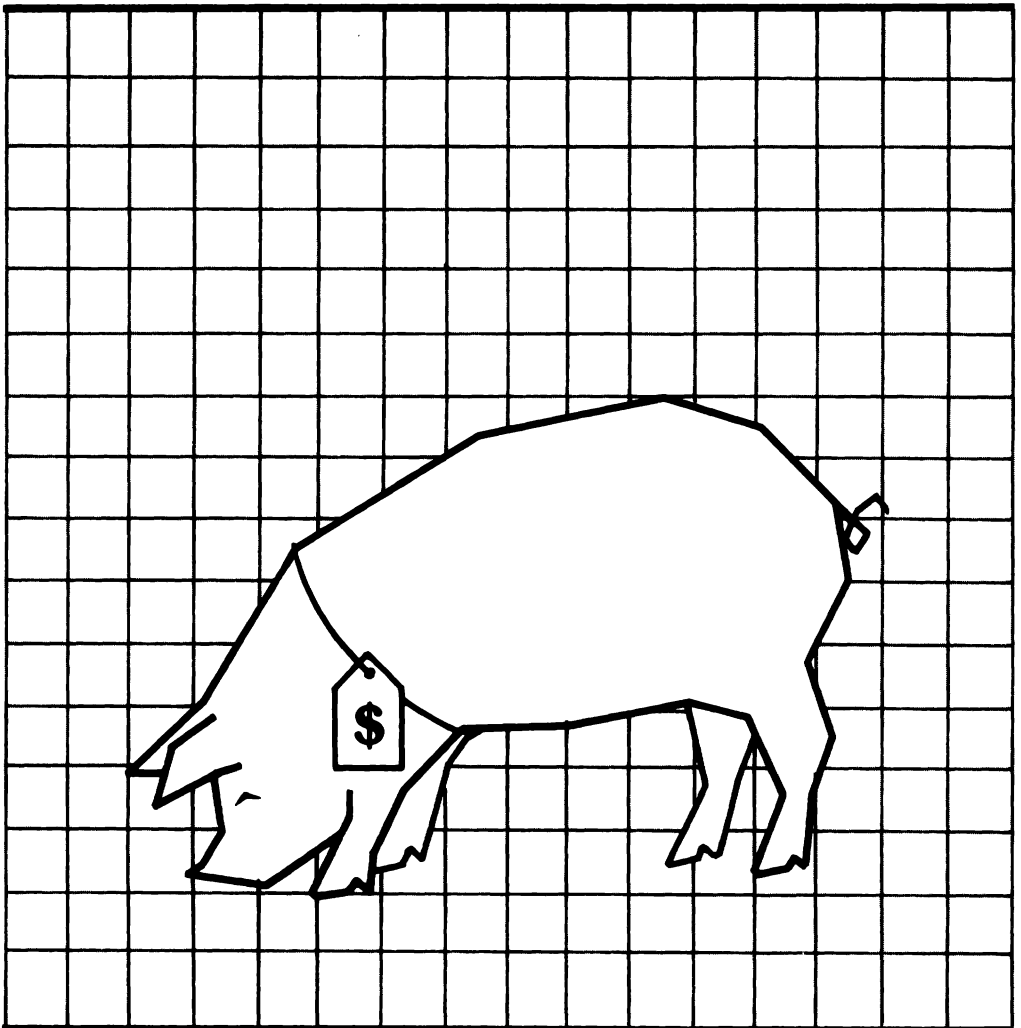

Effects of Changes in Vertical Coordination on Pork Production and Prices



EFFECTS OF CHANGES IN VERTICAL COORDINATION ON PORK PRODUCTION AND PRICES.
By Richard Crom and James Sullivan. Economic Research Service, U.S. Department
of Agriculture. Agricultural Economic Report No. 303.

ABSTRACT

The performance of the hog industry under the existing vertical coordination structure is projected from 1973 through 1985. Then, seven alternative situations for the coordination of hog production are introduced into the model, and these results are simulated over the same projection period. The alternatives simulated are: (1) increased output through addition of several "hog factories", (2) production contracts, (3) a shift in industry structure to large production units, (4) the addition of a price incentive to large production units, (5) stop-loss contracts, (6) pricing on the basis of pork values, (7) and a marketing contract for quality production with an appropriate market incentive.

The 13-year base-line projection traces out one minor and two major production cycles. Pork production per capita averages near current levels--66 pounds over the 13-year period. None of the simulated forms of alternative coordination schemes alters the three cycles projected. However, with the exception of the addition of hog factories, all of the alternatives tend to restrict output with higher prices. With restricted output, geographic concentration of production would usually increase and relatively more production would occur in the established corn-hog areas.

Keywords: simulation, swine, vertical coordination.

FOREWORD

The hog-pork subsector study was initiated by the Economic Research Service (ERS) in cooperation with Purdue University and Michigan State University in 1970. The idea was to analyze the potential for major change in the form of vertical coordination. A principal task was to assess the strength of the forces which might bring about a shift to contracting or ownership integration in pork production, processing, and distribution.

ERS and Michigan State University constructed a simulation model of the hog-pork subsector. Using this model, the potential impacts of a number of possible changes in the form of vertical coordination were analyzed. ERS is preparing one report dealing with the modeling effort and this report evaluating impacts of potential change. Other results of the hog-pork subsector research effort have been reported by Purdue University in a series of publications.



Alden C. Manchester
Co-leader, Hog-Pork Subsector

CONTENTS

	<u>Page</u>
Summary	v
Introduction	1
An Overview of the Hog-Pork Industry Model	2
The Simulation Technique	3
The Base Projection	4
Alternatives Considered	4
Empirical Results	7
Additional Production from "Hog Factories"	7
Production Contracts	9
Large Production Units	11
Large Production Units With Added Market Incentive	11
"Quality of Production" Contracts	11
Conclusion--Consumer vs. Producer	15
Appendix Tables	16

SUMMARY

Performance of the hog industry under the existing vertical coordination structure is projected from 1973 through 1985. Then, seven alternative coordination situations are introduced into the model, and these results are simulated over the same projection period. The coordination alternatives are: (1) increased output through addition of several "hog factories", (2) production contracts, (3) a shift in industry structure to large production units, (4) the addition of a price incentive to large production units, (5) stop-loss contracts, (6) pricing on the basis of pork values, (7) and a marketing contract for quality production with an appropriate market incentive.

The 13-year base-line projection traces out one minor and two major production cycles. In the simulation, pork production per capita averages near current levels (66 pounds) over the 13-year period. Thus, the industry grows only with the population change. This is inherent in the historical structure of the current industry. None of the simulated forms of alternative coordination schemes alters the three cycles projected. This result was expected since the levels of nonmarket coordination schemes introduced were not of major magnitude industry-wide. However, with the exception of the addition of hog factories, all of the alternatives tended to restrict output with higher prices. With restricted output, geographic concentration of production would usually increase--relatively more production would occur in the established corn-hog areas. This result was expected since almost all of the alternatives were producer-oriented. Similarly, the farm-to-retail price spread declined under most of the alternatives.

Obviously, firms will tend toward nonmarket forms of vertical coordination when it is in their interest to do so in terms of either profit or equity considerations; the extent of this change will be determined by individual firm actions. Public and industry leaders will evaluate any change in terms of overall industry performance using traditional price and output variables--the amount of pork available for consumption, retail prices, producer prices, and marketing spreads. Evaluation of the system will be made in terms of both long-term average price and production levels and their year-to-year variability. Since consumers and producers have different criteria for judging industry performance, results are not evaluated.

Average levels of prices and production over the 13-year period are shown in the following table.

Table 1.--Average annual change in four selected variables from base projection

Variable	Unit	Alternative 1/				
		1	2	3	4	5
Per capita production	Lb.	+2.9	-3.8	-1.9	-1.1	-0.4
Retail price	Cents/lb.	-1.6	+1.5	+6	+1.1	+1.8
Hog price	:Dollars/cwt.:	-1.55	+2.65	+1.30	+2.30	+1.00
Farm-retail price spread	Cents/lb.	+1.6	-3.3	-1.8	-3.1	0

1/1 = Addition of hog factories.

2 = Production contracts for 25 percent of initial production.

3 = Shift to large production units.

4 = Shift to large production units with market incentive.

5 = Quality production contracts.

Effects of Changes in Vertical Coordination on Pork Production and Prices

by Richard Crom
and James Sullivan¹

INTRODUCTION

Will vertical integration take over the hog industry as it did the broiler industry? This question has been asked of livestock economists over the past decade, giving impetus to the organization of subsector research for the hog-pork industry. As part of this research, industry leaders presented divergent views on vertical integration during a symposium held in 1971. At that time, the consensus was that, while several forms of nonmarket vertical coordination are being experimented with, (1) it posed no particular threat to the traditional free market system of vertical coordination, and (2) it was not clear what form of coordination might evolve over the next two decades.

Obviously, firms will move toward nonmarket forms of vertical coordination when it is in their interest to do so in terms of either profit or equity considerations. The extent of the industry move will depend on individual firm decisions. Both public and industry leaders, however, will tend to evaluate any form of vertical coordination in terms of aggregate industry performance. Industry performance will continue to be judged in terms of traditional price and output variables.

Consumers are interested in having more quality pork products available at "reasonable" prices. Industry leaders are concerned that hog and pork prices cover costs and yield a fair return to producers, processors, and retailers. Public policymakers are interested in both pork availability and prices and in market performance as indicated by the farm-to-retail price spread--the gross cost to the public for marketing the product.

^{1/} Agricultural Economist, Economic Research Service and Research Economist, Connell Rice and Sugar Co., formerly Agricultural Economist, Economic Research Service.

The system will be evaluated both in terms of average price and production levels over time, and also in the nature of the time path that develops for these variables. One form of coordination might yield a higher average quantity or higher price over time, but the time path of that variable could be much more erratic than under another system. Usually both producers and consumers prefer stable price-quantity relationships over time. Thus, they tend to give priority to a coordination system minimizing cyclical and seasonal fluctuations.

Computer and econometric techniques make possible studies of probable prices and output under different vertical coordination systems. Models representing the entire hog-pork industry can be constructed using econometric techniques. Then these models can be operated on a computer to trace out time paths of the variables embodied in the model. Initially, these variables represent the economic structure of the system under free market conditions. But the relationships can be changed to represent a system that might exist under another form of vertical coordination. When the model is then used to trace out the time paths of the price and output variables, it is able to simulate what might happen under the form of coordination then incorporated into the model.

ERS constructed such a model to simulate the price-output effects at the industry level. In this report, the model is briefly described so that the reader may follow the simulation results. Details of the model construction are reported elsewhere. 2/

AN OVERVIEW OF THE HOG-PORK INDUSTRY MODEL

The hog-pork industry model is made up of three basic subsystems--production, slaughter-processing, and consumer-distribution. A set of equations describes the economic structure of each subsystem. These equations and the three subsystems themselves are ordered to form a recursive model of the entire hog-pork industry. The relationships were estimated using a month as the unit of time. The economic structure linked by the coefficients of these relationships was also influenced by the institutional structure of the time period involved. Data used to fit the model were for 1965-71. During this time, the institutions involved were those of a free market economy. Inflation proceeded at a moderate rate and the general price levels were somewhat lower than in more recent years.

The production subsystem estimates sows farrowing for a particular month. It then accounts for all hogs in the system at different ages and updates their age-weight status by 1 month. Total demand for slaughter hogs is estimated, and hogs are then drawn from the different age groups to satisfy the needs for slaughter after breeding stocks have been retained, given the level of new breedings estimated. Sow-cull is also estimated at this time. This model

2/ Sullivan, J.D., Lui, C.Y., and Vincent, W., A Systems Analysis of the Hog-Pork Subsector (in process). Econ. Res. Serv., U.S. Dept. of Agr.

differs from earlier models of the livestock industry in that all hogs are accounted for at various ages and weights from birth through slaughter.

The slaughter-processing subsystem is then faced with a supply of hogs for slaughter comprised of five different weights of barrows and gilts, plus cull sows and boars. Prices are estimated given these hog supplies and the industry demand for various pork cuts. The quantities of pork cuts produced are then calculated and the determination is made of how much to sell from the current month's production and how much to store for future sale.

Wholesale prices for the six primal pork cuts are determined and then the consumer-distribution sector allocates the cuts among institutional and retail outlets. Retail prices are determined for eight pork cuts, including sausage, and then aggregated into a composite retail price.

From this brief description of the model, its recursive nature should be apparent. Sows farrowing results in a pig crop which is carried to various ages and subsequently reaches slaughter weights. These hogs are then priced, slaughtered, and moved through the system in the form of pork cuts to retail distribution. The retail prices affect packer demands for subsequent periods which eventually trace back to hog prices, and hog prices affect the basic breeding decision. Thus, through this recursive feedback loop, the model can be operated through time for as long as desired. Several variables influencing the industry from outside the economy are entered as exogenous variables--civilian population, consumer disposable income, and beef prices.

THE SIMULATION TECHNIQUE

Initially a base projection of the model is made to represent a time path reflecting the characteristics embodied in the historical period. This base run is an extension of the economic and institutional structure of the historical period. It can be viewed as a projection into future years if, and only if, one assumes that (1) the values of the exogenous variables are correct, and (2) that the economic and implied institutional structure embodied in the model will prevail in a future time period. As an alternative, the historical period could be used as a base model for comparison but industry performance in the historical period is often masked by the effects of extraneous exogenous conditions not embodied in the model, such as weather. Therefore, operation of the model into future periods using projected levels of exogenous variables furnishes a base time path free of random extraneous effects.

When the basis of comparison is free of these exogenous effects, the structure of the model can be modified to represent alternative forms of vertical coordination and rerun the model over the same time period. The different values of the price and output variables so simulated can then be compared with the base run to judge the performance of the industry under different assumed forms of vertical coordination.

The Base Projection

Values of price and quantity variables known January 1, 1973, were used to initiate the base-line projection of the hog-pork industry model. The variables known at that time were the endogenous variables of the system--prices, numbers of hogs in the system at the start, and sows bred to farrow early in 1973. Exogenous variables were supplied to the model for 1973-85. Beef prices, which are exogenous to this model, were estimated by another recursive quarterly model of the beef and pork sectors. 3/

Estimates of civilian population and consumer disposable income are shown in appendix table 1. The 13-year base-line projection was chosen in order to allow the model to encompass approximately three hog cycles.

Projection of a model using the time unit of a month for 13 years yields an immense amount of data on endogenous variables, given the complex structure of the hog-pork industry. Therefore, six variables were chosen to represent the simulated price-output performance of the industry--number of sows farrowing, commercial hog slaughter, per capita pork production (which approximates consumption since changes in stocks and the foreign trade balance are small), retail price of pork, average price of hogs (barrows and gilts), and the resulting farm-to-retail price spread. The annual time paths of these variables are shown in figure 1.

There are two major and one minor hog cycles, of roughly 4-year duration. Except for the major cyclical downturn after 4 years of operation, production patterns are rather stable, with per capita production averaging around 65 pounds per year. Retail pork and hog prices trended upward at a moderate rate throughout the period, representing the degree of general price increases embodied in per capita disposable income. The farm-to-retail price spread was rather stable except for two increases at the bottoms of the price cycle, which has been the historical experience. Thus, the extension of this model 13 years ahead portrays a rather stable hog industry with a continuation of the basic 4-year price-production cycle. Therefore, this simulated industry performance serves as an excellent basis of comparison when the vertical coordination mechanism is moved away from free market conditions.

Alternatives Considered 4/

Many forms of nonmarket coordination could be investigated. However, seven alternatives were selected for simulation, each involving production contracting, market contracting, fundamental change in industry structure, or a combination. In many cases, a shift to contracting or integration as the coordinating mechanism would also cause a change in basic structure of the production or marketing systems.

3/ Crom, R.J., A Dynamic Price-Output Model of the Beef and Pork Sectors, Tech. Bul. 1426, Econ. Res. Serv., U.S. Dept. of Agr., Sept. 1970.

4/ Dr. Warren Vincent, Michigan State University, provided valuable assistance in defining and selecting these alternative forms of coordination to be tested.

BASE PROJECTION FOR PRODUCTION, PRICE, AND FARROWINGS FOR HOGS

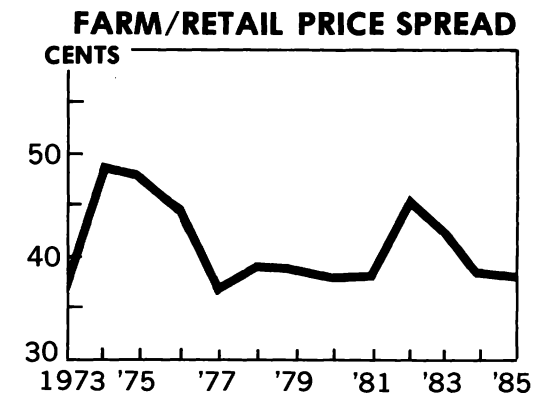
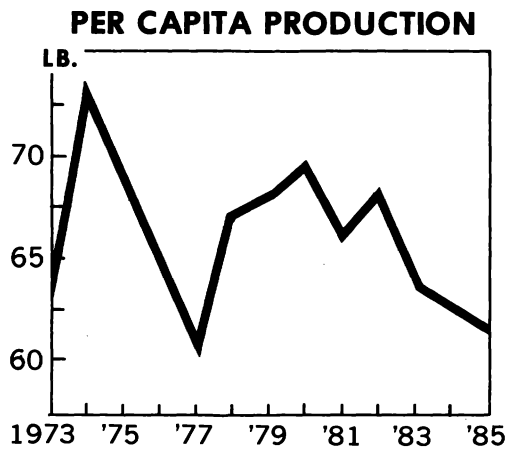
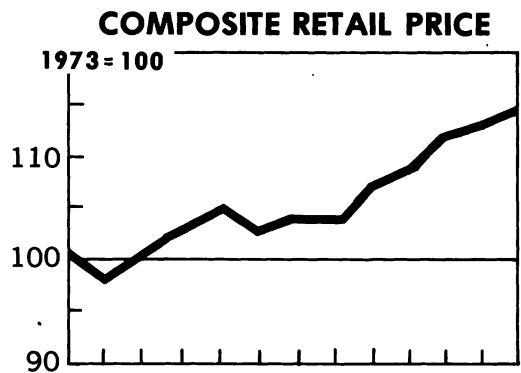
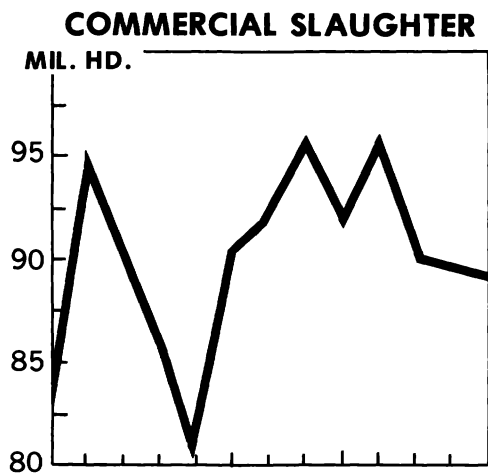
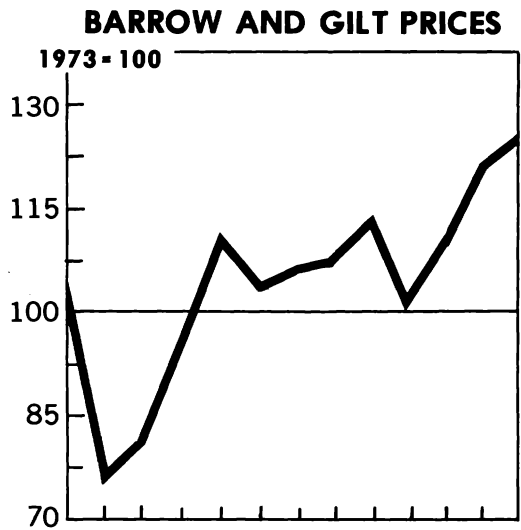
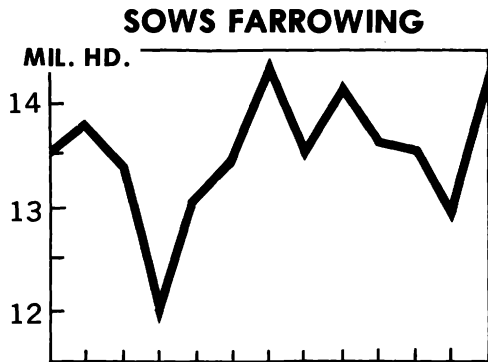


Figure 1

Hog factories: An alternative form of coordination which involves some aspects of direct integration as well as change in industry structure is the addition of several large hog-producing units throughout the country. Consideration of this alternative is timely since two such facilities were proposed in 1973. In this simulation, the new facilities are additions to existing hog-production capacity. They are assumed to add 8 million market hogs per year (plus cull sows) to those produced under the existing structure. These additional marketings were assumed to be distributed evenly throughout the year and not to vary from year to year.

Production contracts: Under this alternative form of coordination, it is assumed that 200,000 sows per month are bred to farrow under contract. This represents about 25 percent of the 1972 sows farrowing. In this situation, no seasonal or cyclical variation is assumed in the number of sows farrowed under contract. Production response by the remainder of the industry is assumed to proceed as usual under the base situation. However, response is limited to the 75 percent of the industry not initially affected.

Large production units: This alternative operates under a basic free market mechanism. The change in coordination stems from the changing structure of production units, not from contracting or integration. Fifty percent of production is programmed to occur in larger individual family farm production units where there would be no seasonal changes in production response and about 50 percent less response to variable costs as indicated by shifts in sow farrowings due to the changing hog-corn price ratio.

Large production units with additional market incentive: This alternative is a variation of the previous change in industry structure, but a market incentive is added to compensate producers for quality production which might be expected to occur from this type of production unit. In this case a \$3 per hundredweight incentive at marketing time is added to prices for hogs produced in the large production units.

Stop-loss contract: This coordination option is a type of marketing contract. Under this option, one-third of production is under contract with producers who are guaranteed a price which will fluctuate no more than \$3 above or below the trend under the base projection. The producer is protected from periods of quite low hog prices, but he is prevented from benefitting from extremely high prices. Producers are given this reward of relatively stable prices for being regular suppliers to the packer they contract with. Hogs marketed under this system are assumed to have a normal weight distribution.

Pricing on pork values: This coordination arrangement assumes a cooperative production-marketing venture by one-third of the producers. Their returns are based on wholesale pork prices (live weight equivalent) plus one-fourth of the previous month's farm-to-retail price spread. Such an arrangement is likely to involve an integration arrangement under which producers own slaughter-processing facilities under cooperative arrangements.

Quality production with market incentive: Under this alternative which involves a market contract, producers of one-third of the hogs are paid a premium for marketing at the 200-220 pound weight. This would increase the quantity of hogs produced in this weight group during portions of the cycle. It assumes the contract would have rigorous quality specifications.

EMPIRICAL RESULTS

Price and output effects at the industry level were simulated by operating the hog-pork industry model on a monthly basis from 1972 through 1985. Results were then aggregated to the annual level for clarity of presentation. Results were compared in terms of the variables used to portray the base-line projection of the model over the same 13-year projection period--per capita consumption, total hog slaughter, sows farrowing, average price of barrows and gilts, retail price of pork, and the ensuing farm-to-retail price spread. These performance variables are used by producers, consumers, middlemen, and Government policymakers to evaluate the effects of the various coordination alternatives.

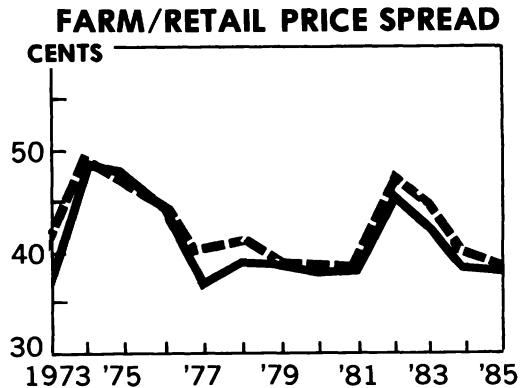
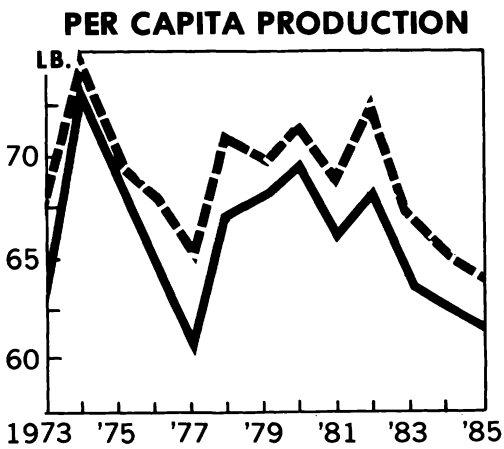
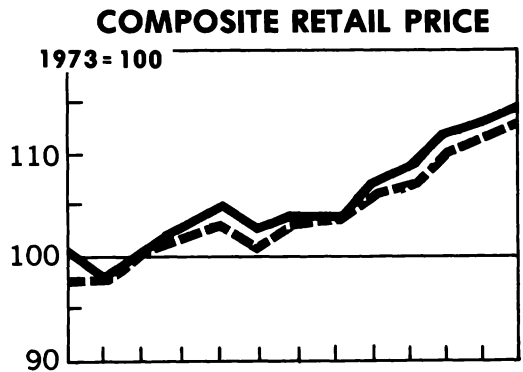
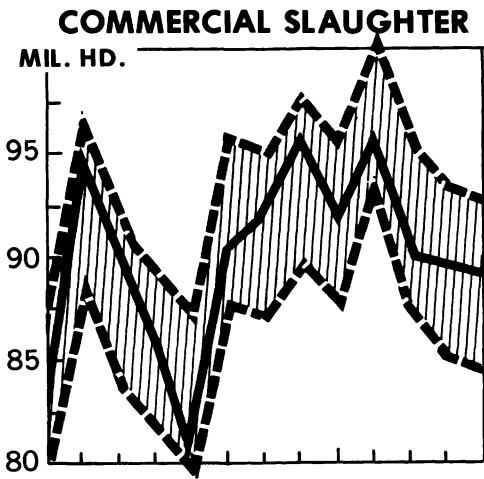
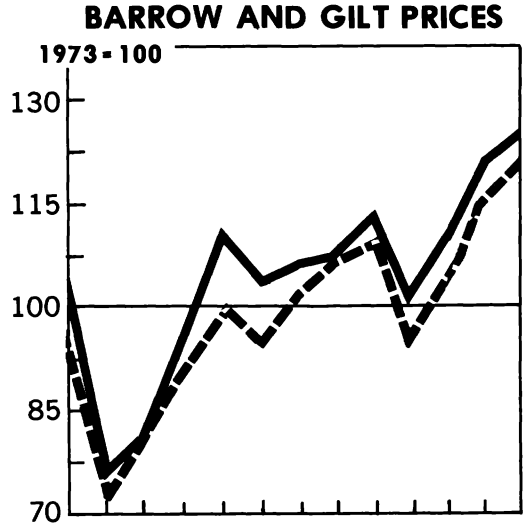
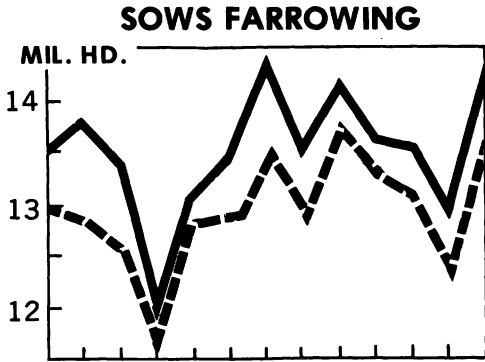
As expected, none of the alternatives simulated altered the three basic hog cycles of the base-line projection, since the changes in coordination involved only a portion of the industry. This illustrates the stability of the industry model when change is introduced.

Simulation results are not presented individually for the alternative involving market contracts where major gains and losses were limited nor for the alternative where cooperative ownership of slaughter facilities might result in returns based on pork values plus a portion of the farm-to-retail price spread. Industry performance under these alternatives did not result in any major deviation from the base-line projection for any of the variables. Thus, the desirability or undesirability of those two forms of coordination cannot be judged by their effect on the relationships among the variables considered in this model.

Additional Production From "Hog Factories"

Increased supplies of pork along with correspondingly lower prices are portrayed in figure 2. Per capita production, and therefore total hog slaughter, averaged about 3 pounds more than under the base projection. The shaded area of commercial hog slaughter in figure 2 indicates the amount of slaughter coming from the additional 8 million hogs produced by the "factories" and the bottom line of the shaded portion indicates slaughter coming from the free market. Thus, we can see that producers already in business cut back on hog production substantially when 8 million more hogs entered the market each year. This change in free-market production varied over the cycle. While the analysis was not conducted on a regional basis, a relatively larger portion of the cutback could be expected outside the Corn Belt.

ADDITION OF HOG FACTORIES



— BASE PROJECTION - - - ADDITION OF HOG FACTORIES

NEG. ERS 2025 - 75 (6)

USDA

Figure 2

This cutback by the free market can be more clearly demonstrated by the sow farrowings under previous industry capacity (fig. 2), which shows farrowings were below those of the base-line projection. Note particularly that farrowings from the free market were about the same as under the base-line projection in the year simulated as 1976.

This cutback in production was triggered by the substantially lower prices received in earlier years. While the price of hogs averaged \$1.55 below the base-line projection, the accompanying reduction in retail price was not quite as large (down 1.6 cents on a retail weight basis). Thus, the farm-retail price spread under this alternative was wider in most years, particularly during periods of falling hog prices.

In summary, under this alternative consumers would have more pork at slightly lower prices. But producers already in production would be forced to cut back because of the economic squeeze triggered by the additional pork supply. While hog prices would be somewhat lower, they should not fall to unprofitable levels.

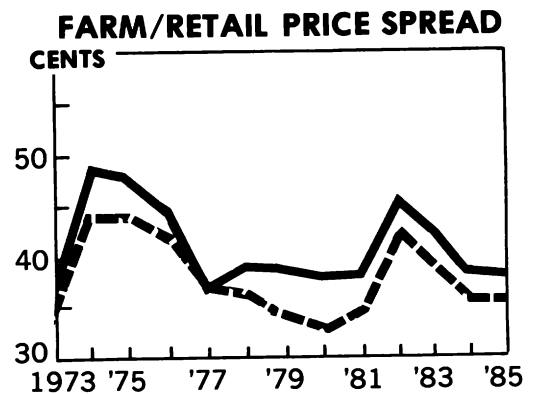
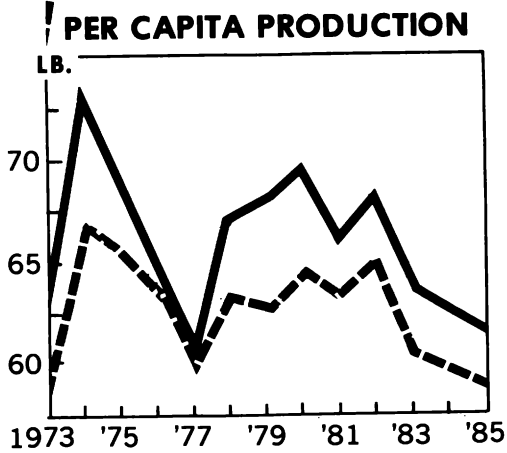
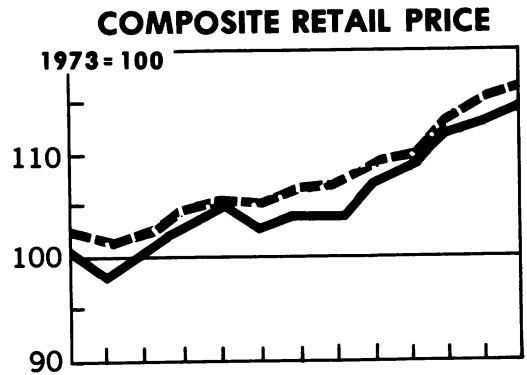
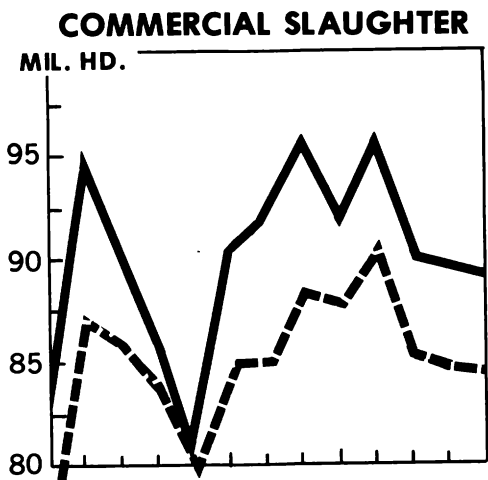
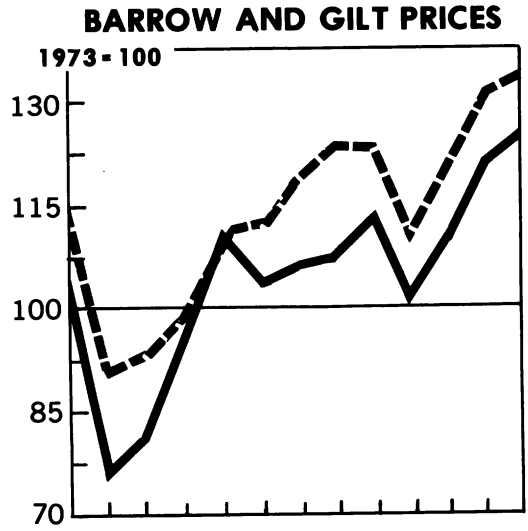
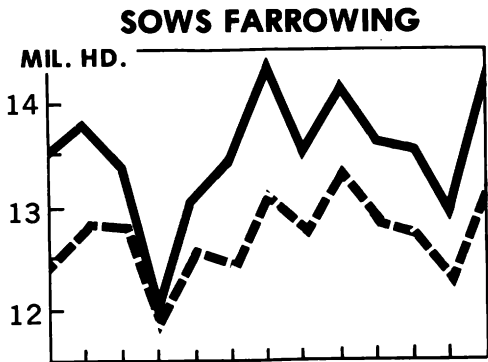
Production Contracts

Under this alternative, about 25 percent of original production was contracted to establish a stable supply with no seasonal or cyclical variability. The remaining three-quarters of productive capacity was free to respond to market conditions which, of course, included the total supply of hogs available. This resulted in a supply cutback the first year as indicated by either per capita production or total slaughter (fig. 3).

Prices the first year were \$3 or \$4 higher than under the base-line projection. As a result of the supply cutback and initial cutback in farrowings, the cyclical price drop of the following 2 years portrayed in the base projection was mitigated substantially. But with one-fourth of the industry capacity committed to a fixed level of farrowings and only three-fourths of the capacity left to respond to market forces, the stage was set for reduced industry output. Thus, throughout the 13-year simulation period, production was substantially lower than the base-line projection with a corresponding higher price at both farm and retail levels. Since prices were higher, marketing margins were squeezed through most of the period and averaged 3.3 cents below the margin of the base-line projection. The amplitude of the cycle was reduced somewhat, particularly in terms of production variability. This was expected since one-fourth of original capacity was committed to fixed output for the entire period under consideration.

Under this alternative, consumers would have around 4 pounds less pork per capita but would pay only 1.5 cents more per pound for it at retail. Marketing firms would suffer reduced gross receipts throughout the period, thus profits would be squeezed. Producers would benefit in terms of higher prices (average \$2.65 increase) and gross farm income from hogs would average only slightly higher over the 13-year period.

PRODUCTION CONTRACTS



— BASE PROJECTION - - - PRODUCTION CONTRACTS

USDA

NEG. ERS 2026 - 75 (6)

Figure 3

Large Production Units

A structural shift to large hog farms controlling 50 percent of production stabilized hog production and prices since large farms show less response to variable costs and less seasonal variation than smaller ones (see fig. 4). Under these conditions, there was considerably less cyclical variation (in fact sows farrowing showed only a slight upward trend). Hog slaughter showed a little of the original cycle of the base-line projection. However, per capita production exhibited a declining trend and averaged about 2 pounds below base-line levels since production did not increase with population. With the exception of 1 year, retail pork and live hog prices were slightly above those of the base-line projection. The farm-to-retail price spread was below the base-line projection for most of the period, averaging nearly 2 cents less.

While consumers would have a somewhat more stable supply of pork, they would also have less pork available at more stable but slightly higher retail prices. Producers would benefit more from price stability although their prices would not only be higher (up \$1.30 on the average) but would also follow a uniform upward trend. Marketing agencies would have lower gross receipts. However, greater price stability would allow them to plan more efficient operations and operate on reduced price spreads.

Large Production Units With Added Market Incentive

This simulated alternative form of coordination is a variation of the preceding one, with the addition of a \$3-per-hundredweight incentive for the large firms, assuming they would produce a higher quality product. Again cyclical variability was minimized and production was generally somewhat below that of the base-line projection (fig. 5). However, production was closer to that under the base-line projection (down only 1.1 pounds per capita) since all producers respond to higher price incentives. Prices averaged about \$1.00 above those under the former large producer alternative but were \$2.30 above the 13-year base-line average. Retail prices were slightly above, but similar to, those under the previous alternative and not much above retail prices of the base-line projection (up 1.1 cents). Since retail prices did not increase quite as much as hog prices, marketing margins were under more pressure (down 3 cents from the base line). However, the regularity of slaughter would enable more efficient slaughtering and processing.

With the added market incentive of \$3 per hundredweight, pork supplies would be more stable and closer to those under the base-line projection than under the alternative without the market incentive.

"Quality of Production" Contracts

Contracting for one-third of the hogs to be produced to yield a quality product marketed at 200-220 pounds resulted in more hogs slaughtered, with per capita production slightly below that of the base projection (fig. 6). The lighter marketing weights for one-third of the hogs nearly offset the increase in number of hogs produced, thus holding pork production at the base-line

50 PERCENT OF HOGS PRODUCED ON LARGE FARMS

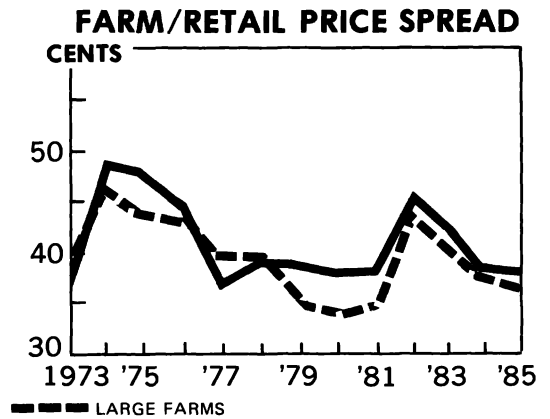
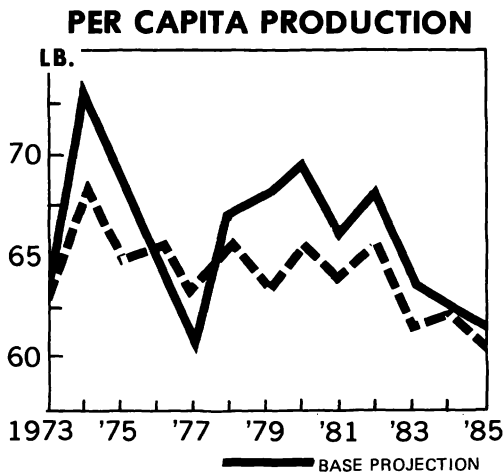
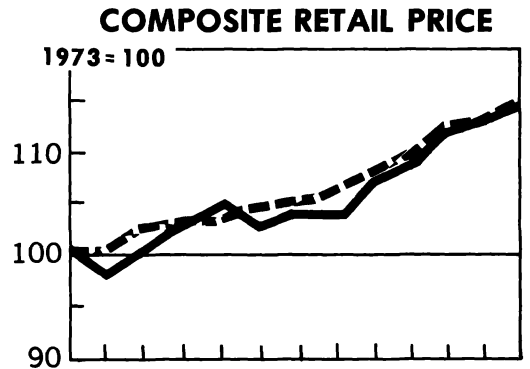
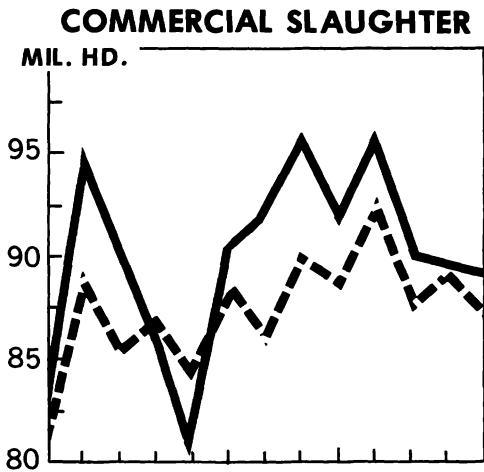
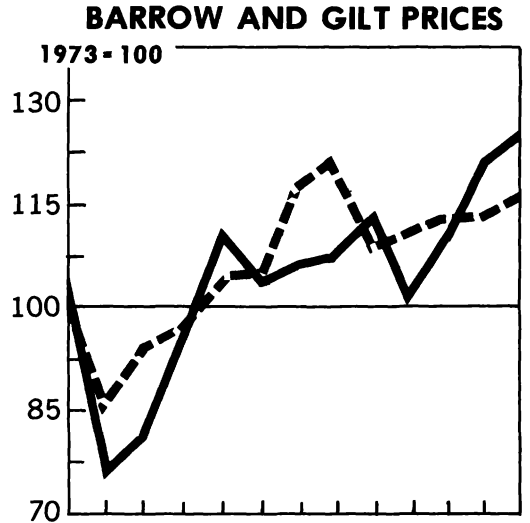
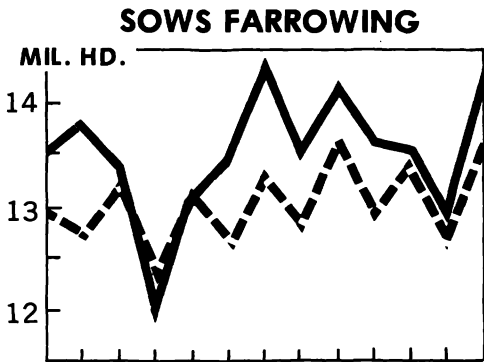
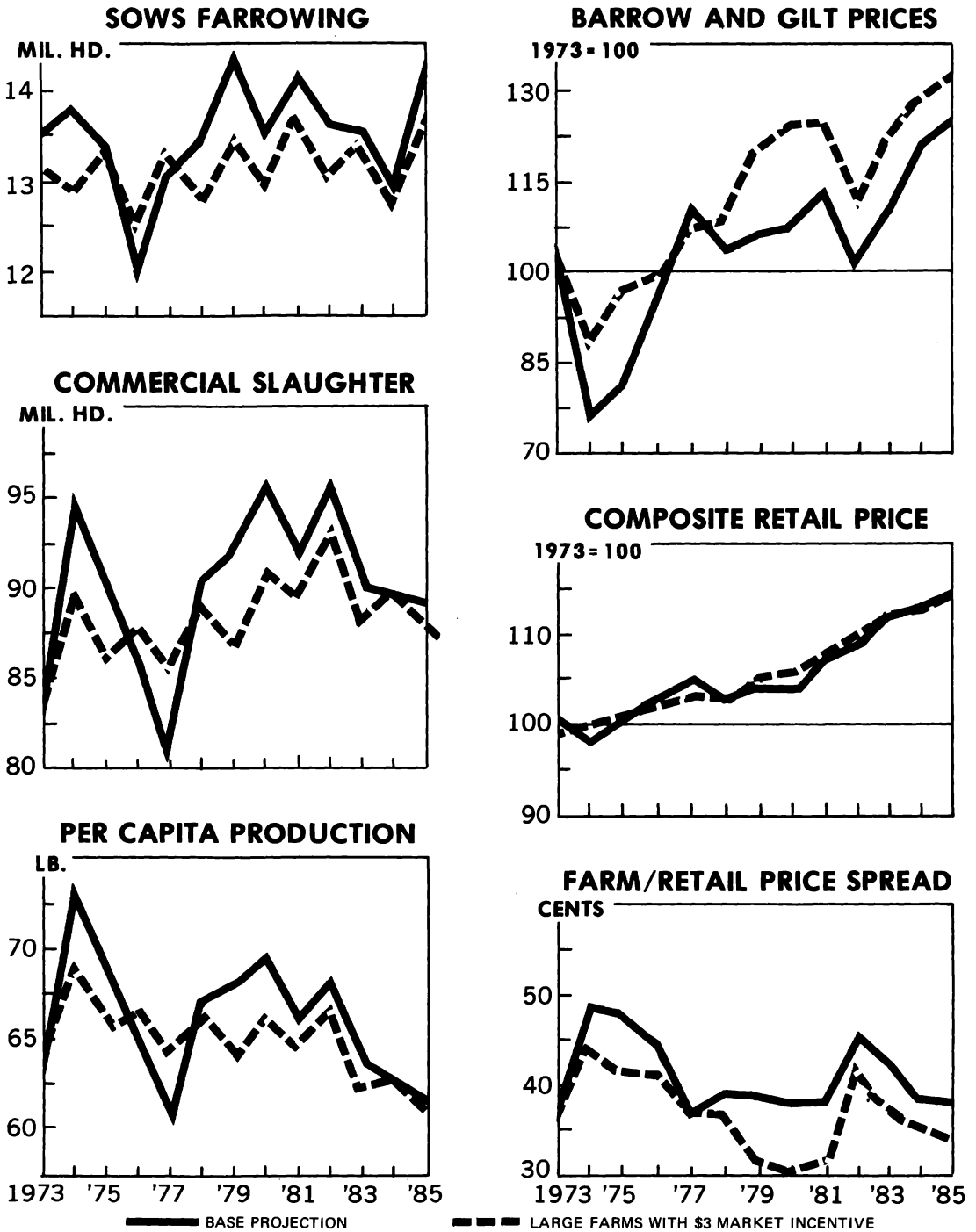


Figure 4

50 PERCENT OF HOGS PRODUCED ON LARGE FARMS WITH \$3 MARKET INCENTIVE

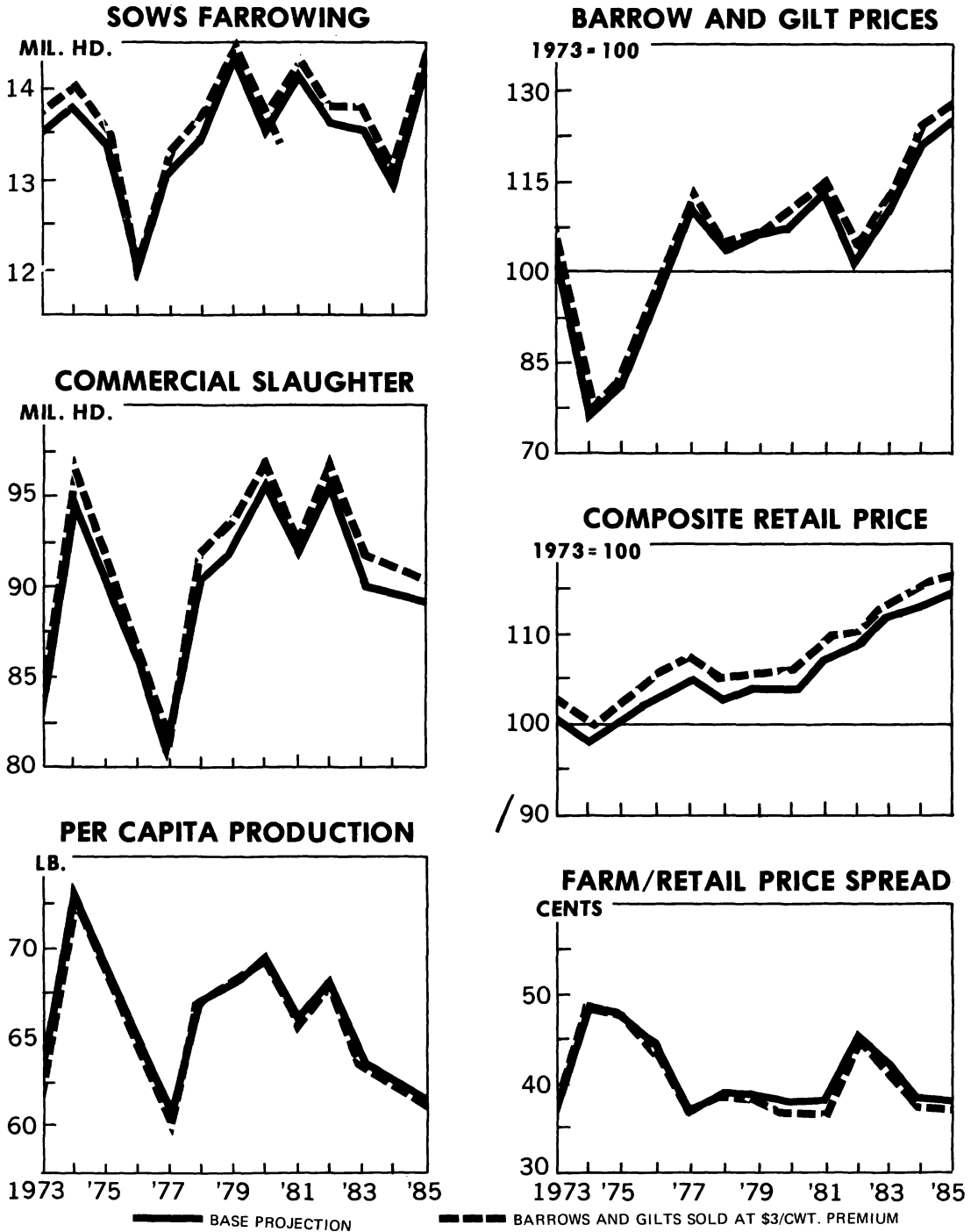


USDA

NEG. ERS 2028 - 75 (6)

Figure 5

ONE-THIRD OF BARROWS AND GILTS SOLD AT 200-220 LB. AT \$3 PER CWT. PREMIUM



USDA

NEG. ERS 2029 - 75 (6)

Figure 6

level. The addition of a \$3-per-hundredweight premium for quality production raised average hog prices by about \$1 and retail prices by \$2. Assuming that this payment to producers for quality was passed on to consumers, the farm-to-retail price spread remained the same as under the base projection with minor year-to-year variation.

This alternative would result in consumers paying more for a quality pork product. Producers would receive more income, with more hogs produced at a slightly higher price. One of the basic assumptions of this alternative is that the \$3-per-hundredweight premium would cover additional production costs plus a reasonable incentive for undertaking quality production. While the marketing margin would remain the same, processors likely could gain some monetary benefit from handling a quality product with less waste fat.

CONCLUSIONS--CONSUMER VS. PRODUCER

Since evaluation criteria differ, broad generalizations of the "good" or "bad" effects of a change in coordination cannot be drawn. However, some observations can be made for certain groups of people. Consumers who want more pork at stable or lower prices would favor the addition of large hog factories, but would vote against production contracts or a shift to fewer but larger production units. They would also favor the market quality contract, since they would have just about as much pork of better quality at a slightly higher price.

Producers interested in higher prices and stable production would find unacceptable the lower price and reduced market share associated with "hog factories". Producers who stay in business during the shift to larger production units would enjoy stability of both production and prices as well as the higher prices associated with this structural change. While producers would like the higher market prices associated with a moderate level of production contracts, those under contract who would be prohibited from expanding production might find total receipts from the hog enterprise inadequate. Finally, producers of quality pork under market contract would favor the program, assuming the premium for quality production covered their increased production costs.

APPENDIX TABLES

Appendix table 1--Exogenous variables

Year	Civilian population	Per capita disposable income
	<u>Million</u>	<u>Dollars</u>
1973	210.4	4,072
1974	212.0	4,396
1975	213.8	4,707
1976	215.6	5,009
1977	217.5	5,321
1978	219.5	5,649
1979	221.6	5,993
1980	224.0	6,355
1981	226.3	6,726
1982	228.5	7,110
1983	230.6	7,527
1984	233.3	7,966
1985	235.6	8,428

Appendix table 2--Base projection

Year	Sow farrow- ings	Commercial hog slaughter	Per capita pro- duction	Retail price	Average price barrows and gilts	Farm-to retail price spread
	- - 1,000 - -		Pounds	1973 base = 1.00		¢/retail lb.
1973	13,523	82,366	63.8	1.00	1.00	38.2
1974	13,768	94,796	72.9	.98	.76	48.3
1975	13,360	90,193	68.7	1.00	.82	47.6
1976	11,964	85,502	64.7	1.03	.95	43.2
1977	13,088	80,881	60.6	1.05	1.10	37.3
1978	13,474	90,403	67.0	1.03	1.04	38.8
1979	14,326	92,442	68.0	1.04	1.06	38.2
1980	13,558	95,577	69.5	1.04	1.08	37.7
1981	14,150	91,617	66.0	1.07	1.13	37.7
1982	13,639	95,732	68.2	1.09	1.01	45.1
1983	13,569	90,470	63.9	1.12	1.11	42.4
1984	12,943	89,741	62.7	1.13	1.22	38.4
1985	14,175	89,234	61.7	1.14	1.25	38.0

Appendix table 3--Addition of "hog factories"

Year	Sow farrow- ings <u>1/</u>	Commercial: hog slaughter: 2/	Per capita pro- duction <u>2/</u>	Composite av. price Retail	Barrows and gilts	Farm-to- retail price spread
	- 1,000 -		Pounds	1973 base = 1.00		¢/retail lb.
1973	12,904	87,702	67.9	0.98	0.89	41.9
1974	12,835	96,479	74.2	.98	.73	49.5
1975	12,585	91,732	69.9	1.00	.81	47.5
1976	11,689	89,440	67.6	1.02	.91	44.0
1977	12,833	87,249	65.4	1.03	1.00	40.2
1978	12,903	95,532	70.9	1.01	.95	41.7
1979	13,505	95,067	69.9	1.03	1.02	39.6
1980	12,904	97,822	71.2	1.04	1.06	38.1
1981	13,789	95,722	68.9	1.06	1.09	38.7
1982	13,338	101,497	72.4	1.07	.94	47.4
1983	13,111	95,544	67.4	1.10	1.04	44.9
1984	12,325	93,654	65.4	1.12	1.16	40.2
1985	13,608	92,595	64.1	1.13	1.21	38.7

1/ Exclusive of "hog factories."

2/ Includes 8 million hogs per year from "hog factories."

Appendix table 4--Production contracts

Year	Sow farrow- ings	Commercial hog slaughter	Per capita pro- duction	Composite av. price	Barrows and gilts	Farm-to- retail price spread
	- 1,000 -		Pounds	1973 base = 1.00		¢/retail lb.
1973	12,406	76,061	58.9	1.02	1.11	34.8
1974	12,760	86,721	66.7	1.01	.91	43.5
1975	12,758	85,105	64.9	1.02	.94	43.5
1976	11,809	83,399	63.0	1.04	1.01	41.0
1977	12,449	79,949	59.9	1.05	1.11	37.2
1978	12,381	84,760	62.9	1.05	1.12	36.4
1979	13,022	84,981	62.5	1.06	1.19	33.9
1980	12,710	88,208	64.2	1.07	1.23	32.7
1981	13,299	87,549	63.1	1.09	1.23	34.3
1982	12,806	90,481	64.5	1.10	1.10	42.2
1983	12,703	85,295	60.2	1.13	1.21	39.3
1984	12,226	84,751	59.2	1.15	1.31	35.3
1985	13,080	84,507	58.5	1.16	1.34	35.2

Appendix table 5--50 percent hogs
produced on large farms

Year	Sow farrow- ings	Commercial hog slaughter	Per capita pro- duction	Composite av. price		Farm-to- retail price spread
				Retail	Barrows and gilts	
	- 1,000 -		Pounds	1973 base = 1.00		¢/retail lb.
1973	12,982	82,006	63.5	1.00	0.99	38.7
1974	12,702	88,685	68.2	1.00	.85	45.9
1975	13,162	85,124	64.9	1.02	.94	43.2
1976	12,394	86,818	65.6	1.03	.97	42.2
1977	13,151	84,488	63.3	1.03	1.04	39.2
1978	12,633	88,228	65.5	1.04	1.04	39.2
1979	13,293	85,901	63.2	1.05	1.17	34.8
1980	12,835	89,890	65.4	1.06	1.20	33.4
1981	13,608	88,663	63.9	1.08	1.08	34.7
1982	12,958	92,115	65.7	1.10	1.10	43.1
1983	13,364	87,532	61.8	1.12	1.12	40.1
1984	12,662	88,917	62.1	1.13	1.13	37.4
1985	13,492	87,287	60.4	1.15	1.15	36.9

Appendix table 6--50 percent hogs produced on large farms with \$3.00 market incentive

Year	Sow farrow- ings	Commercial hog slaughter	Per capita pro- duction	Composite av. price		Farm-to- retail price spread
	- - <u>1,000</u> - -		<u>Pounds</u>	<u>1973 base = 1.00</u>	<u>Barrows and gilts</u>	<u>¢/retail lb.</u>
1973	13,102	83,154	64.4	0.99	1.03	36.4
1974	12,864	89,524	68.8	1.00	.88	44.0
1975	13,301	86,322	65.8	1.01	.97	41.3
1976	12,518	87,978	66.5	1.02	1.00	40.2
1977	13,268	85,594	64.1	1.03	1.07	37.3
1978	12,750	89,300	66.3	1.03	1.08	37.2
1979	13,410	86,976	64.0	1.05	1.20	32.7
1980	12,952	90,965	66.2	1.06	1.24	31.2
1981	13,724	89,736	64.6	1.08	1.25	32.7
1982	13,072	93,168	66.5	1.10	1.11	41.1
1983	13,435	88,336	62.4	1.12	1.22	37.9
1984	12,779	89,931	62.8	1.13	1.29	35.2
1985	13,609	88,363	61.1	1.14	1.32	34.8

Appendix table 7--One-third barrows and gilts sold
at 200-220 pounds at \$3.00 per cwt. premium

Year	Sow farrow- ings	Commercial hog slaughter	Per capita pro- duction	Composite av. price:		Farm-to- retail price spread
	- - 1,000 - -		Pounds	1973 base = 1.00		¢/retail lb.
1973	13,710	83,895	63.8	1.02	1.02	36.8
1974	13,971	96,286	72.7	1.00	.77	47.8
1975	13,484	91,362	68.4	1.02	.83	47.1
1976	11,968	85,969	63.8	1.05	.97	42.1
1977	13,240	81,298	59.8	1.07	1.13	35.9
1978	13,682	91,874	67.0	1.05	1.05	37.8
1979	14,502	93,916	67.8	1.05	1.07	37.5
1980	13,666	96,605	69.0	1.06	1.10	36.8
1981	14,261	92,380	65.3	1.09	1.15	36.7
1982	13,783	96,663	67.7	1.10	1.03	44.1
1983	13,727	91,624	63.5	1.13	1.13	41.5
1984	13,091	90,889	62.3	1.15	1.24	37.4
1985	14,312	90,279	61.3	1.16	1.27	37.0