting systems had been worked out, this cost would be substantially reduced.

The other two firms interviewed had changed their contracting programs substantially. In one case, the firm had gone from a position of no contracts to use of a futures market related contract. Their contract is similar to those discussed earlier with the producer specifying whether his hogs are to be graded on a live or carcass basis. Producers are required to give 24 hours notice before delivery. In the other case, the firm had substantially reorganized its contracting efforts. Here, the firm had been involved in breeding operations, feeder pig production and market hog

production--all controlled through service contracts. This firm had owned all the livestock throughout the cycle from gilt through breeding, farrowing and finishing. At the various stages, these animals were placed out with farmers on a contract feeding or production basis. The firm in question has decided to eliminate much of the contract feeding and production it has done. It is currently re-thinking this process and has not completely firmed up its plans. Reasons for dropping these production contracts were management problems similar to those experienced by the case firm in it's production contract.

Attitudes Toward Contracting

The attitudes of personnel interviewed at the four other meat packing firms varied widely. At two of the firms, personnel seemed to take a reserved position. They expressed a concern over the cost of operating contract programs or evaluated the potential benefits for their firm as being very slim. Another of the firms which had recently taken their first steps into contracting for market hogs expressed concern over the need for strict legal agreements. They apparently prefer a voluntary handshake type of arrangement and believe that farmers also prefer this. The fourth firm expressed real interest in contract procurement. In spite of some problems with past contracting efforts, they believe that the benefits possible to their firm made contracting

a very attractive alternative to be explored. They also thought that there were possibilities through new contract methods for alleviating some of the cyclic nature of hog production.

Contract Benefits Expected

The major benefit expected by two of the firms interviewed was customer satisfaction. These firms were offering contracts on a "when asked for" basis rather than promoting them vigorously. Another of the firms interviewed believed that they benefited only slightly from procurement leverage, if at all. They thought that improved scheduling might contribute ten cents per hundred pounds, but that would be close to an upper limit. They believed that the benefits of an assured supply would be hard for them to capture. They are already in an area with sufficient supply of hogs; on days when deliveries are restricted due to weather or for other reasons of this type, it will also be difficult for farmers with contracts to deliver. One potential hazard they saw in contracting as a major source of hogs was the consequences if contracts were not renewed. They thought that if a major commitment to contracting led to closing some of their other procurement sources that these sources could not be readily reestablished if contracts were not renewed. In terms of the possibilities for premium quality product as a result of

upgrading hogs through contract, they believed that major determinants of product quality were cutting and trimming standards and shelf life, both of which are under internal control.

The fourth firm interviewed believed that they would need to have at least 20 percent of plant capacity contracted if they were to affect plant scheduling. They thought that an indirect benefit to them was that their farmer contractees would be better candidates for feed firm financing; thus, their contracts would be more attractive to farmers. They didn't see that there was any price leverage benefit to be gained over the long run. They believed that any short run gains in this area would probably be eliminated by the high degree of competition for noncontracted hogs if several firms were in the market.

This firm believed that by working with pricing formulae that encouraged farmers and meat packers to stabilize supply and demand for pork products, the size of fluctuations in the hog cycle could be reduced. They felt that limiting hog cycle fluctuations would enable their firm to reach much more efficient plant utilization levels. This firm had been successful in producing higher quality hogs through their earlier contract programs. They also found, however, that the overall quality of hogs has increased to a level far above that at the time they began contracting. This limits the differential in quality

available through contracting. This firm believed that over time they would need to offer a "cafeteria style" choice of several possible contracts to farmers so that each could choose what best suited his position.

Problems with Past Contracts

As was mentioned earlier, one of the packers interviewed found the accounting system necessary with contracts to be expensive and cumbersome. This he thought would soon be solved by application of computer technology to this accounting problem. Another of the packers estimated that the differences in accounting cost from contract procurement were about equal to differences which resulted from grade and yield buying. He believed that the fixed costs of personnel in the buying operation were the same as in current procurement programs but that contracting did require some additional record keeping cost.

A major problem faced by the firm who had owned hogs and contracted for finishing on a fee basis was similar to that experienced by the case firm. This involved the management capabilities and management performance of contractees. In some cases, this firm found that the husbandry of animals they owned was not at a level they had expected. In other cases, they found themselves being called upon whenever there were health problems with their animals. In still other cases, they made mistakes in who

they allowed to care for their animals. All these factors combined with the timing of their entry into this operation resulted in substantially lower than expected profit levels. These low profit levels along with a general dissatisfaction with the contracting program in its past form has lead the firm to phase out most of its contract production.

Another problem faced by all the firms interviewed was producer failure to deliver on contract agreements. This has not been a large problem for any of the firms, but caused some concern for all of them. A hog buyer at one firm expressed surprise that more problems had not occurred, especially with regard to the futures contract. He had viewed several situations in which farmers delivered hogs at contract prices as much as ten dollars below current cash prices. He believed that these cases substantiated the common industry trust in its farmer suppliers. This is not to say that all contracts had been delivered on. In fact, one firm had experienced a situation where individuals had sold hogs on a futures contract, accepted the guarantee money, but did not own any hogs or intend to feed any hogs. All firms expressed a firm stand on such tactics emphasizing that they are interested in purchasing hogs and would prosecute to the limit in cases where there was not good cause for failure to deliver. One of the firms was attempting to develop a pay back mechanism to allow producers to buy out of their contracts. It was clear that these

meat packing firms did not want to alienate potential farmer customers through excessively strict delivery enforcement.

Contract Pricing Formulae

The futures contract pricing formula used by all of the firms interviewed has the same essential provisions. Contract price is equal to live hog futures market price less a transportation differential. The farmer receives an initial payment of five to ten dollars per head which is deducted from his final payment.

One of the firms was considering a pricing system on proposed marketing contracts similar in many respects to those being experimentally tested by the case firm. This pricing formula specified a base price and a ceiling price with contract price equal to market price between these limits. Like the contracts discussed for the case firm, this contract formula specified a sharing of price increases above the upper limit. Unlike the contract formulae of the case firm, this formula specified a sharing of price decreases below the lower limit. The pricing formula being contemplated was of the following type:

If M.P. < \$19.00, then C.P. = M.P. + .25 (19.00 - M.P.)

If 19.00 $\leq$ M.P. 23,00, than C.P. - M.P.

If M.P. $\geq$ 23.00, than C.P. = 23.00 + .75 (M.P. - 23.00)

While the upper and lower prices are not exactly those offered by the firm, the basic pricing formula is the same.

A comparison of market and contract prices using this pricing formula appears in Figure 4.7. An examination of this figure shows that the losses which occur under this formula are considerably less than the losses occurring under the formulae examined earlier (See Figure 4.1).

The firm which was contemplating this type of pricing formula expected that the general dampening effect of such a formula would discourage entry on the high price side of the cycle and discourage exit on the low price side of the cycle. They also thought that the penalty to the packer on very low prices (below $19.00) would discourage efforts to push prices downward.

Other Contract Provisions

The firm considering the contract formula discussed above (contract formula IV) was anticipating offering this pricing scheme as part of a four-year contract. This contract, they reasoned, would coincide with the length of the hog cycle and thus serve to affect the cycle over its entire range. In addition to the four-year provision, farmers would be asked to specify the annual volume to be delivered, as well as the quarterly volumes to be delivered. There would be allowable bounds on these delivery volumes beyond which penalties would occur.

This four-year contract was the longest anticipated by any of the firms interviewed and has substantial

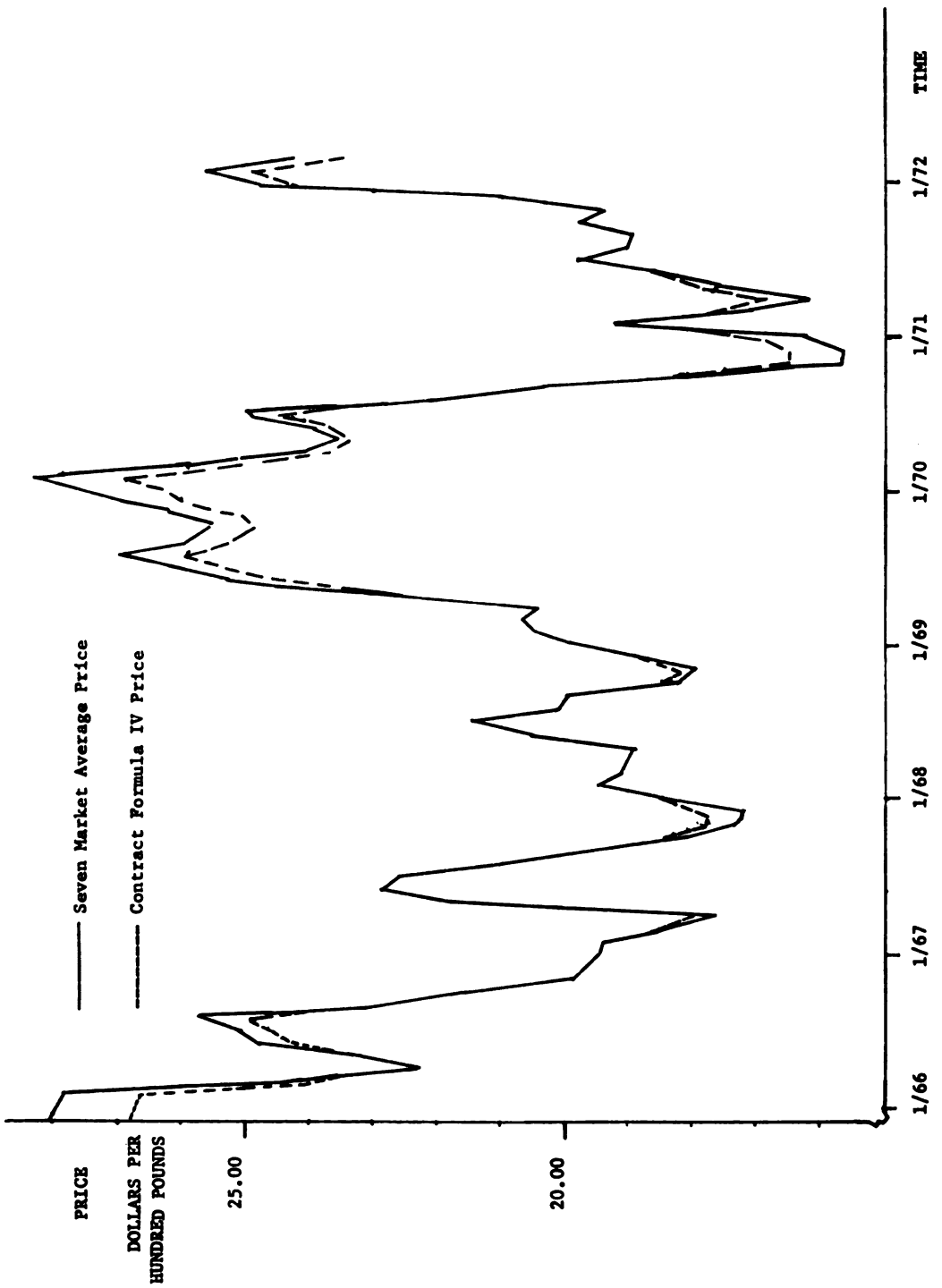

Figure 4.7. Seven Market Average Price and Contract Formula IV Price.

Source: See Appendix Table A.1.

potential for improved long term planning not possible with shorter contracts such as the futures market contract. In addition, the firm considering this contracting scheme was considering it for offer at all of its plants. While they were most interested in large volume customers, they were very willing to consider anyone who was seriously in the hog production business. They were specific in their intention of signing contracts only with persons who had legal claim to the hogs contracted either through ownership or another form of contract. They are trying to protect themselves from contract default.

Product Promotion and Contracting

Only one of the firms interviewed had begun a program of product promotion tied to its contracting efforts. This firm had started a merchandising program for fresh pork in conjunction with their initial contracting efforts. They were depending on their contract hogs to supply the high quality cuts necessary to fulfill the program commitments. While their contract hogs were of high quality, they also found that there were hogs available from traditional sources which met the quality standards they needed. This firm found that with a procurement strategy which rewarded quality, they could obtain the volume of high quality hogs which they needed. This strategy required a program which encouraged their personnel to pay premium prices for

premium hogs. It also required care that the overall market price was not bid up by paying premium prices for average or poor quality hogs. This required a more accurate estimate of hog quality to prevent inaccurate pricing.

Carcass Grade and Yield Buying

Most of the contracts being tried or considered by the firms interviewed specify carcass grade and yield buying. In all the contracts being tried or considered by these firms there is some effort made to stress more accurate purchase systems than the frequently used average weight pricing system. The packers interviewed were all interested in paying for hogs in relation to their quality as accurately as was economically feasible. This prompted several packers to sponsor grade and yield programs even before they incorporated them into their contract purchases.

Producer Participation

The firms interviewed generally felt that producers participating in their contract programs were interested in the security provided by the contracts. They felt this added security helped some farmers get financial assistance for production inputs and feeder pigs. These firms found that there was no hard and fast rule defining what size or type farmer was interested in contract selling. Two of the firms pointed out that not all farmers were interested in

the added security of contracting. They pointed out that some farmers who raised high quality hogs were willing and able to sustain losses in the low price periods of the hog cycle in order to capture gains during the high price periods. The meat packing firms interviewed felt that there would always be farmers in this situation with high quality hogs to sell who would not be interested in contracting. All the firms interviewed including the case firm have found farmer demand for contracts sufficiently high to offer the futures contract and experiment with other contracts.

Summary and Implications of Procurement Contracting

Among major meat packers surveyed, procurement contracts related to the Chicago Mercantile Exchange live hog futures market are most widely used. These contractural arrangements typically provide provisions for grade and yield selling with the base price related to the futures price at the time the contract is signed. These arrangements also typically result in a small initial payment to the farmer to indicate the earnest intention of the packer to purchase according to the terms of the agreement. The farmer determines the delivery data within the contract month, thus limiting the packer's ability to schedule slaughter. Any risk sharing involved in this type of contract could be gained through the live hog futures market independent of

the contract. Meat packer's greater familiarity of hedging in the futures market may explain why farmers choose packer procurement contracts of this type rather than hedging themselves. Farmers who sign contracts of this type are often seeking the security of a guaranteed market price in order to secure production financing. The short run nature of these contracts makes them of limited value in increasing the stability of hog production.

Other experimental attempts at procurement contracting have stressed the determination of a pricing formula which would limit potential losses to the contracting parties. The fairness of these formulae depends on several factors including: length of contract, delivery specifications, cost of operating the program, actual market price levels, and opportunity of renegotiations. At the current contracting volume, the major concern among packers is the pricing advantage to be gained from these contracts. There are also economies to be gained at the plant level from reduction in the weekly and seasonal fluctuation in hog supplies. These gains are, however, dependent on the ability to reduce the demand fluctuations facing individual plants through improved vertical coordination of the wholesale and retail levels.

The costs of operating contract programs appeared to lie mainly in accounting and bookkeeping costs and in higher prices paid during some contract periods according

to the firms interviewed. Some firms saw possible additional problems if they allowed contracts to become substantial sources of supply. The general upper limit for contract procurement was believed to be twenty percent of total purchases. This industry norm was expressed by several packers and may provide a restraining effect on contract procurement. There was sentiment among some firms interviewed that while contracting may become increasingly important, other market channels will continue to be used.

This feeling is supported by the experience of two of the packers interviewed in achieving similar results through other procurement stategies. These firms found that accurate and agressive pricing of hogs resulted in sufficient quantity of high quality hogs to support merchandising programs for high quality pork products. Firms also reported that increased use of grade and yield buying had improved hog quality. Firms in the study also pointed out that some of the seasonality of live hog supplies is due to the non-specialized nature of some hog farms. Thus, the degree of delivery specification possible is limited by the diversion of farmers' attention and energies to other enterprises at harvest and planting.

The examination of the effects of contracting on local market prices provides evidence of the ability of market forces to adjust to structural changes over time. However, short run price leverage may be possible through

limited contract procurement programs. The evidence presented earlier is also conditioned by the scale of contracting, and market structure prevailing at the time of this study. As buyer concentration levels and the degree of contracting change the effect on market prices is not entirely clear. As the percentage of hog supplies sold through contracts increases, the way in which contract pricing provisions are determined becomes more and more important. So long as terminal markets, auctions, and local dealers remain highly competitive focal points for price making, they probably provide a fairly accurate picture of supply and demand conditions. In this context, they may provide accurate bases for contract pricing formulae. If these traditional price discovery points become the markets of last resort for hogs of lower quality and for buyers with lower quality standards, then the relevance of market prices established there for high quality hogs sold direct or through contracts is questionable. If this becomes the market situation of the future, then contract prices may have to be directly related to wholesale or retail product prices.

Related to this pricing accuracy problem is the problem of contract price reporting. At this stage, packers are generally reluctant to report specific details of their contracting activities, especially soon after initiation. In some cases, packers consider particular contracting

methods including pricing and delivery provisions to be valuable competitive information. The time and effort required by a packer to develop a contract scheme which suits his and his customers' needs produces a valuable asset. Packers naturally attempt to protect that asset. The fact that the contract terms offered by individual packers currently are not widely available does limit farmers in attempts to accurately choose alternative market outlets and evaluate their position at the time of contract renewal. The increased incidence of procurement contracting may result in the development of a set of standardized contract provisions which could be fairly accurately compared between firms. The current evolution of pricing arrangements for procurement contracts supports this conclusion. This is also supported by the general uniformity of contracts in poultry production and marketing.

The feasibility of establishing a computerized forward contract market for slaughter hogs has been explored by Holder [12]. This study found that a computerized market for standardized forward contracts could result in reduced production and slaughtering costs and further that if such a market could reach an annual volume of five million head or more, it's operating costs would be substantially below those of current spot markets [12-p. 225]. The likelihood of such a market being developed may be discouraged by the offer of several different kinds of contracts by meat packers.

The effects of procurement contracting on the cyclic nature of hog production is crucially affected by farmer reactions to contract offers and contract provisions. The history of procurement contracting indicates that in many cases the initiative has come from farmers or farm groups. All of the firms offering contracts related to the live hog futures market indicated that these are offered in response to farmers' demands for this service. In this context there has not been a major meat packer effort to "sell" contract programs. There is some indication from our interviews and cursory examination of the farm press that this may be changing.

Farmers who had been involved in marketing or production contracts in Indiana and Missouri [5, 21] reported similar reasons for their involvement. These reasons included: more certainty of prices and gross returns, a source of production credit, technical assistance for production and marketing, and receiving "top dollar" for market hogs without continually checking a number of markets [5-p. 19]. These reasons are similar to those indicated by meat packing firms surveyed as reasons for contracting. One firm indicated the need to provide contracts for all types of farmers, including those who did not want the risk sharing provisions involved in contracting.

There is little information available on farmer reactions to the length of marketing contracts. This factor

has been shown to be crucial to the fairness of pricing formulae and the ability to affect the cyclic nature of hog production. In this context, the increased capital availability implied as a feature of some marketing contracts may enable farmers who would otherwise be unable to enter hog production to do so. Short term contracts will permit these farmers to enter and leave production in a way that accentuates the hog cycle. Longer term contracts may limit entry and exit and thus stabilize production levels. In this respect, meat packers who offer both short and long term contracts may have little net effect on the cyclic production of hogs.

Meat packers seemed to be reluctant to commit their firms to sustained efforts to limit the hog cycle. As a general rule, firms operate in a manner so as to benefit from swings in the cycle. This occurs in spite of the realization that all firms might be better off if the cycle were limited. The subsector as a whole seems trapped in the situation where short run decisions that are desirable lead to the perpetuation of an undesirable long run situation.

To summarize, the experiences of major meat packers interviewed in this study results in the following list of potential contract procurement benefits:

1) Improved scheduling of hog supplies and thus increased efficiency in slaughter plant operations,

2) Some pricing formula would tend to stabilize the rates of return in both meat packing and farm production,
3) Savings because of more efficient pricing and procurement systems,
4) Increased product sales volume and revenue because of improved product quality,
5) Reduction in the price and product fluctuations which have characterized U.S. hog production, and
6) Increased satisfaction of farmers because of the increased availability of production capital.

These benefits occur in the presence of several limitations:

1) Stability in plant operations is of greatest benefit when there is stability in pork product markets.
2) Delivery of contracted supplies are affected by such factors as weather, just as are other market supplies.
3) An overall increase in the quality of hogs available has limited the quality differential to be expected from contracting.
4) The ability to encourage high levels of management at the farm level through contracts has been limited.
5) The prevalence of diversification in farm production of hogs increases the premium necessary to get hog delivery during certain seasonal periods.

6) There are opportunities for increases in procurement efficiency without contracts.

7) Accounting costs of contracting are substantial, given current bookkeeping systems.

8) Shifts to contracting from other procurement sources may not be reversible if contract renegotiations fail.

9) Contracting at levels above twenty percent of plant capacity is thought to limit the opportunity for rapid adjustment to changing market conditions.

CHAPTER V

SOW LEASE PROGRAMS: A SURVEY

Introduction

According to an earlier survey [11] sow lease programs were the major type of contract vertical coordination involving feed manufacturers occurring in the hog-pork subsector. The sows are owned by the feed manufacturer and leased (along with boars) to farmers. The farmers pay a direct lease fee that is usually associated in some way with the market price for hogs. At the end of the production life of the leased animals, they are sold and the proceeds from the sale are returned to the leasing company in the typical sow lease program.

From the farmer's viewpoint, these programs provide high quality breeding animals at a low initial investment cost. The farmer does not need to have as much available capital to purchase breeding animals. But, needs to have available production facilities and working capital sufficient to cover variable expenses beyond the cost of livestock. In some cases, the leasing firm will also give credit to the farmer to purchase feed and other supplies. From the viewpoint of the lease firm, these arrangements

offer the opportunity for profits from the lease arrangements and the opportunity for increased sales of feed and other supplies sold in association with the lease.

Procedure

In order to identify the major developments which have recently occurred in sow lease programs and evaluate the likely future of sow lease programs, in-depth personal interviews were conducted with representatives of the three largest sow leasing firms in the United States. These three firms are each associated with one of the three leading feed manufacturers in the United States.

It was hoped that the interviews would provide an in-depth view of the advantages and disadvantages of sow leasing from a feed firm perspective. While the survey results did not produce a detailed comparison of costs and benefits, they did provide a clear picture of the evolution os sow-leasing, and the rationale for recent changes in the involvement of the three largest United States feed manufacturers in sow leasing and the production of breeding swine.

Results of an Earlier Survey

An initial pork industry survey [11-p. 19] found sow leasing to be a popular concept among feed manufacturers. The focus of these contractural arrangements was the

development of relatively captive markets for feed and associated services. The firms commenting on the profitability of sow leasing felt that it was a profit center in its own right, was projected to be, or had potential return on investment only slightly below other alternatives.

At the time of the initial survey (1970), there was considerable interest in sow leasing. Six of the eight firms surveyed were either in sow leasing or had been given the corporate go ahead to start [11-p. 19]. The researchers conducting this initial sow lease survey felt the presence of the leading feed manufacturing firms in sow leasing was one important cause of the flurry of sow lease activity in the feed industry.

With this follow-the-leader hypothesis in mind, the history and current development in sow lease programs for the leading feed manufacturers becomes an important part of predicting the future of these arrangements and the likely organization of the hog-pork subsector. The current survey of the three largest feed manufacturers gives some insight into their motivations, actions, and evaluation of sow lease programs.

Survey Results

Reasons for Entering Sow Leasing

All three of the firms interviewed were interested in sow leasing as an independent profit center within their

firm. Two firms acknowledged that the acceptable rate of return was less than other projects because of the increase in feed sales from sow leasing. One firm indicated that the increased feed sales generated by sow leases was their primary interest. Other reasons for leasing mentioned by firm personnel were: gaining information on problems of large-scale commercial hog production through their breeding herd operations, to help increase pork productivity in terms of litter size, to improve pork as a product, and to make credit available to farmers.

All of the reasons for entering sow leasing given by firm personnel revolve around increasing the firm's volume of feed sales. This may be a direct increase due to new feed accounts generated by the lease, or it may be an indirect increase from an overall increase in consumption and production of pork. The firms interviewed reasoned that if they can provide farmers with high quality breeding stock which results in better quality pork and higher profits to hog farmers, then the industry will grow and their firm will share in this growth.

Supporting Facilities for Leasing

Two firms reported substantial production facilities constructed and operated by their firm for the production of breeding animals. These firms felt that this was necessary to achieve the degree of health and sanitation which

they required. In addition, this gave the firms a high degree of control over the husbandry of the leased animals. The third firm interviewed relies mainly on contracts with top level farmers to produce the breeding stock they lease. One firm used only animals produced by their personnel as part of their lease herd. In the other cases, contracts with individual farmers to grow breeding animals were used. In both of these cases, the health, sanitation, and husbandry requirements were quite stringent.

Two firms were involved with substantial research programs using their breeder herds both as examples of commercial hog operations and for genetic and other basic research. Two firms had found their experiences in managing their breeder herds to be helpful in understanding problems facing commercial hog producers, and adjusting their products to meet producers need.

Lease Contract Terms

The leases used most recently contain similar general provisions which are outlined below.

Length of Lease

In two cases, the length of the lease was specified as four farrowings with option to renew for a fifth and sixth farrowing. In the other case, the contract length was twenty-seven months after delivery of first lot of

leased animals. This lease also contained an option for renewal. The leases often also contained the stipulation that the lease terms will remain in effect until all offspring of the leased swine have been sold. This insures the lease firms ability to exercise their rights to payment or animals in lieu of payment.

Lease Payments

All of the leases required a deposit at the time the lease was agreed to. The actual lease fee generally depends on the value of market hogs at specified time intervals into the lease. The following formula is typical:

1st yearly rental = 90% x Practical Top Market Price
x Number of Gilts
Leased, computed 12 months after delivery of animals

2nd yearly rental = 81% x Practical Top Market Price
x Number of Gilts
Leased, computed 24 months after delivery of animals

3rd yearly rental = 35% x Practical Top Market Price
x Number of Gilts
Leased, computed 36 months after delivery of animals

The percentages in this formula reflect the general tendency but are not exactly those of any one firm. Practical Top Market Price is defined as the price generally regarded as the highest paid by a nearby terminal market for slaughter hogs, but not the absolute highest paid for

small numbers of top quality swine. The fact that the rental payments are related to the price of slaughter swine at some future date places the lease firm in a risk sharing position with farmers.

All of the leases examined required farmers to keep gilts between 45 and 60 days before breeding. This means that the first offspring of these gilts would go to market approximately one year after signing the lease. Farmers then pay for breeding stock at prices related to the sale price of hogs produced. This means that when market hog prices are high, the cost of leased animals is high; when market prices are low, the cost of leased animals is low. This means that the returns to the leasing corporation are related to market hog prices. The leasing corporation is thus sharing the risk with the leasor.

As in other risk sharing arrangements, gains to the producer are limited as well as losses. This limitation on gains when hog prices are high diminishes the attractiveness of leasing arrangements to farmers who have the capital capacity to weather periods of low prices.

One of the firms had experimented with a leasing fee system where the payments were fixed at the time the animals were delivered. This arrangement related the lease fee to current market prices and did not embody the same degree of risk sharing as the other leases. This

uniform payment system also specified semi-annual as opposed to annual payments. This diminished the time which lease firm capital was tied up without return.

A look at figure 5.1 shows the difference between these two arrangements. Under the risk sharing scheme, a farmer who took delivery of gilts in January 1966 would make this first payment based on market prices in January 1967 and his second payment based on market prices in January 1968. In the fixed payment scheme, the producer who took delivery of gilts in January 1966 would have payments based on the market price prevailing at that time. It is clear that for these particular dates, the producer would have been better off under the risk sharing scheme. He would have paid lease fees based on a relatively low price for market hogs which prevailed at the time he sold his first and third batches of pigs. If the producer had taken delivery of gilts in December 1967, the tables would be turned. In this case, the fixed payment scheme would be based on the relatively low market price prevailing at the time of delivery. The risk sharing arrangement would result in payments based on the relatively higher market prices prevailing in December 1968 and December 1969.

In terms of the profit impact on the farmer signing the two types of lease agreements, it is not possible to tell absolutely which would have been more profitable over both periods. It is possible to say that the risk sharing

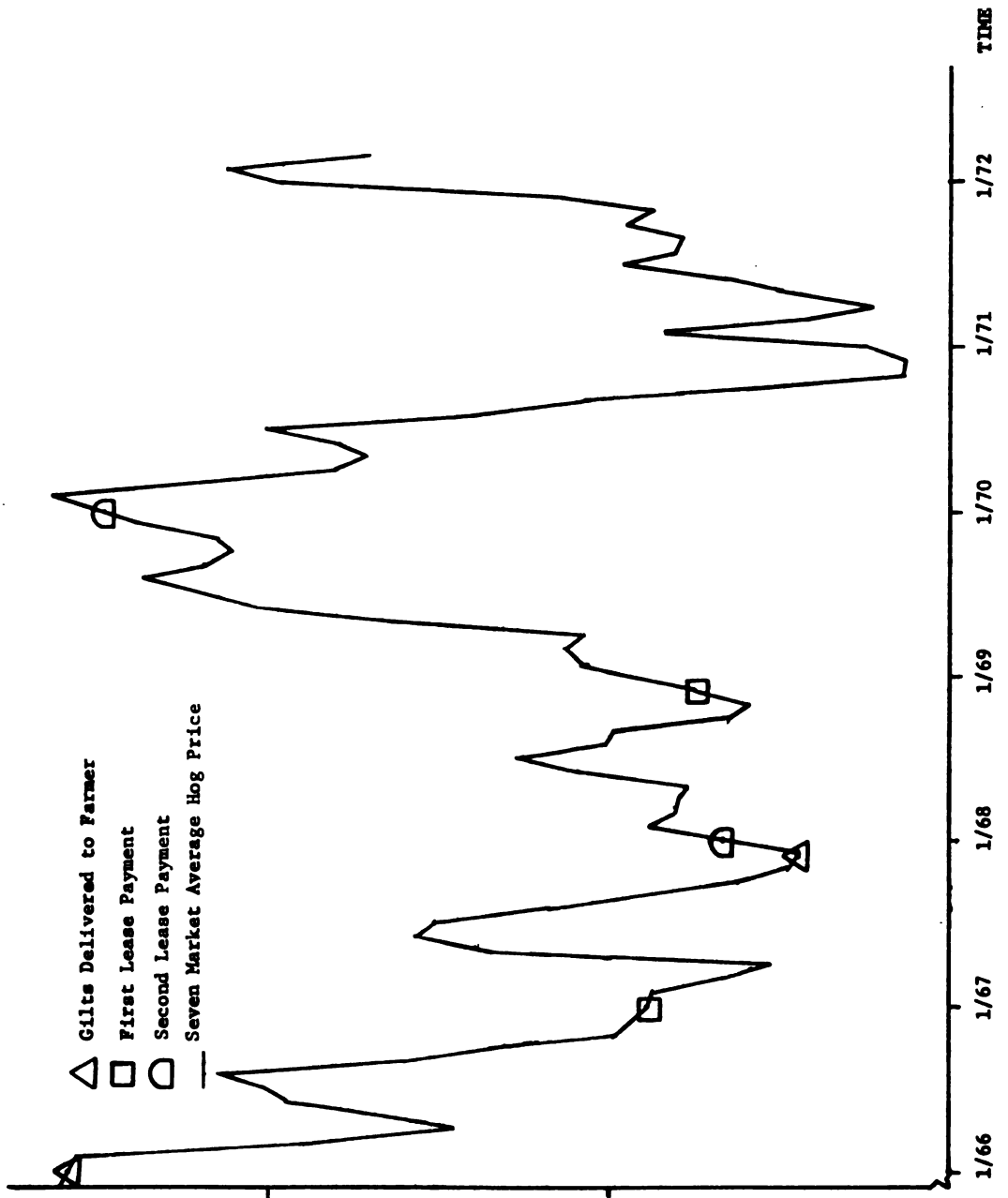

Figure 5.1. Relationship of Sow Lease Payments to Market Hog Prices for Selected Parts of the Hog Cycle.

Source: See Appendix Table A.1.

arrangements would result in more stable profit levels to the farmer. The fact that this form of lease payment matches the cost of breeding stock to market prices at the time when offspring are sold results in more stable levels of return on investment over time. The risk sharing form of payment produces less stable profit levels for the sow leasing firm. This results because the gilts delivered to the farmer by the leasing firm are produced at an opportunity cost reflected in market prices at the time of delivery. Thus, the leasing firm will probably prefer a fixed payment plan based on market prices at the time of delivery.

Ownership and Disposal of Animals

All of the leases examined specify that the leasing firm remains the sole owner of breeding stock leased. Producers agreed to notify leasing corporation prior to sale of any of the breeding animals.

All leased swine are required to go to slaughter unless previous arrangements for renewal of the lease have been made. This provision protects the lease firm from further use of its breeding stock without compensation. The proceeds from the sale of leased swine go to the leasing firm. In some cases, the producers' deposit is refunded from these proceeds.

In all the leases examined, the producer is the owner of all progeny from the leased swine. In all cases examined, the lease firm retained a lien on all progeny and usually retained option to purchase any progeny at current market prices. In two of the leases, the producer was required to send all progeny to slaughter. In the third case, the producer could use the progeny for breeding purposes, but only after payment of a royalty to the leasing operation.

In two leases, the producer was responsible for any death loss or culling of delivered swine for whatever reason. The exception to this is the case of non-breeding boars which were to be replaced by the leasing firm. In all the leases, producers were required to breed leased swine to boars leased from the leasing firm.

Depopulation

Two leases required that there be a period of approximately six weeks in which no swine shall have been on the premises to be occupied by the leased swine. All leases required that the producer keep only leased swine on the premises and that the leased swine be isolated from all other swine by at least one hundred yards.

Management, Health Requirements, and Costs

All of the leases examined featured provisions specifying a management program to be followed by the

producer. The firms indicated that this program for feeding leased swine and their offspring generally recommended their own firm's feed. In only one case did a firm require that animals be fed exclusively their feed. In this case, the firm required this only for the leased swine. This firm indicated that they felt their ownership of these swine legally entitled them to specify this level of care.

The leases examined generally specify that producers will be responsible for paying all expenses of maintaining, raising, and selling leased swine. These expenses would include feed, property, transportation expenses, selling expenses, and veterinary expense. In some of the leases, there is a specific stipulation indicating the producer will pay all taxes on leased animals.

All the leases specified that the producer would vaccinate the leased swine for erysipelas and leptospirosis at appropriate intervals.

Warranties by the Lease Firm

In only one of the leases examined did the leasing firm specify what warranties were implied by the lease. These warranties specified the average weight of delivered swine, guaranteed delivery of a health certificate on all leased swine, guaranteed boars to be breeders, guaranteed gilts not to be bred at time of delivery, and guaranteed

the delivered swine to be free of certain diseases. All the leases contain a disclaimer concerning profitability or performance of leased swine.

Other Provisions

The provisions described above are general to all the lease agreements examined. Some other provisions included in leases were a provision for producers electing to sell progeny as feeder pigs, a provision for producers to replace their original leased swine with their progeny, and minimum number of animals leased.

One firm was making initial attempts at a marketing program for progeny of their leased swine. Farmers would deliver their swine to a central collection point. Farmers were paid a price $.50 above the nearest terminal price quotation for U.S. grade 1-3 hogs. There were no yardage charges. Title to the hogs passes to the feed manufacturer at the collection point. The hogs were then shipped to packers. The price received by the feed manufacturer was determined by a formula previously agreed to through discussion with the packer. This feed manufacturer felt that they could offer a valuable service to packers by providing a quality product. He felt that this was particularly important to packers located in deficit production areas. He reasoned that, if a packer must ship in hogs to operate his plant, he is better off to ship in high quality hogs.

Promotion and Management of Sow Leases

All firms interviewed handled their sow lease programs in association with local feed dealers. Only one program involved the local dealer as a party to the lease agreement. In this program the local dealer leased the animals from the home firm, then sub-leased them to farmers.

None of the programs involved payment of a fee to the dealer either for placing or for servicing accounts. The sole incentive for dealer participation in the programs was their opportunity for new sales of feed and associated products. While the sow lease programs did offer local feed dealers opportunity to offer their customers a new service, they were not directly rewarded for this. Many local feed dealers have served as information exchanges, often locating breeding stock for farmer customers. Usually without the formality and complications involved in leasing programs. An impression gained from the interviews was that local feed dealers often resisted the demands placed on them to service and supervise leased animals.

Only the case where sows were leased directly to dealers did the farmer leases contain terms and specifications on financing of feed and other inputs. While other leases carried an implicit offer of financing for variable production expenses, the terms were left up to the local dealer. It was thus impossible to determine from our

interviews whether lease holders were treated differently with respect to feed prices than other customers by local dealers.

Results of Sow Lease Programs

All three firms interviewed found that sow-leasing was profitable for their firm. However, two firms had found that the ability of sow lease programs to match investment alternatives was limited. In both these firms, sow leasing had been evaluated as a separate profit center as well as a feed sales generator. In the remaining firm which had emphasized sow leasing as a generator of feed sales, the program was valued highly.

Two firms estimated 90 percent of sow-lease customers were also their feed customers. All firms interviewed thought that approximately 50 percent of their sow lease customers were new feed customers for their company. The firms did expect the new feed sales generated by sow leasing to decline as more firms entered the leasing or breeding stock market; it would be more difficult to attract feed customers away from their current supplier if that supplier also offered sow leasing as a service.

Two of the firms interviewed had recently made decisions to limit the emphasis on leases and move to direct sales of breeding stock. The third firm was committed to leasing as a viable way to increase feed sales. It is

interesting to note that the two firms de-emphasizing leasing are firms who stressed the profitability of lease operations independent of feed sales. These firms felt that selling breeding stock offered a return on livestock more nearly in line with other corporate opportunities and effects on feed sales similar to leasing.

While it is impossible to give very precise estimates of the scale of leasing operations, a ball park estimate for these three firms combined is 100,000 animals currently on lease. This is a decline from a combined total of approximately 150,000 animals prior to the de-emphasis of leasing by two firms.

Problems Encountered in Sow Leasing

All firms interviewed had encountered problems with their leasing programs. The problems discussed here are those which might characterize any leasing program, not those peculiar to a single firm.

Two firms found that lease holders expected more assistance with animal health than was implied in the lease. When their animals got sick, the feed manufacturer was asked to care for them in spite of lease terms which placed this responsibility with the farmer.

Two firms reported that between five and ten percent of the leaseholders had some difficulty in meeting payment schedules. They were quick to point out that there

were usually extenuating circumstances for these delays. They felt that the incidence of fraud or misrepresentation was minimal.

Two firms indicated a concern over the length of time their capital was tied up in a lease. This prompted one of the firms to change the length and payment provisions of its lease. This seemed also to be a major factor in prompting firms to favor fixed payment leases or sales agreements compared to leases with fees related to the slaughter hog market.

All firms reported some difficulty with dealer servicing of leases. This included failure of dealers to accurately checkout prospective lease holders and dealer reluctance to follow up lease arrangements with inspection and supervision. This problem had prompted both firms contemplating breeding stock sales to offer commission payments to dealers as part of the sales program.

All firms reported some difficulties in receiving salvage returns from sale of leased animals. Some farmers reported death loss when animals were actually kept or sold. Similarly, some farmers attempted to skirt lease provisions by keeping progeny from leased animals for breeding stock, mixing owned and leased animals, or keeping leased and other animals on the same property. One firm believed that the lease requirement for farm depopulation severely limited

their market for leased animals. In some cases the requirement encouraged leasors who were inexperienced in hog production or those who had been forced to liquidate their herd because of disease. The requirement that the lease holder keep only leased swine may have prevented hog producers with established breeding herds and strong management capabilities from taking part in the program.

All firms reported problems in selection of lease holders. The requirements for depopulation and exclusively using leased breeding swine at any one location contributed to these problems. They felt the basic problem, however, was finding farmers who were willing to meet the terms of the leases. One firm expressed an overall dissatisfaction with it's ability to communicate with lease holders what was expected of them and what they could expect from the lease firm. The large staff for paperwork and control of leases was seen as a problem by one firm. In fact, personnel at this firm felt that sow leasing might work better for a small firm with a smaller volume of leased animals which could more easily be supervised.

One firm mentioned some legal difficulties that had occurred in trying to operate over several states. These problems involved meeting local requirements for legally repossessing leased animals in cases where they were improperly cared for or other terms of the lease were not met. Another firm had mentioned that successive

refinements of it's lease were made with references to greater security. Thus, later versions of their lease specified exactly the rights and responsibilities of the parties.

Summary of Benefits and Problems in Sow Leasing

Among the firms surveyed the following major benefits of sow lease programs were mentioned: 1) Profits from rental fees, 2) Increased feed sales, 3) Increased knowledge of hog production, feeding, and breeding, 4) Reduced cost of feed production because of increased sales, and 5) improved quality of pork as a product.

These benefits were accompanied by several problems including: 1) High required capital investment and capital cost in animals and facilities, 2) High costs of assisting lease holders with disease problems and other management problems, 3) Difficulty in recovering leased animals, 4) Difficulty in encouraging dealers to service leases, 5) High accounting, record keeping, and legal expenses in operating lease programs over a wide area, and 6) Limited problems with lease holders not making rental payments.

Conversion From Leasing to Selling

Two of the firms interviewed were beginning to sell breeding stock as well as lease them. An obvious reason for this was the current high market price for slaughter hogs and breeding stock.

One firm had already converted their lease program to a uniform payment system related to current prices for market hogs. The sales programs offer firms an opportunity to get faster returns on their invested capital. They also offer firms returns more in proportion to opportunity costs of the gilts sold than did future payment lease programs. Both firms contemplating sales of breeding stock expected additional feed sales to be about the same as under leasing programs. In both cases, these firms were planning to promote their breeding stock sales through their feed dealers. One firm planned to give local dealers a small commission on the livestock sales. In addition, local dealers would get the initial contact enabling them to promote their feeding program to the farmer.

They expected selling of breeding stock to be as profitable for the feed business as leasing was, while significantly reducing the accounting and supervising costs. These firms seemed very interested in providing the same high quality hogs provided under the lease, but transferring ownership responsibility to the farmer. They felt that this would significantly reduce their problems associated with ownership and remove them from the risk sharing provision of some leases.

The transformation from leasing to selling will be accompanied by arrangements for financing. While both firms agreed that they did not want to be in the banking

business, each of them had plans available to finance the purchase of their gilts in cases where outside financing may be difficult to obtain.

Farmer Reaction to Sow Leasing

The future of sow lease programs and breeding sales programs depend to a large degree on farmer reaction. Three studies of sow lease contractees [1, 5, 21] have shown that farmers entering these contracts were interested in access to quality inputs, source of credit for production expenses or expansion, more certainty of gross returns, and technical assistance with production or marketing [21-p. 17 and 5-p. 19]. Problems which sow lease contractees had experienced were lack of cooperation, poor quality of health of hogs, loss of independence, compulsory involvement of feed firm, inexperienced fieldmen, complicated or vague contract, and cost relative to independent production[21-p. 20]. In addition, one study found that many of the contractees had not read or were unfamiliar with the terms of their contract [21-p. 21].

Interestingly, three of the items sought by farmers in sow lease contracts are available from other independent sources. High quality breeding stock, production capital, and technical assistance are all available from independent market sources. Certainty of returns, or at least some risk reduction, is available through hedging. The

availability of these services, along with farmers' dislike for loss of independence, and compulsory involvement of feed firms in contracts as cited above, may mean that firms offering breeding stock and offering financing when necessary are meeting the needs of most farmers.

The leases examined in this study were often hard to understand or vague. These features, along with the high incidence of farmers who did not read their leases, indicates that this form of coordination may be little better than current alternatives as a means of communication. Farmers in general have dealt often with oral or very simple written agreements and are not geared to highly specified terms or legal language. At the same time, sow leasing firms are attempting to protect themselves from future legal complications and specify clearly the behavior and performance expected. The communication problem created by these circumstances may limit the success of production contracting for all parties.

Implications of Sow Leasing

Perhaps the most significant implication of sow leasing for the hog-pork subsector is its effect on breeding stock production. Sow leasing firms, along with several other firms, have applied genetic principles to improving breeding stock production on a very large scale. The estimate of 100,000 hogs on lease for the three firms interviewed,

while representing less than two percent of the United States breeding herd, may lead to a substantial incremental change, ultimately, in the genetic background of the swine population.

The application of sophisticated breeding technology to hog production is producing a new market situation for breeding animals. Whereas previously farmers have relied on pure bred herds for boars to upgrade their own breeding herds, farmers have tended to rely on gilts kept from their own herds. The availability of high quality gilts backed by rigid health programs may be changing the pattern of farrowing management. Sow leasing may have contributed to changing farmer patterns by offering farmers an opportunity to work with these new types of breeding animals at reduced costs compared to outright purchase. In fact, the major benefit of sow leasing to some firms may be the wide publicity given to the breeding hogs they had developed.

It is too early to determine the rate at which the new cross breeds being developed will be adopted. It was clear from the firms interviewed that they believed they were making a contribution to the overall improvement of pork through the development of better breeding animals.

Those firms switching their emphasis from leasing to selling breeding stock were clearly not satisfied with the risk sharing payment plans of their leases. While these provisions were desired by farmers, both firms were

unwilling to continue sharing the risk of future fluctuations in slaughter hog prices on such a direct basis. All swine feed firms are affected by slaughter hog prices to the extent that prices affect profitability of hog production and thus affect the overall market for hog feed. The pricing arrangements in several of the leases resulted in direct risk sharing. While this direct risk sharing had potential for damping the hog cycle through more stabilized returns for farmers, feed firms were apparently unwilling to absorb possible short run losses due to low market prices to gain longer run stability. The small scale of these risk sharing arrangements relative to total United States hog production may have been a discouraging factor. A successful effort to stabilize hog production may require a total readjustment for the subsector. This condition exists because the degree of control which one firm can exercise is not sufficient to change the overall pork production pattern. Thus even though one firm tries to stabilize pork porduction, the industry remains unstable and many of the potential benefits of stable production to the firm are not achieved. It seems likely from the above example that the current organization of the subsector is geared to cyclic production and does not provide sufficient incentives to any one firm or group of firms for a substantial reorganization to occur.

CHAPTER VI

SUMMARY, IMPLICATIONS, AND SUGGESTED RESEARCH

Meat packing firms and feed manufacturers have been using procurement contracting and sow leasing in attempts to improve their profitability through better control over their input supply or increased sales of their output. Among those firms interviewed in this study, the use of these vertical coordination arrangements has ranged from experimental to substantial. Evidence found in this study indicates that while meat packers have experienced some difficulties with contract procurement the outlook for expanded use of this procurement method is good. The degree of expansion will be limited by the hesitance of packers to contract for more than twenty percent of their supply requirements. Current plans for implementation of contract programs are hampered by current high price levels which limit the attractiveness of contract selling from the farmer's viewpoint. As hog prices decline over the next two years, there will probably be an effort by at least two of the firms surveyed to expand their contract procurement programs. The remaining firms currently are taking a wait and see posture. Their entry into major

contract programs will be conditioned by the success of their competitors and the requests of their suppliers. Feed manufacturers interviewed were mixed in their outlook for sow lease programs. Two firms were de-emphasizing leasing in favor of breeding stock sales while the third firm was expanding its breeding stock program. It is clear from our interviews and other developments in breeding stock production and sales that several large firms will be offering breeding stock for sale to farmers. The future importance of leases in the market for breeding stock is not clear.

Meat packers and feed manufacturers have experienced problems in attempts at production contracting. In these vertical coordination arrangements where the meat packer or feed manufacturer owned the livestock and the farmer provided labor, facilities, equipment, and variable production inputs the results had been unsatisfactory to the integrating firms. These integrating firms were unable to achieve the degree of control they desired at an acceptable cost level. They were apparently unable to structure their contractural agreements with sufficient incentives for farmers to give the desired level of care to the animals owned by the integrating firm. Many of the firms expressed the belief that the performance generated when farmers owned the animals was superior. The benefits and experience of

meat packers and feed manufacturers with production contracting and sow leasing have conditioned some of them to shun coordination arrangements of this type.

Feed manufacturers have apparently found that they can profitably manage the highly specialized production of breeding stock. While efforts to manage large scale sow leasing programs have been abandoned or de-emphasized by some firms, they are continuing to produce breeding stock using contract production to increase the size of their breeder herd. In this case, profits from the sale of breeding stock are high enough to cover the management costs of the breeder herd program which are reduced because of the small number of contracts involved.

Sow leasing programs have evolved for some feed firms into a major effort to produce and sell breeding stock. They feel that this new effort will afford them similar gains in feed sales without the high accounting, servicing, and financing costs encountered in leasing sows. All the firms interviewed felt that the contribution to feed sales from this service would decrease as more feed manufacturers entered sow leasing or breeding stock sales. These feed manufacturers may find that they have a competitive advantage over other firms entering the breeding stock market. The ability of feed manufacturers to offer a complete package of swine production inputs through their local dealers may give them an edge in breeding stock sales over more specialized firms.

While sow lease programs at a very large scale may not present a profitable alternative, the experience of one firm interviewed (supported by views of the other firms) indicates that small scale sow leasing or similar arrangements are feasible. A key constraint on the size of sow lease operations from the feed firms viewpoint was the high capital requirement. This high capital requirement along with the relatively slow pay back rate was a major reason firms had changed payment provisions in their leases. Firms with available capital and more limited investment alternatives may find sow leasing attractive.

Both packer procurement contracting and sow leasing work as competitive services differentiating firms adopting them from their rivals. In this light, they place firms offering these arrangements along with other services at an advantage over other firms. There are few indications from this study or the others surveyed that any one firm size has advantages in offering either of these arrangements. There are some indications that procurement contracting may be facilitated by the existence of on-going grade and yield procurement programs and the associated record keeping services. Similarly there was some indication that sow leasing was limited in scale by the high level of supervisory management required. Firms interviewed were not particularly geared to service farmers at any particular contract volume. There was some evidence

that many of the initial contracting efforts that had been attempted involved large volume producers or producer groups. This was primarily due to the experimental nature of these efforts. Large scale producers would have the ability to offer packers substantial numbers of hogs for delivery at specific times. This advantage may be eroded by the packers' resistance to putting all his eggs in one basket. The generally expressed desire to serve their farmer suppliers indicates that packers will generally not limit contract agreements to large scale producers.

The entry of major feed manufacturers and other large agribusiness firms into the production and sale of breeding swine may place smaller scale swine breeders at an initial disadvantage. If, as has been suggested earlier, these large firms are successful in changing farmers patterns of breeding swine selection, this may open new opportunities for all swine breeders. It is certain that the availability of breeding swine from these firms creates the need for an increased dissemination of information on breeder swine prices. The market for breeding animals could develop into a highly competitive one. There is some danger, however, that the competition in this market will take place in an atmosphere clouded by performance claims that farmers are unable to verify or evaluate. The need for consumer protection may be as great in this market as in any other where the manufacturers claims are not easily tested by buyers.

Wholesalers and retailers of pork products can look forward to efforts on the part of meat packers to add stability to this side of their market. Some meat packers have already taken steps toward branding and promotion of fresh pork products. The evidence presented here on the returns available from reduced supply fluctuation indicate the need to stabilize product demand in order to take full advantage of scheduling economies. While some meat packers already experimented with contract sales via verbal agreements, these have not been widespread. The incidence of sales contracting among major meat packers may be encouraged by their inability to enter retailing directly because of antitrust restraints. For smaller meat packers these restraints have not been so specific; thus there may be efforts by these packers to enter some phases of wholesaling and retailing. Centralized cutting and packaging of pork may become an effective way for some packers to improve product quality and both stimulate and stabilize product demand.

Consumers as well as wholesalers and retailers can look forward to more uniform quality pork. The efforts at improved breeding stock production along with packer evaluation indicating an improved quality of hogs being produced indicates a general improvement in pork quality. This improvement in quality will be encouraged by grade and yield purchase programs within or outside contracting. The

possibility of passing along substantial cost savings from improved regularity in the production and marketing of hogs seems unlikely in the near future. Procurement contracts do afford an opportunity for improved communication of consumer preferences to producers. While the contracts examined here don't contain the specific size of pork chops to be produced, they do provide quality evaluation systems which more accurately communicate and reward demanded pork characteristics than have traditional market price coordination systems.

Implications for Subsector Performance

In an earlier section we discussed four performance criteria which were particularly applicable to the Hog-Pork subsector. It is important to assess the effects of sow lease programs and packer procurement contracts, as they are evolving, on these dimensions of performance.

Efficiency

Sow lease programs and packer procurement contracts both offered opportunities for improved productivity and improved communication of consumer preferences. At the feed manufacturer level sow lease programs have not and likely will not reach volume levels which might lead to substantial economies in feed production. While the production of breeding stock may lead to improved utilization

of some of the excess capacity in feed manufacturing the savings generated at current production levels are limited. Breeding stock production may however produce a better degree of communication between feed manufacturers and farmers and lead to more rapid adjustments in feed products in response to changing requirements of hog production. Feed manufacturing will probably have a greater increase in efficiency if the efforts of meat packers to stabilize production through procurement contracts are successful. This stabilized production of hogs would make possible the organization of feed manufacturing facilities at efficient scales without the need for a wide range in feed production capacity.

At the farm level sow lease programs and breeding stock sales by feed manufacturers offer the farmer the benefits of extensive genetic research and development and thus a potential improvement in production efficiency. Packer procurement contracts offer farmers the opportunity to produce for a predetermined or stabilized price and at a specified quality level. The grading and evaluation systems associated with these contracts give the farmer a more direct and accurate indication of value of his hogs to consumers and thus improves pricing efficiency.

At the meat packer level there is an increase in productivity possible if supply of hogs can be stabilized through procurement contracts. It is also possible that

improved quality hogs through the efforts of feed manufacturers and other breeding firms will result in higher transformation rates of pigs into pork.

At the wholesale retail level packer procurement contracts and breeding stock production are potential sources of a more uniform quality and more stable quantity of pork products. This may allow firms to rationalize production levels and capital investments at more efficient levels. Procurement contracts also offer wholesalers and retailers the potential for increased specification purchasing for specialized markets.

Equity

The degree to which benefits and costs of improved vertical coordination through procurement contracting or sow leasing will be equitably distributed is difficult to predict. As these arrangements have evolved they have been primarily controlled by the meat packers or feed manufacturers offering the particular program. The increasing concentration in hog purchasing produces a situation in which meat packers could potentially offer contracts with inequitable terms on a take it or leave it basis. Under present market conditions there are adequate alternatives for farmers such that an inequitable contract would be passed up by farmers because of better available market alternatives. If buyer concentration increases, this degree

of competition may disappear as the number of available alternatives disappear. This may indicate as has been suggested earlier the need for contract standardization and a national market for these standardized contracts to offset local oligopsony. The general tendency of farmers not to read or understand the contracts they were leasing or producing under also indicates the possibility of inequitable treatment. It is desirable in this context to explore the overall legal sophistication of farmers and provide extension aid to insure that farmers are aware of the performance expected in the agreements that they sign. In a similar vein it may be necessary to insure that contracts are available uniformly to farmers who can meet the contract performance standards.

In the market for breeding swine there are possibilities that small scale breeders will suffer from the competition of large firms both in and outside feed manufacturing. In this context it may be desirable to encourage a government-sponsored breeding stock "certification" and price intelligence program to insure a high degree of competition in this market. This would insure that farmers had an equal opportunity to compare quality and price of breeding stock from different firms.

Stability

Major improvements in the stability of hog production are also a potential benefit of improved vertical coordination. Only two of the contract procurement programs being tried or considered by meat packers offer incentives for increased production stability. In both of these programs there are pricing mechanisms which would tend to discourage the peaks and valleys in the hog cycle. These contracts also call for a two to four year commitment to produce hogs at specified rates. The major limitations to these contracts is their limited extent of coverage in terms of total hog production. There also may be a tendency for these contracts to attract farmers who are already primarily committed to hog production and thus currently produce at stable levels. This tendency could limit the effectiveness of such contract programs in stabilizing the "in and out" hog producers.

If sow lease programs continue a trend toward selling or shift to rental payment systems which are not risk sharing in nature, then their effects on hog production stability will be diminished. The attitudes toward risk sharing expressed by feed manufacturers in our survey indicate that a move away from risk sharing arrangements is likely.

In terms of overall system stability, the current operating procedures at the various levels within the system are geared to an unstable cyclic production pattern. The reactions of firms interviewed in this study indicate that, even in their efforts to reduce this system instability, these firms hedge against fluctuations. The upper limit on contracting as a percentage of total procurement indicated by meat packers is an example of this. This tendency is accentuated by the inability of a single firm to exercise control over the production cycle and capture the benefits of such control. Thus firms attempting control systems to increase stability are often disappointed in the returns to these operations.

Offsetting these experiences is a realization and belief (among at least two of the packers and one of the feed manufacturers interviewed) that there are substantial benefits to be gained if the system can be stabilized. This belief will encourage these firms to continue efforts to stabilize the system.

The major effects of sow leasing and packer procurement contracting on the price of pork products will be on production costs. In as much as these arrangements result in higher quality, more efficient hog production and marketing, they will slow price increases for pork products.

Progressiveness

Both sow leasing and packer procurement contracting will likely encourage a faster rate of acceptance of new production technology and new product development. The entry of feed manufacturers into the production of breeding swine has focused a substantial amount of new capital and energy into this area. This will likely result in a more rapid rate of development of genetically superior swine. The large scale production of these high quality animals coupled with an agressive and wide spread promotional campaign will likely result in their more rapid adoption by farmers.

The development of a large scale breeding swine industry coupled with the incentives for production of high yielding hogs found in packer procurement contracts may result in a more rapid increase in the overall quality of pork produced. This increase in overall hog quality and thus the increased availability of high quality pork cuts may encourage packers, wholesalers, and retailers to develop new products and merchandising programs. These new products will likely involve new pork cuts which were unavailable in sufficient quantity to be profitably marketed in the past.

Suggested Research

The conclusions and implications presented above reveal a need for a better understanding of some of the complex economic interactions in the Hog-Pork subsector. Feed manufacturers, farmers, meat packers, wholesalers, retailers, and consumers could benefit from a better understanding of those factors which will shape the future of the pork production and marketing system. Some of the research topics which require further study are presented below classified according to the industry or level in the subsector at which they occur.

Feed Manufacturing

At the feed manufacturer level there are several important research areas. The market for feed and associated services at the farm level has received only limited attention. There is a current need to explore the structure and performance of the feed industry at the local market level. It seems likely that this industry is characterized by high degrees of service competition, excess capacity, and increasing concentration. Documentation of these trends, if they exist at the local market level, would provide better insight into the effect these firms will have on the organization of the livestock subsector.

There is a need to examine the compatibility of feeding technology being developed by feed manufacturers

with the pork products demanded by consumers. The entry of feed manufacturers into swine breeding opens the possibility for the promotion of input combinations (feed and livestock) which will result in pork products not meeting consumer demands. This possibility should be examined in the context of discovering how farmers react to advertising, promotion, pricing, and financing of feed and breeding stock.

The issue of credit availability runs throughout the Hog-Pork subsector. Access to production financing was a primary consideration in farmers choosing to lease breeding stock. The role of feed firms in financing production, the control over production implied in these financial agreements, the application of "truth in lending" principles to these agreements, and effect on farm organization of feed firm financing are all important research topics.

The industry's internal firm operating procedures need to be identified, as the degree to which they effect success or failure of particular ventures needs to be estimated. Because of departmentalization, the combined benefits of the program weren't being added together, except perhaps informally. In sow leasing, it was difficult under current operating procedures for firms to count the total benefits from sow lease programs as independent profit centers and as increased sales of hog feed. Current accounting systems forced an evaluation of these programs on one

of these bases or the other. This seems to imply that programs with multiple benefits to several areas of firm operations are penalized relative to clearly independent ventures. The effect of these considerations on possible diversification or vertical integration may discourage some divisions within firms from instigating complementary enterprises or doom those enterprises to poor evaluation and ultimate "failure" whether it's deserved or not.

A detailed description of the market for breeding swine along with a study of the feasibility of developing an accurate information system for wisespread dissemination of prices and product characteristics in this market is needed. This would make possible an accurate evaluation of the impact of the entry of large scale firms into the breeding swine market and provide farmers and policy makers with an estimate of the costs of an improved information system in this market.

Pork Production on Farms

Perhaps the greatest research need pointed out by this study would be an increased understanding of how farmers evaluate pricing information, risk, and uncertainty. These factors and farmers' reaction to them are crucial in determining the effects of contracting arrangements on pork production. Until we identify the rule under which farmers

decide to enter or change the scale of their hog enterprises, we can only speculate about some effects of particular length contracts, particular pricing arrangements and other contract terms.

The experience of both feed manufactuers and meat packers in production contracting highlights the need to determine the difference in the way farmers react to contractural incentives versus the way they react when they own the livestock being cared for. There may be differences in these reactions between farmers entering hog production for the first time and those who are established hog producers. The ability of contracting firms to provide incentives for high levels of management input by farmers is crucial to the future of production contracting. This problem is accentuated in hog production where current technology for disease control requires high management levels.

There is also a need to understand the incentives necessary to produce delivery timing and product quality desired in procurement contracting by meat packers. Since general farmers are occupied during certain seasons with other crop and livestock enterprises, the payment or reward required to get specific delivery during these seasons may be higher than during slack periods. The level of incentives required will determine the profitability of contracting for packers and the kind of producers willing to contract.

There is also a need for an in depth study of the effect of contract selling or production on internal organization of farm firms and their growth patterns over time. Risk reduction, capital availability, improved input quality, and management assistance are factors associated with contracting which may change internal firm management and growth patterns.

Meat Packing

One research area is the description and analysis of particular market characteristics which favor or inhibit an increase in contractural arrangements. This might involve a study of selected market areas throughout the United States to determine how factors such as buyer concentration, alternative market channels, average volume of hogs sold, location, strength of farmer bargaining groups and other factors have effected farmer and meat packer attitudes and the growth of contract procurement in different markets.

The increasing incidence of contracting opens a whole series of questions on the bargaining relationships between farmers and meat packers. It was unclear from our packer interviews what role farmer bargaining groups would play in future contract hog procurement. Packers were concerned that those with whom they contracted have clear title to hogs either under their ownership or through contracts. The advantages and disadvantages for packers

and farmers of contracting with bargaining associations could be a productive research topic. Along with this, the examination of effective bargaining strategies for individual farmers in their negotiations with packers may require further study of renegotiation provisions and resulting terms of trade in standardized contracts.

The effect of contracting on market prices and the examination of terminal market prices as accurate bases for pricing formulae are topics of continuing interest. The study of alternative methods of establishing price bases when terminal market prices became suspect would be useful.

Wholesaling, Retailing, and Consumption

This study has concentrated on vertical coordination among feed manufacturers, farmers, and meat packers. There have been some limited retailer and wholesaler integration into meat packing, and pork processing. Retailers and wholesalers may however possess unique advantages in coordinating the system because of their proximity to the consumer and the possibility of effecting demand for pork products through promotion. It is important to attempt to understand current vertical coordination systems between wholesalers, retailers, and meat packers including the possibility and effects of long and short term contracts,

specification buying, working agreements, and open markets as they are currently organized.

Technological developments in cutting and packaging of meat may also put increasing pressure on firms to develop new vertical coordination systems. In this context the understanding of the economies of centralized cutting and packaging of meat at the packer versus retailer level may indicate the level in the vertical system at which changes will most likely occur.

There was an impression gained from feed manufacturers and meat packers that consumers were ill informed about the role of pork, fresh and processed, in a balanced diet. They felt that consumers maintained an image of pork as a fatty food high in calories and cholestrol and perhaps hazardous to their health. There may be a need in this context for research on the properties of modern pork products in providing nutritional needs. This does not imply the need to promote pork as a food but the need for an accurate evaluation of its characteristics in providing protein, carbohydrate, and fat as part of a well balanced diet if such an evaluation does not already exist.

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APPENDIX

TABLE A.1

SEVEN MARKET AVERAGE PRICES AND CONTRACT PRICES FOR SLAUGHTER HOGS
DECEMBER 1965-MARCH 1972
MONTHLY

Year	Month	Market[a/] Price	Contract Price I	Contract Price II	Contract Price III	Contract Price IV
1965	12	28.07	25.00	25.80	26.25	26.80
1966	1	27.93	25.00	25.70	26.45	26.70
1966	2	27.80	25.00	25.60	26.35	26.60
1966	3	24.41	24.41	23.06	23.93	24.06
1966	4	22.26	22.26	21.44	22.23	22.26
1966	5	23.16	23.16	22.12	23.04	23.12
1966	6	24.72	24.72	23.29	24.18	24.29
1966	7	25.09	25.00	23.57	24.47	24.57
1966	8	25.75	25.00	24.06	25.00	25.06
1966	9	23.16	23.16	22.12	23.04	23.12
1966	10	21.57	21.57	20.93	21.57	21.57
1966	11	19.87	19.87	19.65	19.87	19.87
1966	12	19.67	19.67	19.50	19.67	19.67
1967	1	19.46	19.46	19.35	19.46	19.46
1967	2	19.38	19.38	19.28	19.38	19.38
1967	3	18.43	19.00	19.00	19.00	18.57
1967	4	17.62	19.00	19.00	19.00	17.96
1967	5	21.83	21.83	21.12	21.83	21.83
1967	6	22.89	22.89	21.92	22.80	22.89
1967	7	22.58	22.58	21.68	22.52	22.58
1967	8	21.04	21.04	20.93	21.04	21.04
1967	9	19.46	19.46	19.35	19.46	19.46
1967	10	18.16	19.00	19.00	19.00	18.37
1967	11	17.36	19.00	19.00	19.00	17.77
1967	12	17.29	19.00	19.00	19.00	17.72
1968	1	18.31	19.00	19.00	19.00	18.48
1968	2	19.41	19.41	19.31	19.41	19.41
1968	3	19.07	19.07	19.05	19.07	19.07
1968	4	19.00	19.00	19.00	19.00	19.00
1968	5	18.88	19.00	19.00	19.00	18.91
1968	6	20.43	20.43	20.07	20.43	20.43
1968	7	21.48	21.48	20.86	21.48	21.48
1968	8	20.08	20.08	19.81	20.08	20.08
1968	9	19.93	19.93	19.70	19.93	19.93
1968	10	18.29	19.00	19.00	19.00	18.47
1968	11	17.92	19.00	19.00	19.00	18.19
1968	12	18.76	19.00	19.00	19.00	18.82
1969	1	19.77	19.77	19.58	19.77	19.77
1969	2	20.41	20.41	20.06	20.41	20.41
1969	3	20.69	20.69	20.27	20.69	20.69
1969	4	20.38	20.38	20.03	20.38	20.38
1969	5	23.14	23.14	22.10	23.03	23.10
1969	6	25.16	25.00	23.62	24.53	24.62
1969	7	26.05	25.00	24.29	25.04	25.29
1969	8	26.91	25.00	24.93	25.68	25.93
1969	9	25.94	25.00	24.21	25.15	25.21
1969	10	25.53	25.00	23.90	24.82	24.90
1969	11	25.77	25.00	24.08	25.02	25.08
1969	12	26.93	25.00	24.95	25.70	25.95
1970	1	27.40	25.00	25.30	26.05	26.30
1970	2	28.23	25.00	25.92	26.36	26.92
1970	3	25.94	25.00	24.21	25.15	25.21
1970	4	24.02	24.02	22.76	23.62	23.76
1970	5	23.53	23.53	22.40	23.38	23.40
1970	6	24.04	24.04	22.78	23.63	23.78
1970	7	25.13	25.00	23.60	24.50	24.60
1970	8	22.12	22.12	21.34	22.11	22.12
1970	9	20.35	20.35	20.01	20.35	20.35
1970	10	17.91	19.00	19.00	19.00	18.18
1970	11	15.69	19.00	19.00	19.00	16.52
1970	12	15.67	19.00	19.00	19.00	16.50
1971	1	16.25	19.00	19.00	19.00	16.94
1971	2	19.43	19.43	19.32	19.43	19.43
1971	3	17.13	19.00	19.00	19.00	17.60
1971	4	16.19	19.00	19.00	19.00	16.89
1971	5	17.43	19.00	19.00	19.00	17.82
1971	6	18.38	19.00	19.00	19.00	18.53
1971	7	19.84	19.84	19.63	19.84	19.84
1971	8	19.05	19.05	19.04	19.05	19.05
1971	9	18.91	19.00	19.00	19.00	18.93
1971	10	19.80	19.80	19.60	19.80	19.80
1971	11	19.39	19.39	19.29	19.39	19.39
1971	12	20.98	20.98	29.49	20.98	20.98
1972	1	24.84	24.84	23.38	24.27	24.38
1972	2	25.61	25.00	23.96	24.89	24.96
1972	3	23.56	23.56	22.42	23.40	23.42

a/Price per hundred pounds for U.S.D.A. No. 2-3, Barrows and Gilts, 220-240 pounds.

Source: United States Department of Agriculture, Livestock and Meat Statistics, Statistical Bulletin 333, Economic Research Service, Washington, D.C.

TABLE A.2

ST. LOUIS MARKET PRICES AND PRODUCTION CONTRACT PRICES
MONTHLY, MAY 1966-JANUARY 1972

Year	Month	Market[a] Price	Contract Price	Year	Month	Market[a] Price	Contract Price	Year	Month	Market[a] Price	Contract Price
1966	5	23.75	24.55	1968	4	19.50	19.36	1970	3	26.45	23.87
1966	6	25.14	24.73	1968	5	19.43	19.72	1970	4	24.52	24.44
1966	7	25.11	24.71	1968	6	21.13	20.17	1970	5	24.82	24.92
1966	8	25.64	25.50	1968	7	22.00	20.52	1970	6	24.96	25.65
1966	9	23.20	24.81	1968	8	20.68	21.02	1970	7	25.61	26.04
1966	10	21.84	23.07	1968	9	20.48	20.24	1970	8	22.47	25.16
1966	11	20.17	22.56	1968	10	18.72	19.69	1970	9	20.56	24.05
1966	12	20.02	22.26	1968	11	18.32	19.81	1970	10	18.23	23.01
1967	1	19.71	21.95	1968	12	19.12	20.49	1970	11	16.48	21.51
1967	2	19.38	21.78	1969	1	20.20	20.09	1970	12	16.18	21.52
1967	3	18.56	21.56	1969	2	20.64	19.59	1971	1	16.67	21.05
1967	4	17.33	21.17	1969	3	20.90	19.48	1971	2	19.84	20.46
1967	5	22.05	21.01	1969	4	20.66	19.48	1971	3	17.27	19.73
1967	6	22.03	21.25	1969	5	23.67	19.90	1971	4	16.86	19.18
1967	7	22.57	21.27	1969	6	25.44	20.83	1971	5	17.94	20.26
1967	8	21.04	21.80	1969	7	26.35	22.12	1971	6	19.28	20.61
1967	9	19.46	21.16	1969	8	27.24	22.51	1971	7	20.57	21.15
1967	10	18.33	20.68	1969	9	26.02	21.89	1971	8	19.73	21.26
1967	11	17.53	20.33	1969	10	25.85	21.36	1971	9	19.05	20.09
1967	12	17.64	20.35	1969	11	25.96	21.50	1971	10	20.28	18.89
1968	1	19.02	20.08	1969	12	27.62	21.79	1971	11	20.10	18.82
1968	2	19.98	19.56	1970	1	27.70	22.39	1971	12	21.62	18.55
1968	3	19.48	19.71	1970	2	28.40	22.45	1972	1	25.29	19.54

[a] Price per hundred pounds, barrows and gilts, No. 2-3, 220-240 pounds, National Stock Yards, St. Louis.

Source: United States Department of Agriculture, Livestock and Meat Statistics, Statistical Bulletin No. 333, Economic Research Service, Washington, D.C.

TABLE A.3

PRICES AND INTEREST RATE USED IN CALCULATING PRODUCTION CONTRACT PRICE
MONTHLY, FEBRUARY 1966-DECEMBER 1971

Year	Mth	Feeder Pig Price[a]	SBOM Price[b]	Corn Price[c]	Interest Rate[d]
1966	2	25.19	77.30	1.35	5.00
1966	3	25.02	71.50	1.33	5.50
1966	4	23.19	75.50	1.35	5.50
1966	5	23.44	80.30	1.35	5.50
1966	6	21.30	92.70	1.38	5.50
1966	7	17.69	97.20	1.48	5.75
1966	8	17.59	97.20	1.55	5.75
1966	9	17.94	97.90	1.51	5.75
1966	10	17.56	82.20	1.48	6.00
1966	11	16.70	78.90	1.42	6.00
1966	12	16.12	84.60	1.46	6.00
1967	1	15.56	81.70	1.46	6.00
1967	2	15.84	79.50	1.46	5.62
1967	3	16.35	76.60	1.47	5.62
1967	4	16.22	74.50	1.39	5.50
1967	5	17.10	73.70	1.43	5.50
1967	6	16.32	78.10	1.42	5.50
1967	7	16.03	78.20	1.38	5.50
1967	8	16.15	78.70	1.28	5.50
1967	9	16.92	79.20	1.24	5.50
1967	10	16.29	71.80	1.22	5.50
1967	11	14.81	71.90	1.13	5.50
1967	12	15.00	73.40	1.20	6.00
1968	1	14.40	75.10	1.20	6.00
1968	2	15.40	74.50	1.19	6.00
1968	3	16.32	75.00	1.18	6.00
1968	4	16.62	74.60	1.17	6.00
1968	5	17.29	75.00	1.18	6.50
1968	6	15.84	79.50	1.17	6.50
1968	7	15.06	82.80	1.16	6.50
1968	8	15.75	84.40	1.09	6.50
1968	9	17.16	85.10	1.09	6.50
1968	10	16.25	78.20	1.10	6.12
1968	11	14.81	73.50	1.16	6.12
1968	12	14.67	71.60	1.16	6.25
1969	1	14.57	69.80	1.20	6.75
1969	2	15.34	69.90	1.18	7.00
1969	3	16.81	76.60	1.19	7.00
1969	4	18.85	73.30	1.25	7.50
1969	5	19.13	76.10	1.33	7.50
1969	6	18.19	77.50	1.33	7.50
1969	7	17.85	77.30	1.31	8.50
1969	8	18.69	76.90	1.28	8.50
1969	9	19.85	72.70	1.22	8.50
1969	10	20.91	75.40	1.23	8.50
1969	11	20.10	69.90	1.21	8.50
1969	12	23.00	82.90	1.23	8.50
1970	1	25.06	87.50	1.26	8.50
1970	2	26.56	85.25	1.28	8.50
1970	3	28.09	71.80	1.27	8.50
1970	4	27.60	74.60	1.30	8.00
1970	5	24.25	71.20	1.31	8.00
1970	6	21.19	74.70	1.37	8.00
1970	7	18.72	82.90	1.42	8.00
1970	8	15.91	84.00	1.51	8.00
1970	9	16.17	81.20	1.53	8.00
1970	10	14.81	77.25	1.46	7.50
1970	11	12.72	77.90	1.45	7.50
1970	12	11.18	82.00	1.52	7.00
1971	1	10.28	80.25	1.59	6.75
1971	2	13.03	77.50	1.57	6.00
1971	3	13.82	77.00	1.55	5.75
1971	4	14.50	74.25	1.52	5.25
1971	5	14.78	78.25	1.48	5.37
1971	6	13.72	81.50	1.55	5.50
1971	7	13.13	84.25	1.45	5.50
1971	8	14.25	78.75	1.22	6.00
1971	9	13.80	73.25	1.06	6.00
1971	10	15.44	74.75	1.01	6.00
1971	11	16.22	78.50	1.07	5.75
1971	12	17.90	86.00	1.07	5.37

[a] Feeder pig prices are per head as reported for central Illinois, U.S.D.A. No. 1 and 2, few 3, 40-50 pounds.

[b] Soybean oil meal prices are per ton, 44 percent unrestricted, Decatur, Illinois.

[c] Corn prices are per bushel, No. 2 yellow, at St. Louis, Missouri.

[d] Interest rate is the prime rate as charged by major banks to their best customers.

Sources: United States Department of Agriculture, Livestock, Meat, Wool Market News, Livestock Division, Consumer and Marketing Service, Washington, D. C.

United States Department of Agriculture, Feed Market News, Grain Division, Consumer and Marketing Service, Washington, D. C.

United States Department of Agriculture, Grain Market News, Grain Division, Consumer and Marketing Service, Washington, D. C.

Board of Governors, Federal Reserve System, Federal Reserve Bulletin, April, 1972, Washington, D. C.