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VERTICAL COORDINATION OF CATTLE FEEDING
AND SLAUGHTERING IN THE CATTLE AND BEEF
SUBSECTOR

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Vertical coordination is the process of harmonizing or synchronizing flows of products between production-marketing stages, vertically from producers to consumers. Coordination methods range from an open, purely competitive market price system to a closed, ownership integrated system. The coordination process is dynamic, being dependent on structural characteristics and behavior of firms involved in the exchange process. In cattle feeding and slaughtering, those firms include cattle feeding firms, meat packing firms, and intermediary marketing firms.

This paper discusses current and changing structural characteristics of cattle feeding and slaughtering, emphasizing conditions and characteristics directly influencing vertical coordination. Current and changing coordination practices are discussed, followed by an attempt to analyze various aspects or dimensions of the coordination process. The paper relies heavily on published data and research, and focuses primarily on coordination in 23 States for which cattle feeding data are readily available.

Cattle Feeding Structure and Characteristics

Major changes characterize the cattle feeding industry, including trends toward: (1) fewer, larger feedlots; (2) higher geographic and firm concentration; (3) increased financing from sources outside agriculture; and (4) greater involvement by agribusiness firms.

Feedlot Numbers and Size

On January 1, 1976, 23 States accounted for 95.2 percent of all cattle on feed in the U.S. (6). ^{1/} In those 23 cattle feeding States between 1962 and 1975, the number of small, farm feedlots (those with a one-time capacity under 1,000 head) declined by 93,103 or 40.1 percent (tables 1, 2, and 3). That compares with an increase in number of large, commercial feedlots (those with a one-time capacity 1,000 head or more) of 325 or 22.6 percent. Large lots increased by 765 or 44 percent between 1962 and 1971 but have declined by 440 or 20 percent between 1971 and 1975. Over the 1962 to 1975 period, fed cattle marketings increased 5.9 million head or 40.8 percent.

Each of the 23 States experienced a decline in number of farm feedlots, while marketings from farm feedlots declined by nearly 2 million head or 21.5 percent. Only Minnesota increased fed cattle marketings from small feedlots. The number of commercial feedlots increased in 17 States (exceptions were; Arizona, California, Idaho, Oregon, Pennsylvania, and Texas), and fed cattle marketings from commercial lots increased in 20 States (exceptions were; California, Missouri, and Pennsylvania). Total increase in commercial feedlot marketing was 7.9 million head or 149.9 percent. Thus, the proportion of fed cattle marketed from commercial lots increased from 36.3 to 64.5 percent between 1962 and 1975.

A comparison of average marketings per feedlot in tables 1 and 2 indicates the dramatic relative and absolute shift toward fewer, larger

^{1/} Numbers in parentheses correspond to numbered references, pages 54-56.

Table 1 -- Number of cattle feedlots, fed cattle marketed by feedlot size, and average marketed per feedlot, 23 states, 1962

State	Number of feedlots		Fed cattle marketed		Average number of head marketed per feedlot
	: under 1,000 head or more	: 1,000 head or more	: under 1,000 head or more	: 1,000 head or more	
Arizona	95	94	36	532	3,005
California	305	300	42	1,802	3,048
Colorado	1,200	80	233	582	637
Idaho	870	60	79	142	238
Illinois	31,976	24	1,201	64	40
Indiana	14,982	18	334	21	24
Iowa	49,964	36	2,604	83	54
Kansas	14,947	53	524	250	52
Michigan	2,495	5	203	5	83
Minnesota	23,979	21	571	38	25
Missouri	17,984	16	480	62	30
Montana	577	23	60	40	167
Nebraska	23,991	312	1,322	500	75
New Mexico	96	34	26	103	992
North Dakota	3,693	7	122	14	37
Ohio	14,488	12	356	20	26
Oklahoma	2,159	29	95	91	85
Oregon	603	45	63	85	228
Pennsylvania	6,000	4	134	8	24
South Dakota	10,780	20	412	39	42
Texas	1,600	203	105	651	419
Washington	585	39	108	150	413
Wisconsin	5,996	4	161	7	28
Total 23 states	229,365	1,439	9,271	5,289	63

Source: Statistical Reporting Service, USDA, Cattle on Feed, July 1968.

Table 2 --- Number of cattle feedlots, fed cattle marketed by feedlot size, and average marketed per feedlot, 23 states, 1975

State	Number of feedlots	Feedlot capacity : under 1,000 head or more	Feedlot capacity : under 1,000 head or more	Feedlot capacity : under 1,000 head or more	Fed cattle marketed	Average number of head marketed
					1,000 head	per feedlot
Arizona	3	48	1	728	14,294	
California	28	128	7	1,642	10,570	
Colorado	344	193	140	1,698	3,423	
Idaho	504	59	13	317	586	
Illinois	14,450	50	720	85	56	
Indiana	10,975	25	316	30	31	
Iowa	32,841	159	2,334	311	80	
Kansas	6,169	131	282	1,982	359	
Michigan	1,667	33	183	61	144	
Minnesota	10,531	49	698	64	72	
Missouri	10,965	35	300	38	31	
Montana	102	50	23	109	868	
Nebraska	14,700	374	1,130	1,665	185	
New Mexico	5	39	1	260	5,932	
North Dakota	882	18	27	40	74	
Ohio	8,175	25	322	57	46	
Oklahoma	314	41	18	497	1,451	
Oregon	310	23	37	112	447	
Pennsylvania	5,997	3	113	4	20	
South Dakota	9,132	68	363	198	61	
Texas	921	179	50	3,017	2,788	
Washington	160	21	42	273	1,740	
Wisconsin	7,087	13	155	31	26	
Total 23 states	136,262	1,764	7,275	13,219	148	

Source: Statistical Reporting Service, USDA, Cattle on Feed, January 1976.

Table 3--Number of cattle feedlots and fed cattle marketed by feedlot size, 23 states, 1962 and 1975

Year	Feedlot capacity under 1,000 head		Feedlot capacity 1,000 head or more	
	Number	Cattle marketed	Number	Cattle marketed
	--1,000 Head--		--1,000 Head--	
1962	229,365	9,271	1,439	5,289
1963	225,765	10,081	1,498	5,837
1964	217,680	10,675	1,564	6,720
1965	214,733	10,334	1,687	7,588
1966	209,986	10,855	1,824	8,678
1967	204,303	11,418	1,908	9,503
1968 ^a	193,903	11,442	1,966	10,950
1969	183,504	11,467	2,023	12,396
1970	174,655	11,234	2,162	13,650
1971	163,032	10,520	2,204	14,769
1972	152,429	10,275	2,107	16,560
1973	144,180	8,941	2,040	16,363
1974	135,810	8,261	1,922	15,073
1975	136,262	7,275	1,764	13,219

^aEstimated

Source: Statistical Reporting Service, USDA, Cattle on Feed, July 1968 and January 1969-76.

lots in some States. Average number of fed cattle marketed per feedlot increased in 21 States (exceptions were; Pennsylvania and Wisconsin). The greatest absolute growth in commercial cattle feeding occurred in the following States: in order; Texas, Kansas, Nebraska, Colorado, and Oklahoma. For all States, average marketings per small and large feedlots in 1962 were 40 and 3,675 head, respectively; in 1975, 53 and 7,494 head, respectively. Farm feeders remaining in operation also increased in size, but absolutely and relatively less than commercial lots. In States other than the 23 States for which data are available, it is assumed that most feedlots are small, farm feedlots.

Geographic and Firm Concentration

Cattle feeding has shifted geographically and concentration by a few leading States has increased (table 4). In 1975, six States (in order; Texas, Nebraska, Iowa, Kansas, Colorado, and California) accounted for 69.6 percent of the fed cattle marketings in 23 States. In 1962, six States (in order; Iowa, California, Nebraska, Illinois, Colorado, and Kansas) accounted for 63.2 percent of fed cattle marketed. For the two years, 1962 and 1975, the leading State accounted for 18.4 and 15.0 percent, respectively. Five of the 6 leading States in total fed cattle marketed in 1975, were the 5 leading States in marketings from commercial lots (the exception was Iowa).

More important than concentration in feedlots or States is concentration in cattle feeding firms. In 1973, 25 cattle feeding firms with 2 or more feedlots had a modal lot size of 30,000 head (18). Approximately 12.5 percent of total fed cattle marketed were from lots owned by 16 multi-lot firms, and 2 firms supplied 3 percent. The second

Table 4--Percentage of fed cattle marketed from 23 states and changes in percentage by state, 1962 and 1975

State	Percentage of 23 state total fed cattle marketings		Change
	1962	1975a/	
Arizona	3.9	3.6	0.3
California	12.7	8.0	-4.7
Colorado	5.6	9.0	3.4
Idaho	1.5	1.6	0.1
Illinois	8.7	3.9	-4.8
Indiana	2.4	1.7	-0.7
Iowa	18.4	12.9	-5.5
Kansas	5.3	11.0	5.7
Michigan	1.4	1.2	-0.2
Minnesota	4.2	3.7	-0.5
Missouri	3.7	1.6	-2.1
Montana	0.7	0.6	-0.1
Nebraska	12.5	13.6	1.1
New Mexico	0.9	1.3	0.4
North Dakota	0.9	0.3	-0.6
Ohio	2.6	1.8	-0.8
Oklahoma	1.3	2.5	1.2
Oregon	1.0	0.7	-0.3
Pennsylvania	1.0	0.6	-0.4
South Dakota	3.1	2.7	-0.4
Texas	5.2	15.0	9.8
Washington	1.8	1.5	-0.3
Wisconsin	1.2	0.9	-0.3

a/ Total does not equal 100 due to rounding.

Source: Statistical Reporting Service, USDA, Cattle on Feed, July 1968 and January 1976.

ranking firm planned to market 5 percent of total fed cattle marketed in future years. Multi-lot firms operated feedlots of varying sizes, and individual firms operated lots in several States. A few large firms and their total feedlot capacities were: Western Beef, Inc., 181,000 head; Mesa Agro, 171,000; Stratford of Texas, 110,000; and Pro Chemco, 108,000 (17, 18).

A 1969-70 study of Texas feedlots and a 1971 study of Kansas and Nebraska feedlots indicated sole proprietorships and partnerships declined and corporate ownership increased as feedlot size increased (4, 28). Of the Texas feedlots studied, two-thirds of those with 40,000 head capacity or more were divisions of general corporations and it was found that the number of stockholders increased as lot size increased. At least 27 cattle feeding firms have been organized as public limited partnerships since 1970 (15). An extended period of unprofitable cattle feeding resulted in numerous ownership changes in cattle feedlots. In a 3 year period, many traded among agribusiness firms. Bankruptcies may have enabled some agribusiness firms to enter the industry for considerably less cost than building commercial feedlots. Currently, one of the largest cattle feeding firms is a subsidiary of Cargill, Inc., one of the three largest grain marketing firms and a major feed manufacturer. Cooperative ownership of feedlots is relatively unimportant. In 1976, 16 cooperative feedlots in 7 States had a total capacity of about 260,000 head.

Growth, Entry, and Exit

Increased demand for beef, a regional grain surplus, and economies of size contributed to the growth in commercial feedlots and geographic

shift in production (19). U.S. per capita beef consumption has increased more than 50 percent in the past 15 years. The supply response was relatively greater in the Plains States because of rapid expansion in irrigated grain production and the development of hybrid milo varieties. Both developments resulted in a rapid expansion in feed grains production in those States, giving them a comparative advantage in cattle feeding.

Economies of size partially explain the growth in commercial cattle feedlots (18). Most economies of size for non-feed costs were found to be achieved in 5,000 to 7,000 head feedlots (11). A California study later found economies of size for lots in the 10,000 to 26,000 head size range but diseconomies in larger feedlots. Perhaps more important factors than size economies for facilities are financing, risk, and feedlot utilization advantages of large lots.

In 1966-67, costs were found to decrease as feedlot utilization increased, indicating that commercial lots have cost advantages in feeding and in maintaining high utilization levels (5). Feedlot occupancy rate was found to range from 62 percent for 10,000 to 19,999 head capacity lots; to 80 percent for 30,000 to 39,999 head capacity lots (4). Capital requirements to maintain high utilization levels are high for commercial lots, possibly several million dollars, depending on cattle and feed prices. A 25,000 head capacity feedlot was estimated to cost \$1.25 million; and cattle and feed, another \$10 million in 1974 (19). The glamour and potential profitability of cattle feeding attracted persons willing to own cattle and bear the feeding risk, greatly reducing capital requirements and risk for feedlot owners.

Custom feeding, though not new to the cattle industry, expanded in popularity during the 1960's and 1970's. In 1966-67, commercial feedlots in Texas fed about 67 percent of cattle on feed in those lots for custom operators; in 1969-70; it was 90 percent (4). Initially, custom feeding was done for local farmers, ranchers, and some business and professional people. As it grew in popularity, more nonfarm people were attracted to cattle feeding. Gradually, people pooled their capital and jointly owned a larger group of cattle, rather than each individually owning smaller lots of cattle. Cattle feeding clubs, resembling stock investment clubs, grew in popularity and size and became a part of institutional investment opportunities. Public limited partnerships were formed, resembling mutual funds, to pool capital and own a fraction of large blocks of cattle.

Public limited partnerships became popular in cattle feeding because of the tax shelter/deferral advantages they offered to high income investors; those in high (50 percent or above) marginal income tax brackets (15, 19). New legislation in 1976 reduced somewhat the tax advantages of cattle feeding. Public limited partnerships enabled financing large groups of cattle, reducing operating capital requirements and risk for feedlot operators and increasing feedlot utilization rates. Because of high development and operating costs for public limited partnerships, they are only applicable for feedlots with 30,000 head capacity or more (19).

There are few barriers to entering or exiting cattle feeding for small, farm feeders. Oftentimes small feedlots can be converted relatively easily to other livestock feeding operations and may have

some alternative uses in machinery and grain storage. Large feedlots have few alternative uses and higher barriers to entering and existing cattle feeding. Management and facilities are more costly and specialized. Though attracting investment capital and custom feeders may be an advantage and lead to high utilization levels when profits are favorable, that financing source is less stable and more sensitive in some ways. When cattle feeding becomes less profitable relative to other investments, capital flows to higher returning investments as it has in the past 3 years. Similarly, it is highly dependent on tax regulations allowing tax shelter investments in cattle feeding. Therefore, to enter cattle feeding, commercial feedlots require larger amounts of investment and operating capital. They become relatively more dependent on factors beyond their control to sustain the investment flow needed to operate facilities at high utilization rates. Commercial feedlots have exit barriers because potential buyers of commercial feedlots are likely to be fewer in number than for small feedlots. One possible reason why agribusiness firms have purchased several bankrupt commercial feedlots, is that there were few potential buyers and pressure by lenders to sell those lots drove prices down to attractive levels for firms with sufficient financial and human capital resources to purchase and operate them.

Cattle Slaughtering Structure and Characteristics

Major changes characterizing the cattle slaughtering industry include: (1) fewer, larger plants slaughtering steers and heifers; (2) increased geographic and firm concentration; and (3) ownership changes among major meat packing firms.

Plant Numbers and Size

Total number of plants slaughtering all livestock species increased by 2,309 or 110.7 percent in 23 cattle feeding States, and 3,111 plants or 98.9 percent nationally between 1960 and 1976 (table 5). Passage of the Wholesome Meat Act in 1967 resulted in several States abandoning their State-inspection service, and transferring plant inspection to USDA (2). Consequently, more plants are federally inspected now than previously. Between 1950 and 1973 the number of federally inspected plants slaughtering cattle increased by 860 or 208.7 percent nationally. A much higher percentage of total plant numbers in 1973 were small plants (slaughtering under 12,500 head) than in 1950. In percentage terms, large slaughter plants (slaughtering 200,000 head or more) increased more than other size groups over that period. Number and size of federally inspected plants slaughtering cattle are shown in table 6.

In 17 States for which data were comparable, 16.8 percent of the plants accounted for 85 percent of cattle slaughter (table 7). Nationally, 13.6 percent of all plants slaughtered 81.1 percent of total cattle slaughtered. Average slaughter per plant varies widely among States, ranging from 2,678 head in Pennsylvania to 140,403 head in Iowa. Since these data include cow and bull slaughter and plants slaughtering cows and bulls tend to be smaller, average slaughter per plant in major cattle feeding States could be expected to be higher. For 17 States, average slaughter per small plant (slaughtering under 50,000 head) was 5,367 head compared to 150,567 head for the larger size group. Nationally, comparable figures were 5,229 and 141,782 head for the small and large size group, respectively. Therefore, plants in States other

Table 5--Number of livestock slaughtering establishments, 23 states, 1960 and 1976.^{a/}

State	Number of establishments					
	Under Federal		Other		Total	
	inspection					
	1960	1976	1960	1976	1960	1976
Arizona	1	7	16	33	17	40
California	59	65	59	14	118	79
Colorado	14	49	30	23	44	72
Idaho	6	10	49	47	55	57
Illinois	39	40	71	210	110	250
Indiana	13	23	110	150	123	173
Iowa	27	46	24	324	51	370
Kansas	16	27	67	177	83	204
Michigan	4	20	190	162	194	182
Minnesota	12	76	19	266	31	342
Missouri	17	133	47	156	64	289
Montana	5	33	27	16	32	49
Nebraska	29	51	29	138	58	189
New Mexico	1	11	25	26	26	37
North Dakota	-	38	10	100	10	138
Ohio	32	39	206	261	238	300
Oklahoma	3	21	62	180	65	201
Oregon	9	54	47	15	56	69
Pennsylvania	26	363	320	120	346	483
South Dakota	7	9	8	120	15	129
Texas	30	89	190	352	220	441
Washington	15	44	58	15	73	59
Wisconsin	19	20	38	222	57	242
Total 23 states	384	1,268	1,702	3,127	2,086	4,395
Total U.S.	530	1,741	2,614	4,514	3,144	6,255

^{a/} 1960 data includes all plants with an output of 300,000 pounds or more live weight annually.

Source: Statistical Reporting Service, USDA, Number of Livestock Slaughter Plants, June 1965; and Annual Livestock Slaughter, April 1976.

Table 6--Number and percentage of federally inspected plants slaughtering cattle by size, U.S., 1950 and 1973

Size category	Number of plants		Percentage	
	1950	1973	1950	1973
Number of head:				
Less than 12,500	169	925	41.0	72.7
12,500 - 49,999	175	170	42.5	13.4
50,000 - 99,999	41	99	10.0	7.8
100,000 - 199,999	19	43	4.6	3.4
200,000 or more	8	35	1.9	2.7
Total	412	1,272	100.0	100.0

Source: Allen J. Baker, Federally Inspected Livestock Slaughter by Size and Type of Plant, U.S.D.A., ERS Statistical Bulletin 549, May 1976.

Table 7--Number of federally inspected cattle slaughtering plants, cattle slaughtered by plant size, and average slaughter per plant, 23 states, 1975.

State	Number of slaughter plants		Cattle slaughter		Average number of head slaughtered per plant
	Plants slaughtering under 50,000 head	Plants slaughtering 50,000 head or more	Plants slaughtering under 50,000 head	Plants slaughtering 50,000 head or more	
			-----1,000 head-----		
Arizona	<u>a/</u> 6	-	<u>a/</u> 370	-	61,650
California	41	22	819	2,003	44,803
Colorado	38	7	170	1,781	43,353
Idaho	6	4	128	369	49,650
Illinois	15	8	180	1,072	54,452
Indiana	14	3	124	219	20,170
Iowa	9	20	113	3,959	140,403
Kansas	18	11	149	2,534	92,538
Michigan	5	4	112	302	46,089
Minnesota	58	10	69	1,372	21,191
Missouri	132	4	380	672	7,728
Montana	<u>a/</u> 34	-	<u>a/</u> 146	-	4,294
Nebraska	54	23	319	4,404	61,332
New Mexico	6	3	46	518	62,700
North Dakota ^{b/}	-	-	-	-	-
Ohio	21	6	343	425	28,433
Oklahoma	<u>a/</u> 16	-	<u>a/</u> 594	-	37,119
Oregon	<u>a/</u> 51	-	<u>a/</u> 289	-	5,665
Pennsylvania	333	7	366	545	2,678
South Dakota ^{b/}	-	-	-	-	-
Texas	54	28	926	4,042	60,588
Washington	36	3	222	325	14,010
Wisconsin	6	8	75	1,205	91,400
Total 17 states ^{c/}	846	171	4,541	25,747	29,782
Total U.S.	1,336	211	6,987	29,916	23,855

^{a/} Plants and cattle slaughtered from larger size group are included to avoid disclosing individual operations.

^{b/} Data not available.

^{c/} Includes only states where data are available and comparable.

Source: Statistical Reporting Service, USDA, Annual Livestock Slaughter, April 1976.

than the 23 cattle feeding States are smaller, partially attributable to a lower density of slaughter cattle in many of those States. The wide disparity in average slaughter between small and large plants is partially explained by the transfer of many, small State-inspected plants to the federal inspection category. Of States not among the 23 States in 1975, 11 slaughtered more cattle than Montana, which slaughtered the least number of cattle among the 23 cattle feeding States. Of those 11, 8 were southeastern, 2 northeastern, and 1 a western State. In all cases, it is believed a relatively high percentage of cattle slaughter in those States were cows and bulls rather than steers and heifers.

Geographic and Firm Concentration

Steer and heifer slaughter has become more concentrated in 23 cattle feeding States and especially in 6 leading States. Between 1969 and 1974 percentage of total U.S. steer and heifer slaughter in 23 cattle feeding States increased 2.4 percentage points, from 91.0 to 93.4 (table 8). That portion accounted for by 6 leading States in each period increased 10 percentage points, from 56.8 to 66.8 percent. Though rank among the 6 States changed during that period, only one State was replaced. The 6 leading States in each period were: in order; 1969-- Iowa, Nebraska, California, Missouri, Texas, and Colorado; 1974-- Nebraska, Iowa, Texas, Colorado, Kansas, and California. The 4 States experiencing the largest increase in share of total U.S. steer and heifer slaughter (in order; Kansas, Colorado, Texas, and Nebraska) were the 4 States with the greatest increase in commercial cattle feeding.

Table 8--Percentage of U.S. steer and heifer slaughter and change in percentage, 23 states, 1969 and 1975

State	Percentage of U.S. steer and heifer slaughter		Change
	1969	1974	
Arizona	1.8	1.8	-
California	9.0	8.7	-0.3
Colorado	5.7	8.8	3.1
Idaho	0.8	1.3	0.5
Illinois	3.9	3.8	-0.1
Indiana	1.8	1.2	-0.6
Iowa	14.9	15.0	0.1
Kansas	4.0	8.8	4.8
Michigan	1.2	0.9	-0.3
Minnesota	4.9	3.3	-1.6
Missouri	6.5	2.9	-3.6
Montana	0.4	0.2	-0.2
Nebraska	14.2	16.3	2.1
New Mexico	1.0	1.2	0.2
North Dakota	0.5	0.5	-
Ohio	2.9	2.4	-0.5
Oklahoma	1.9	1.5	-0.4
Oregon	0.8	0.4	-0.4
Pennsylvania	1.6	1.1	-0.5
South Dakota	2.0	1.4	-0.6
Texas	6.5	9.2	2.7
Washington	1.7	1.2	-0.5
Wisconsin	2.9	1.4	-1.5
23 states	91.0	93.4	2.4

Source: Packers and Stockyards Administration, U.S.D.A., Packers and Stockyards Resumé, December 1970 and 1975.

Again, more important than geographic concentration is firm concentration. In 20 of the 23 cattle feeding States between 1969 and 1974, four-firm concentration increased (table 9). For 23 States in 1974, four-firm concentration increased from 55.9 to 62.8 percent, ranging from 19.7 percent in California to 100 percent in North Dakota. Of the 8 States with the greatest increase in four-firm concentration, only 2 are among the 6 leading cattle feeding States (Kansas and Texas). The 4 States with the greatest increase in commercial cattle feeding and in share of total U.S. steer and heifer slaughter (Colorado, Kansas, Nebraska, and Texas), also experienced an increase in four-firm concentration. Comparing tables 8 and 9 indicates that each of the 7 States which had an increased share of steer and heifer slaughter also had an increase in four-firm concentration level. As indicated in table 10, State concentration in steer and heifer slaughter is higher in States which are not among the 23 States for which cattle feeding data are available. In 1974, the lowest four-firm concentration level in the "other States" category was 70.7 percent.

In 1969, 926 firms reported purchasing steers and heifers for slaughter in 1,032 plants (21). Of those firms, 886 were single plant firms and the remaining 40 were multi-plant firms operating 146 plants, an average of 3.65 plants per multi-plant firm. By 1974, the number of firms had declined by 241 or 26.0 percent, while the number of plants declined 265 or 25.7 percent, to 767. Of the 685 firms in 1974, 651 were single plant firms and 34 were multi-plant firms operating 116 plants, an average of 3.41 plants per multi-plant firm. Though average number of plants per firm decreased, average slaughter per plant and per

Table 9--Four firm concentration level of steer and heifer slaughter and change in level, 23 states, 1969 and 1974

State	Four-firm concentration level <u>a/</u>		Change
	1969	1974	
Arizona	83.7	89.6	5.9
California	20.5	19.7	-0.8
Colorado	63.3	64.5	0.4
Idaho	77.3	77.4	0.1
Illinois	63.1	68.1	5.0
Indiana	64.3	78.9	14.6
Iowa	53.4	65.1	11.7
Kansas	54.3	76.2	21.9
Michigan	53.4	57.6	4.2
Minnesota	59.7	78.3	18.6
Missouri	67.9	82.5	14.6
Montana	92.9	90.2	-2.7
Nebraska	51.1	52.6	1.5
New Mexico	95.9	97.7	1.8
North Dakota	100.0	100.0	-
Ohio	40.9	42.7	1.8
Oklahoma	72.9	84.1	11.2
Oregon	62.0	75.3	13.3
Pennsylvania	73.6	82.2	8.6
South Dakota	91.3	94.6	3.3
Texas	43.2	59.5	16.2
Washington	66.5	90.4	23.9
Wisconsin	79.6	93.0	13.4
23 states	55.9 <u>b/</u>	62.8 <u>b/</u>	6.9

a/ Percentage of state steer and heifer slaughter accounted for by the four largest firms in each state.

b/ Weighted average.

Source: Packers and Stockyards Administration, U.S.D.A., unpublished data.

Table 10--Distribution of state four-firm concentration levels, U.S.,
1969 and 1974. a/

Year	States	Concentration level <u>b/</u>		
		80 percent or more	60 percent or more	40 percent or more
		----- Number of states -----		
1969	23 states <u>c/</u>	5	15	22
	Other states	17	23	24
	Total	22	38	46
1974	23 states <u>c/</u>	10	18	22
	Other states	20	21	21
	Total	30	39	43

a/ Firms report no plants slaughtering steers and heifers in some states; 1969-3 states, 1974-6 states.

b/ Percentage of state steer and heifer slaughter accounted for by the four largest firms in each state.

c/ States for which Statistical Reporting Service, USDA, report cattle feeding statistics in more detail than for all states.

Source: Packers and Stockyards Administration, U.S.D.A., unpublished data.

firm increased. Average slaughter per plant increased from 24,775 to 33,332 head and average slaughter per firm increased from 27,611 to 37,323 head over the 1969 to 1974 period. In 23 cattle feeding States, 12 firms slaughtering steers and heifers operated 60 plants and slaughtered 52.3 percent of steer and heifer slaughter in those States (table 11). For those firms, average slaughter per plant and per firm were 208,150 and 1,040,750 head, respectively. Since 1974, one of the 12 firms in table 11 filed for bankruptcy and two others began operating slaughtering plants, which are among the nation's largest, in a highly concentrated cattle feeding area.

Several meat packing firms have formed, merged, or been acquired by conglomerate corporations. A few examples are: (1) Armour, owned by Greyhound; (2) Cudahy, owned by General Host; (3) John Morrell, owned by United Brands; (4) Swift, owned by Esmark; and (5) Wilson, owned by LTV. Though data are unavailable, it is believed that financing is a primary consideration for conglomerate entry into slaughtering. Other food distribution firms are integrated into slaughtering. Examples are: Acme Markets, Food Fair Stores, Kroger, Winn-Dixie, American Stores, Beatrice Foods, and Consolidated Foods. Cooperatives play a minor role in steer and heifer slaughter. Three cooperative firms, each operating one plant, slaughtered 0.9 percent of all steers and heifers slaughtered in 23 cattle feeding States; and nationally, four cooperative firms slaughtered 0.9 percent in four plants.

Growth, Entry, and Exit

Economies of size in slaughtering and processing contribute toward explaining the industry structure in cattle slaughtering. It was found

Table 11--Number of plants and steer and heifer slaughter of 12 leading firms in 23 states, and percentage of U.S. steer and heifer slaughter, 1974.a/

Firm rank <u>b/</u>	Number of plants	Steer and heifer slaughter	Percentage of U.S. steer and heifer slaughter	
			Firm	Cumulative
--1,000 head--				
1-2	18	4,549	19.0	19.0
3-4	12	2,529	10.6	29.6
5-6	11	1,932	8.1	37.7
7-8	9	1,511	6.4	44.1
9-10	5	1,056	4.4	48.5
11-12	5	912	3.8	52.3
Total	60	12,489	52.3	-

a/ States for which Statistical Reporting Service, USDA, report cattle feeding statistics in more detail than for all states.

b/ Two firms were combined to avoid disclosure of confidential data.

Source: Packers and Stockyards Administration, U.S.D.A., unpublished data.

that larger slaughtering plants tend to be species specific, taking advantage of specialized, labor-saving technology (2). The same study noted that smaller, specialized plants (30 head per hour or less) became more involved in processing, boning, and rendering than larger, specialized plants. Newer plants have been built close to the source of cattle supply, in the leading commercial cattle feeding States, and tend to be large, species specific, and engage only in slaughtering.

A review of the literature dealing with slaughtering costs emphasizes the importance of labor costs and that economies of size do exist (14). All studies were conducted between 1961 and 1965 and slaughtering technology has changed since that time. However, it might be noted that an Oklahoma study found long-run average costs turning up for plants above 60 head per hour, whereas a study in California showed long-run average costs continuing to decline for plants slaughtering up to 120 head per hour. The Oklahoma study included offal workup and rendering while the California study included no rendering, sausage-making, boning, or breaking operations. These two studies may provide a clue why smaller, specialized plants engage in operations besides slaughtering and why larger, specialized plants only slaughter. Utilization levels were not mentioned, though must be important, considering that labor constituted 50 to 70 percent of operating costs in model plants and the 36-hour minimum work week in many labor contracts (14). Utilization levels were found to average 80 percent for plants specializing in cattle slaughter between 1970 and 1973 but were higher for larger plants (2).

To build a plant capturing most economies of size requires a capital investment large enough to form a barrier to entry in slaughtering. A plant with a slaughtering capacity of approximately 130 head per hour (annual capacity of 250,000 head) and performing some processing was estimated to require \$12.9 million for investment and operating capital in 1976 (10). After tax earnings as a percent of net worth in the meat packing industry has trailed other manufacturing industries. Average earnings between 1971 and 1974 were 11.1 percent in meat packing compared to 13.4 percent in other manufacturing industries, though the gap narrowed over that period (10). Another barrier to entry involves procurement and distribution. New plants in a given area must compete with established plants for a given supply of cattle. Similarly, it means penetrating existing meat distribution arrangements.

Because of the specialized nature of slaughtering plants, there are few alternative uses for facilities and equipment. Plants which are species specific may be converted to handle other species and some plants may be converted to performing additional meat processing operations besides slaughtering. Beyond that, the possibility for converting plants to other industrial uses is unknown but believed to be limited. There appears to be some exit barriers also, both because of the inflexibility of physical assets and the potentially limited number of prospective buyers.

Vertical Coordination

Structural changes and characteristics in the cattle feeding and cattle slaughtering industries contribute to vertical coordination changes. Most noticeable are changes in procurement methods of packers

(used synonymously here with marketing methods of feeders) which have less visible implications on and for several dimensions of vertical coordination.

Procurement/Marketing Methods

The number of public markets and market agencies affect and have been affected by changing procurement or marketing methods. Terminal markets have declined in number and relative importance as a market for cattle, especially steers and heifers (table 12, 13, and 14). The number of terminal markets declined from 80 in 1937, to 42 in 1966, to 28 in 1975 (21). The percentage of slaughter cattle sold through terminal markets dropped from 75.8 percent in 1940 to 13.9 percent in 1974. Between 1969 and 1974 the number and percentage of steers and heifers sold through terminal markets declined nationally as well as in leading cattle feeding areas. In 23 cattle feeding States, the percentage of steers and heifers procured by packers through terminal markets declined from 20.3 percent in 1969 to 13 percent in 1974. Number of head declined from 4.7 million to 3.1 million head over the same period, a decline of 34.5 percent. Packers purchased a lower percentage of steers and heifers through terminals in the 5 leading cattle feeding States (California, Colorado, Kansas, Nebraska, and Texas) in each period, 12.3 percent in 1969 and 7.3 percent in 1974.

Public auction markets also declined; from 2,472 in 1949, to 2,316 in 1966, to 1,905 in 1975. The proportion of slaughter cattle marketed through auctions declined slightly, from 17.8 percent in 1963 to 16.4 percent in 1974. Both the number and percentage of steers and heifers purchased for slaughter by packers through public auctions declined

Table 12--Number of posted stockyards, auction markets, market agencies, and dealers by region, 1966 and 1975.^a

Region	Year	Terminal : markets	Auction : markets	Commission : firms	Dealers and order buyers	Total
Northeast and Mid-Atlantic	1966	2	122	25	742	891
	1975	3	125	20	696	844
Southeast	1966	1	305	2	508	816
	1975	-	306	-	391	697
South Central	1966	3	247	-	366	616
	1975	1	203	4	330	538
East North Central	1966	11	360	80	1,436	1,887
	1975	9	260	57	1,461	1,787
West North Central	1966	11	792	167	2,904	3,874
	1975	10	537	129	2,308	2,984
Southwest	1966	10	267	53	904	1,234
	1975	5	248	28	646	927
Mountain	1966	3	71	-	458	532
	1975	-	86	15	565	666
Pacific Slope	1966	1	152	-	526	679
	1975	-	140	-	853	993
United States	1966	42	2,316	327	7,844	10,529
	1975	28	1,905	253	7,250	9,436

a/ Data from individual states in 1975 were not current at the same point in time.

Source: Donald B. Agnew, Cost of Marketing U.S. Livestock Through Dealers and Public Agencies, U.S.D.A., ERS Marketing Research Report 998, June 1973; and lists maintained by Packers and Stockyards Administration, U.S.D.A.

Table 13--Number and percentage of steer and heifer purchases by packers, in state where slaughtered, by procurement method, 1969.

State	Number of steers and heifers purchased			Percent of total purchases <u>a/</u>		
	Direct <u>b/</u> methods	Terminal markets	Auction markets	Direct <u>b/</u> methods	Terminal markets	Auction markets
-----1,000 head-----						
Arizona	432	0	20	95.6	0.0	4.4
California	2,214	12	63	96.7	0.5	2.7
Colorado	1,402	19	49	95.4	1.3	3.3
Idaho	173	1	29	85.1	0.4	14.5
Illinois	480	441	87	47.6	43.8	8.6
Indiana	151	241	61	33.3	53.1	13.5
Iowa	3,238	512	59	85.0	13.4	1.6
Kansas	760	155	100	74.9	15.3	9.8
Michigan	61	133	112	19.9	43.5	36.6
Minnesota	752	478	18	60.3	38.3	1.4
Missouri	915	653	88	55.3	39.4	5.3
Montana	83	1	15	83.8	0.7	15.6
Nebraska	2,544	954	139	69.9	26.2	3.8
New Mexico	236	0	30	88.7	0.0	11.3
North Dakota	71	51	11	53.3	38.3	8.4
Ohio	243	287	216	32.6	38.5	29.0
Oklahoma	406	51	33	82.9	10.3	6.7
Oregon	178	17	12	85.8	8.3	5.9
Pennsylvania	69	169	136	17.2	48.9	33.9
South Dakota	318	156	42	61.6	30.3	8.1
Texas	1,372	101	194	82.3	6.1	11.7
Washington	386	3	55	87.0	0.6	12.4
Wisconsin	285	255	203	38.3	34.3	27.4
Total 23 states	16,768	4,718	1,772	72.1	20.3	7.6
Total other states	1,012	582	717	43.8	25.2	31.0
Total U.S.	17,780	5,300	2,489	69.5	20.7	9.7

a/ Totals do not equal 100 due to rounding.

b/ Includes order buyers, packer buyers, country commission firms, livestock dealers, etc.

Source: Packers and Stockyards Administration, U.S.D.A., Packers and Stockyards Administration Resumé, December 1970.

Table 14--Number and percentage of steer and heifer purchases by packers, in state where slaughtered, by procurement method, 1974.

State	Number of steers and heifers purchased			Percent of total purchases ^{a/}		
	Direct ^{b/} methods	Terminal markets	Auction markets	Direct ^{b/} methods	Terminal markets	Auction markets
-----1,000 head-----						
Arizona	436	8	7	96.7	1.8	1.6
California	2,109	20	105	94.4	0.9	4.7
Colorado	2,248	0	6	99.7	0.0	0.3
Idaho	258	5	79	75.4	1.5	23.1
Illinois	498	305	176	50.9	31.2	18.0
Indiana	101	136	60	34.0	45.8	20.2
Iowa	3,213	561	51	84.0	14.7	1.3
Kansas	2,173	71	8	96.5	3.2	0.4
Michigan	46	50	145	19.1	20.7	60.2
Minnesota	618	212	20	72.7	24.9	2.4
Missouri	485	175	74	66.1	23.8	10.1
Montana	22	6	22	44.0	12.0	44.0
Nebraska	3,183	851	142	76.2	20.4	3.4
New Mexico	285	0	15	95.0	0.0	5.0
North Dakota	99	14	8	81.8	11.6	6.6
Ohio	160	246	202	26.3	40.5	33.2
Oklahoma	357	30	8	90.4	7.6	2.0
Oregon	84	3	7	89.4	3.2	7.4
Pennsylvania	64	139	76	22.9	49.8	27.2
South Dakota	229	98	24	65.2	27.9	6.8
Texas	2,119	24	220	89.7	1.0	9.3
Washington	269	10	24	88.8	3.3	7.9
Wisconsin	121	128	124	32.4	34.3	33.2
Total 23 states	19,177	3,092	1,602	80.3	13.0	6.7
Total other states	1,034	192	468	61.0	11.3	27.6
Total U.S.	20,211	3,284	2,071	79.0	12.8	8.1

^{a/} Totals do not equal 100 due to rounding.

^{b/} Includes order buyers, packer buyers, country commission firms, livestock dealers, etc.

Source: Packers and Stockyards Administration, U.S.D.A., Packers and Stockyards Administration Resumé, December 1975.

between 1969 and 1974, nationally and in the 23 cattle feeding States. Packers purchased 9.5 percent or 1.7 million fewer steers and heifers through auctions in 23 cattle feeding States between 1969 and 1974, which represents a decline in proportion of all steer and heifer purchases from 7.6 to 6.7 percent. As with terminal markets, packers purchased a lower percentage of steers and heifers through public auctions in the 5 leading cattle feeding States, 5.4 percent in 1969 and 3.6 percent in 1974.

Direct marketing encompasses a variety of marketing or procurement methods and is increasing in importance as a procurement method for slaughter cattle, especially steers and heifers. For all slaughter cattle, the proportion of cattle purchased by direct methods increased from 38.6 percent in 1960 to 69.6 percent in 1974. Nationally, the number of steers and heifers purchased by packers from direct sources increased 2.4 million head or 13.7 percent between 1969 and 1974. Comparable figures for the 23 cattle feeding States, were 2.4 million head and 14.4 percent, respectively. The proportion of steer and heifer purchases by packers increased from 72.1 percent in 1969 to 80.3 percent in 1974 in 23 States. That was more in each year than nationally, 69.5 and 79.0 percent, respectively; but less than in five leading cattle feeding States where it increased from 82.3 to 89.1 percent over the same period.

Four States (Colorado, Kansas, Nebraska, and Texas) underwent several structural and marketing changes in recent years. They are the 4 leading cattle feeding States, and the four experiencing the largest increase in commercial cattle feeding. They are among 5 leading steer

and heifer slaughtering States, and the four which experienced the largest increase in share of U.S. steer and heifer slaughter. Four-firm concentration level for steer and heifer slaughter increased in each State, and each experienced an increase in proportion of steers and heifers slaughtered in those States procured by direct methods. The number of public markets and marketing agencies presented in table 12 is of limited usefulness. Volume data are not published to provide a size distribution of markets and agencies. Numbers alone do not indicate how competitive marketing methods are, specifically in local areas. Without knowing more about these firms it is difficult to know the kind and amount of effect they have on vertical coordination dimensions. Many producers worry about market access, and declining numbers of markets may reinforce their concern, however.

Vertical Integration and Forward Contracts

Here, vertical integration of cattle feeding and slaughtering is discussed. Omitted are such integrated arrangements as: (1) custom feeding and slaughtering by farmers and ranchers; (2) agribusiness firms feeding cattle but not slaughtering, including grain marketing firms; and (3) agribusiness firms slaughtering but not feeding, including food processing and distribution firms. The estimated percentage of output produced under vertical integration increased from 3 to 4 percent in the U.S. between 1960 and 1970 (20). Each year since 1968, from 7 to 9 of the 10 major meat packers have engaged in cattle feeding, feeding an average number of head per firm ranging from 34.4 thousand in 1972 to 74.4 thousand in 1969 (21). Average number fed per firm increased in

1973 and 1974 relative to the low in 1972, and at least 3 major packers announced plans to further increase their feeding activities in 1975 (Armour, Iowa Beef, and Swift). The increased interest in cattle feeding by meat packers may stem partially from a 1974 Packers and Stockyards Administration regulation. In that regulation, meat packers are prohibited from having cattle custom fed and prohibits meat packers from owning or operating custom feedlots, and vice versa. As a percentage of fed cattle marketed in 39 States, cattle fed by or for packers has remained within a 6.1 to 7.8 percent range since 1960. However, Packers and Stockyards Administration data do not include feeding activities of owners, officers, or employees of meat packing firms or subsidiaries and affiliates not included in annual reports. In 1961 and 1965, feeding data for packer associated interests were obtained and showed that data annually reported by Packers and Stockyards Administration understated actual feeding activities of packers. In 1961, packer feeding as a percentage of fed cattle marketed in 39 States was understated 2.1 percent; and in 1965, 4.2 percent. Feeding activities by packers varies considerably by State. For each of 5 leading cattle feeding States, the number of head fed by or for packers and percentage of fed cattle marketed were: Colorado, 534,400 head or 33.7 percent; Nebraska, 229,400 head or 14.5 percent; Kansas, 140,100 head or 8.8 percent; Texas, 139,500 head or 8.8 percent; and California, 135,600 head, or 8.6 percent.

Data are not available to determine the extent of forward contracting by packers. Forward contracts, similar to the one in Appendix A, parallel futures market contracts. They specify a minimum

quantity and quality of cattle to be delivered at a specified time and place, and some allow for an advance partial payment from packer to feeder.

Dimensions of Coordination

The number of coordination dimensions and boundaries of each is unclear. Here, dimensions are grouped into 10 categories and discussions of some necessarily overlap with others.

Goals of operation--Economic goals of operation vary among firms at one level (intralevel or intrastage) and between firms at more than one level (interlevel or interstage). Small feedlots often supplement grain-producing enterprises or off-farm employment, and are timed so as to utilize available labor from other enterprises. Investment in cattle and facilities is relatively low compared to commercial lots and producers do not experience comparable pressure to maintain small lots at high utilization levels. In localized areas, farm feedlots supplement a relatively small set of cropping enterprises. Purchases and sales of several lots tend to coincide, increasing seasonality in cattle purchases and sales. As feedlots increase in size and specialization, the investment in cattle, feed, and facilities increases, resulting in increased pressure to maintain higher utilization levels. That results in increased demand for a constant flow of cattle into those lots and a more constant, less seasonal flow of cattle to packers. Purcell found that most cattle feeders, especially commercial feeders, attempt to maximize returns per head on each lot of cattle fed (23). Fewer cattle feeders indicated a longer

run goal, either maximizing returns to the total operation over a given period or seeking stability of returns at some acceptable level.

In Purcell's study, packers expressed longer run goals relative to cattle feeders. Packers chose to maximize returns or margins per head over each year's operation or achieve some targeted margin above that currently achieved. Thus, packers seek more stability and have a longer planning horizon than cattle feeders.

Implications of goal conflicts found by Purcell included increased pressure to vertically integrate when coordination is hampered by firms at separate stages. The renewed interest of some packers to increase their feeding activities may result from less than satisfactory interstage coordination in recent years and seems consistent with their longer run planning and stability goals. The study by Purcell was based on research conducted in 1969 or 1970 and significant change has occurred at each stage since then. The rapid rise in commercial cattle feeding, volatility in prices, low profitability in feeding, and rise and fall in outside financing may have changed their economic goals. A follow-up study may yield different results than in 1970, clarifying differences in goals of interstage and intrastage firms.

Space--Structural changes in feeding and slaughtering affect the spatial dimension of vertical coordination, but several changes occurred simultaneously, making it difficult to determine cause and effect. As cattle feeding shifted geographically, packers built larger, more specialized plants near the source of supply. When terminal markets were used more widely as a marketing and procurement method and

slaughter plants were located near terminal markets, it was not unusual to move cattle 250 miles or more from farm to terminal market. Public auction markets assemble livestock mostly within a 50 mile radius of the auction. Formerly, it was not unusual to transport cattle another 150 miles or more to a slaughter plant. With the decline in use of public markets and movement of slaughter plants closer to major supply areas, cattle move less distance from feedlot to slaughter plant than previously.

Slaughter plant proximity to public markets and cattle feeding operations, among other factors, influence packer procurement methods. In feeding areas dominated by commercial lots, packers are able to procure a relatively high proportion of their slaughter volume from within 100 miles of the plant. The task of spatial coordination in areas where commercial feedlots are dominant and where there are relatively new plants is much smaller than where cattle feeding density is less, dominated by farm feedlots, and where older slaughter plants exist. An advantage in concentrated cattle feeding areas is that packer buyers or their order buyers are able to regularly visit feedlots and maintain a perpetual inventory of cattle supply. Packers in those areas no longer need terminal and public markets to perform an assembly function and rely more on direct procurement methods, enabling them to purchase on carcass weight and grade. Public markets may still serve a useful assembly function in less dense cattle feeding areas, where a given volume of slaughter cattle must be purchased over a wider geographic area. Spatial coordination can be improved through vertical integration. Several feeders may purchase or build a slaughtering plant

near the source of supply or conversely, packers may locate feedlot facilities near slaughter plants.

Coordination over space depends on how concentrated cattle feeding is in a given area surrounding a slaughtering plant. Where commercial cattle feeding has expanded and attracted new plants, spatial coordination is of minor importance. However, in areas where older plants procure cattle from areas of declining relative importance in cattle feeding the problem has increased. Spatial coordination becomes more difficult when low profitability in feeding forces a reduction in fed cattle supplies and results in widening the procurement area.

Time--Coordination over time may be more difficult than over space. The coordination task increases as feedlot utilization levels decline, as additional packers enter an area, and as the proportion of farm feeders increases. The importance of temporal coordination has been alluded to earlier. Newer plants are larger, more specialized, and require large amounts of investment and operating capital. For maximum efficiency, such plants require high utilization levels. That becomes especially important considering the importance of the labor component in total costs. As mentioned earlier, labor comprised 50 to 70 percent of total costs in model plants and most meat packing firms operate under a 36-hour labor agreement, meaning that employees are guaranteed 36 hours of pay per week regardless whether or not cattle are killed during that period. Having cattle ready to enter the kill line early Monday morning and maintaining a constant flow throughout the week, including late Friday afternoon, requires planning of procurement and delivery.

High utilization levels are especially important for commercial feedlots and large packers. In areas dominated by commercial lots, when feedlot utilization level is high, the temporal coordination task for packers in that market area is easier. As utilization levels decline, the task for packers increases somewhat, and becomes more difficult when slaughter capacity closely matches feeding capacity in a given area. As available supplies decline, there tends to be excess slaughter capacity and the temporal coordination task increases. Generally, it increases when a new plant begins slaughtering in a given area and all plants compete for the same level of supply. In areas dominated by farm feedlots, coordination over time becomes more difficult because cattle are assembled from smaller feeding operations in more widely dispersed locations. Also, as noted earlier, farm feeders have less pressure to maintain high utilization levels year-round and market cattle in more seasonal patterns than commercial lots.

Stockyards facilities of terminal markets enable holding cattle one or more days, aiding packers to coordinate procurement and delivery of cattle for slaughter within a single week. Packers purchasing cattle from public auctions have less opportunity to coordinate procurement and slaughter because auctions are usually conducted only once or twice per week, have fewer facilities for holding cattle beyond a single day, and normally handle a smaller volume per sale. Direct procurement methods facilitate temporal coordination because packers initiate procurement and influence the marketing decision, rather than relying on producers' reaction to market prices. Feeders which have cattle ready for slaughter can be contacted and an offer extended; whereas with public

markets, producers first make the decision to sell, then packers react by bidding for them. Packers also purchase cattle from commercial lots and coordinate delivery over the next 7 days (26).

Forward contracts offer the opportunity for packers to specify delivery time in advance and arrange cattle deliveries to mesh with purchases from other procurement methods. Vertical integration offers even greater opportunities. It may require a relatively low percentage of total annual slaughter volume in a given plant to significantly improve temporal coordination, especially near the beginning and end of work shifts and during slack periods within some weeks.

Quantity--Coordinating quantities of cattle marketed varies by location and type of feeding, time (within and between years), and procurement method. The importance of coordinating the quantity of cattle moving from feedlots to packers has been discussed implicitly. Utilization levels and the labor component of total costs requires that the proper quantity of cattle be available for slaughter at the correct time and place. Total fed cattle supplies depend on several factors, including; feeder cattle prices, pasture conditions, season of the year, and price of grain, among other factors. Quantity coordination in an aggregate sense depends on total fed cattle supply and becomes less problematic as supply increases. Except via vertical integration, packers can do little to control aggregate supply.

In a micro sense, quantity coordination influences procurement and transportation costs. Terminal markets perform an assembly function and though cattle may be sold in less than truckload lots (approximately

40,000 pounds), they are assembled into truckload lots for delivery to packing plants. Similarly, public auctions receive and sell cattle in less than truckload lots but buyers assemble them into larger lots for shipment to slaughter plants.

Direct procurement improves quantity coordination in areas dominated by commercial feedlots, but not in predominately farm feeding areas. Farm feedlots often feed and market less than truckload size lots over a relatively short time period. Procuring cattle directly from farm feeders means purchasing in smaller lots and transporting cattle in smaller trucks or less than truckload size lots. Total transportation costs are increased and plants require additional facilities for handling more trucks of varying sizes. Procurement costs are higher to purchase an equal quantity of cattle from farm feedlots relative to direct procurement from commercial lots. Commercial cattle feeders feed cattle in yard lots of 100 to 200 head and market entire yard lots at a single time. Consequently, a buyer is able to purchase 2 to 5 truckload lots at one time from a single feedlot. To purchase a comparable number from farm feedlots may require phoning or visiting twice as many feedlots or more. Packers sometimes purchase several yard lots of cattle from commercial lots at one time as mentioned earlier, arranging delivery over a several day period.

Forward contracts improve quantity coordination because contracts specify a minimum quantity of cattle (usually 40,000 pounds), guaranteeing that each contract is equivalent to one truckload of cattle. Vertical integration enables the highest level of quantity coordination because truckload lot deliveries are more nearly assured

and total cattle supply above some level for a given plant, a marginal concept, can be controlled somewhat. Thus, vertically integrated firms can maintain their feedlots at full capacity and offset to some degree a decline in feeding in the plant procurement area.

Quality--Here, quality is discussed from the viewpoint of cattle performance, producing meat which matches consumer demands. Purcell found that feeders gave nearly equal importance to quality grade and dressing percentage with yield grade or cutability ranked a weak third (23). Packers ranked quality grade first, dressing percentage second, and yield grade or cutability a weak third. Feeders in Kansas and Nebraska ranked the 3 criteria in the same order; dressing percentage, quality grade, and yield grade (28).

A high level of agreement may imply a high level of coordination; however, potential conflicts are concealed. Dressing percentage is directly affected by live weight and feeders and packers may disagree on pencil shrink and degree of finish or fat. A higher pencil shrink by packers raises the dressing percentage but reduces sales weight, and feeders are paid on the basis of live weight. Feeders put more finish or fat on cattle to produce higher dressing percentages and add weight, but it does not proportionately increase the yield of saleable beef per carcass for packers.

Public markets facilitate quality coordination only in the sense that they assemble cattle, allowing buyers to visually inspect cattle at a single place and bid on those which most nearly match their demands. Direct marketing potentially improves quality coordination because it

facilitates a higher level of information exchange between buyers and sellers. Forward contracts specify minimum quality and yield grade requirements and those which price on carcass weight and grade ensure a given quality level or specify some reduction in purchase price. Vertical integration enables the highest level of quality coordination because cattle can be fed to specifications of the packer.

Information exchange--Improvement in vertical coordination depends to some extent on the type and amount of data and ability to analyze and interpret data. Resulting information aids exchange participants to individually estimate product value and jointly determine a price which accurately reflects buyers' demands. Rhodes cites interpretation of information as a more important problem than quantity or quality of information (26). Commercial feeders probably spend proportionately less but absolutely more resources to acquire national market information than farm feeders. Packers probably spend proportionately less but absolutely more than commercial feeders and have greater analytical capability to interpret that information. Packers have access to at least as good or better information in their relevant procurement area than feeders and can interpret national information in light of local information.

Terminal markets physically assemble cattle, enabling buyers to make a visual inspection and appraisal of value; similarly for auction markets. Auction markets and terminal market pricing by the auction method allow public bidding and public announcement of price for each transaction. Beyond that, packers know the quantity and weight of

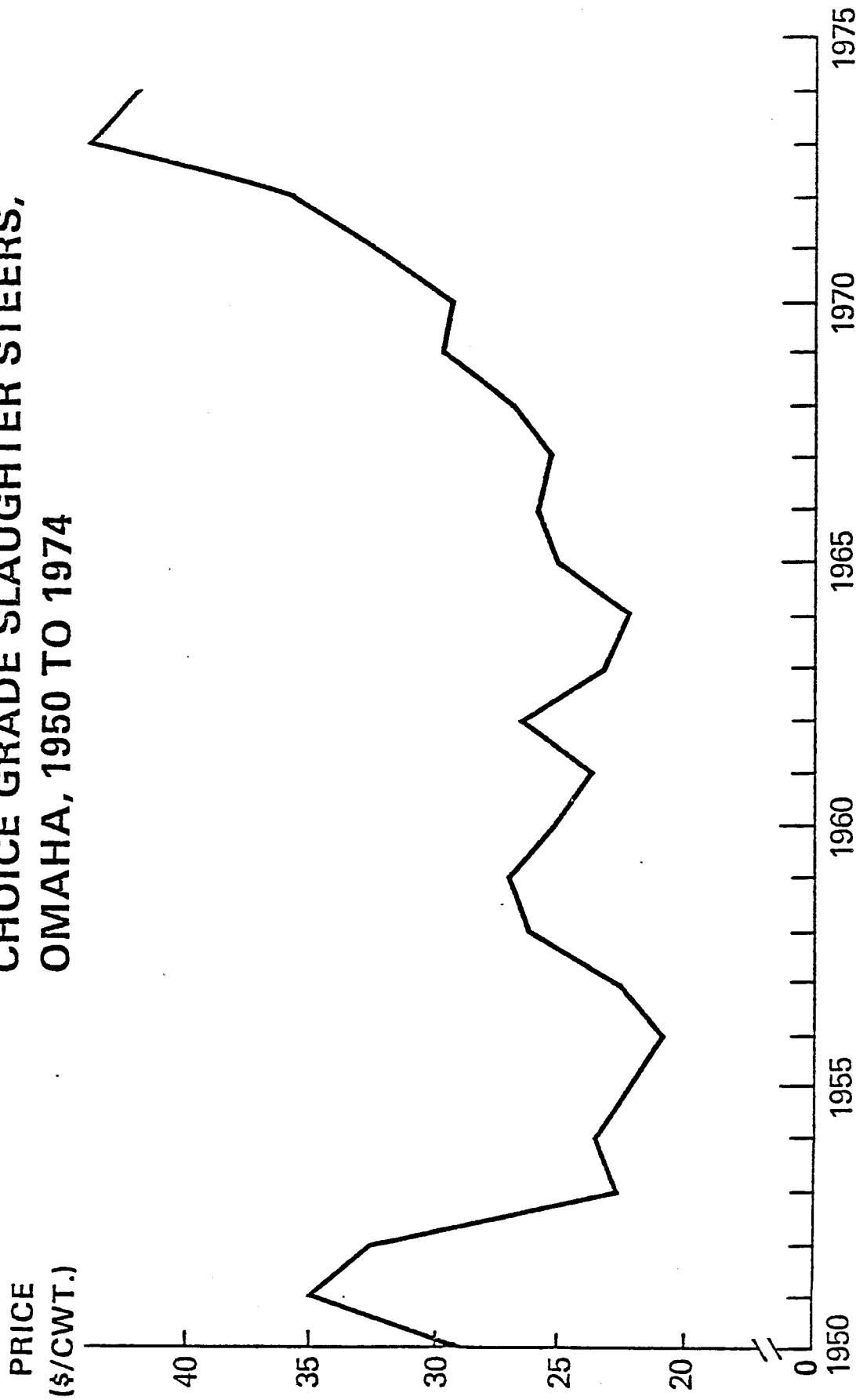
cattle and visually estimate cattle quality. Direct marketing methods yield less information on past transactions because prices and volumes are not publicly announced, but more information probably flows between buyer and seller for individual transactions. Besides quantity, an estimate of weight, and an estimate of quality; participants exchange information on source of cattle, rations fed, length of time on feed, age, and other factors. Similar information may be exchanged in negotiating forward contracts. Even more information is available in a vertically integrated arrangement, where the integrating firm controls production through the entire feeding process.

It is assumed that an unequal distribution of information and ability to analyze and interpret information benefits the firm with access to more and better interpreted information. In this case, how much packers presumably benefit relative to feeders is unknown.

Price--Market prices are theorized as the optimal method of vertical coordination under given conditions. Other vertical coordination systems are required because conditions under which prices theoretically function are absent in reality and because they perform their prescribed functions suboptimally.

Slaughter cattle prices exhibit a cyclical movement over time though cycles vary in magnitude and duration (figure 1). Purcell found that slaughter cattle prices trended upward between 1959 and 1973 (figure 2) (22). He also found that prices reached seasonal highs in late spring and summer, and seasonal lows in late fall and early winter. Trend and seasonality explained 55 percent of price variability of monthly average

**Fig. 1 -- ANNUAL AVERAGE PRICES FOR
CHOICE GRADE SLAUGHTER STEERS,
OMAHA, 1950 TO 1974**



SOURCE: ECONOMIC RESEARCH SERVICE, USDA, LIVESTOCK AND MEAT STATISTICS, STATISTICAL BULLETIN 522, JULY 1973 AND ANNUAL SUPPLEMENTS.

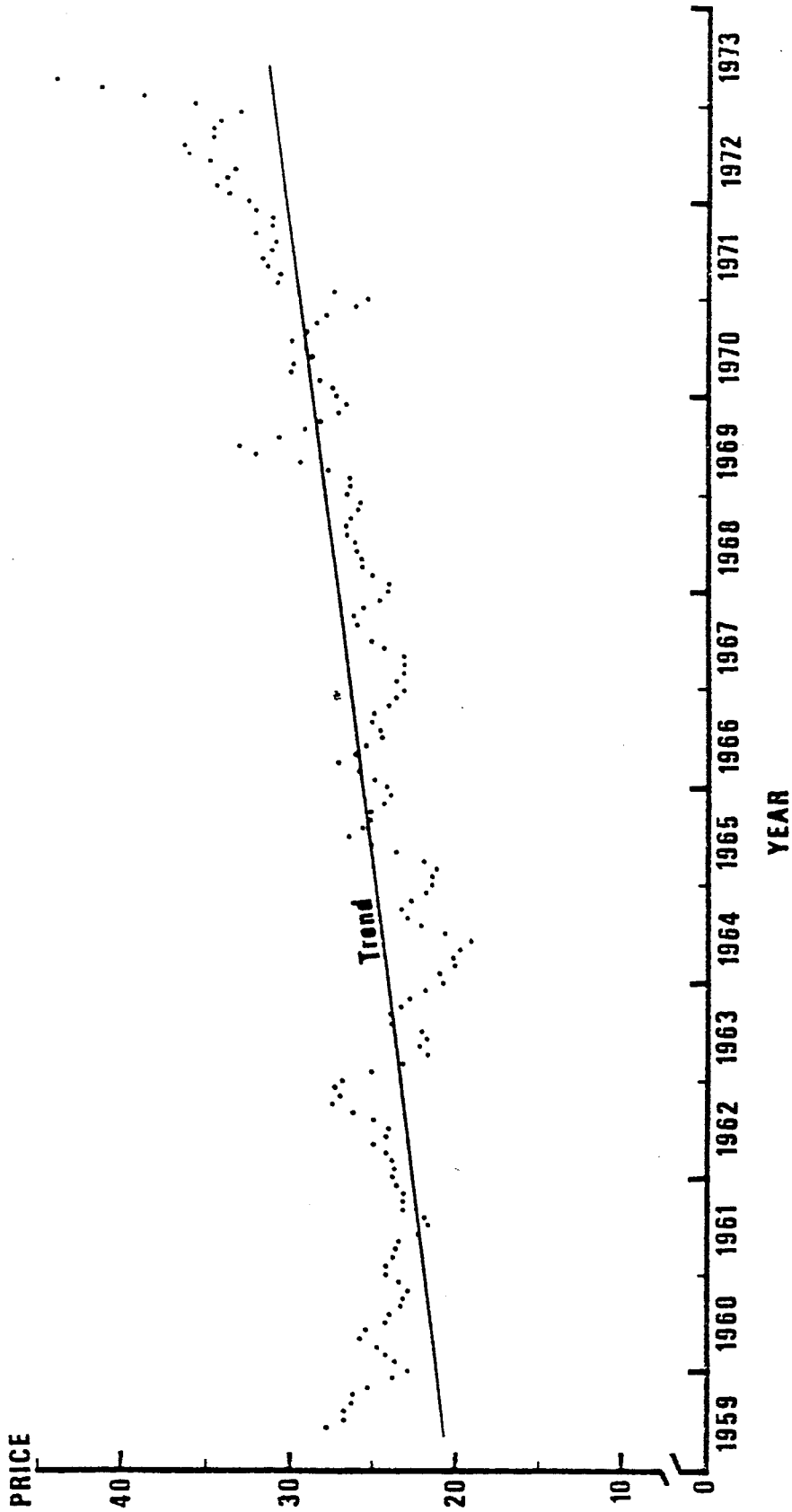


Figure 2 --Variation and Trend in Price of Slaughter Steers, Kansas City, May 1959-March 1973 (Choice Slaughter Steers). Source: USDA, Livestock and Meat Statistics.

(Reprinted from, J.C. Purcell and J.C. Elrod, Price Related Risk in the Cattle-Beef Sector, University of Georgia, Department of Agricultural Economics, Research Report 182, January 1974. Figure 3, p. 5.)

prices over the 1959 to 1973 period. Purcell analyzed Kansas City price quotations and at that market and over that period, most slaughter cattle originated from farm feedlots. An analysis of prices based on transactions between commercial feeders and packers might exhibit less seasonality and combined with trend, explain less price variance. In a shorter run sense, daily and weekly price variability is greater than monthly or annual prices. Since 1972, daily and weekly prices seem to have fluctuated more widely than prior to that time, though some argue the increased variability is in absolute rather than relative terms. A comprehensive analysis of price variability has not been found.

Price determination for fed cattle usually is by private negotiation, auction, or formula; and based on live weight or carcass weight and grade (carcass grade and yield). Commission firms, both at terminal markets and in the country, determine price by private negotiation and most transactions are based on live weight, though some are on carcass weight and grade. Public auction markets and some terminal markets operating auctions use auction pricing and base sales almost exclusively on live weight. Order buyers, packer buyers, and dealers use private negotiation pricing. Packer and order buyers base a higher percentage of their transactions and sales volume on carcass weight and grade. The proportion of cattle purchased by the 10 major packers on a carcass weight and grade basis increased from 8.2 percent in 1963 to 29.9 percent in 1974 (21). Carcass weight and grade selling varies by states, tending to parallel the shift towards direct procurement (table 15). Rhodes notes that much of the volume of carcass weight and grade purchases by packers occurs during short periods of

Table 15--Percentage of steers and heifers purchased by packers on carcass grade and weight and change in percentage, 23 states, 1969 and 1974

State	Percentage of steer and heifer purchases		Change
	1969	1974	
Arizona	1.0	4.2	3.2
California	4.9	7.1	2.2
Colorado	19.1	40.3	21.2
Idaho	11.6	10.2	-1.4
Illinois	9.1	6.5	-2.6
Indiana	6.5	3.7	-2.8
Iowa	39.8	39.7	-0.1
Kansas	17.4	24.9	7.5
Michigan	14.0	2.9	-11.1
Minnesota	33.2	40.5	7.3
Missouri	13.8	11.2	-2.6
Montana	9.2	26.5	17.3
Nebraska	32.9	29.8	-3.1
New Mexico	10.8	2.7	-8.1
North Dakota	0.8	12.4	11.6
Ohio	19.5	9.0	-10.5
Oklahoma	8.2	2.0	-6.2
Oregon	24.7	36.2	11.5
Pennsylvania	3.0	15.0	12.0
South Dakota	24.9	36.9	12.0
Texas	10.4	7.1	-3.3
Washington	5.0	18.2	13.2
Wisconsin	13.3	14.2	0.9
Total 23 states	20.8	23.2	2.4
Total other states	13.2	9.8	-3.4
Total U.S.	20.1	22.3	2.2

Source: Packers and Stockyards Administration, U.S.D.A., Packers and Stockyards Resumé, December 1970 and 1975.

sharply declining prices (26).

Pricing in forward contracts is either by private negotiation or a negotiated formula. Contracts either specify a given sale price, tie price to a futures market or future spot market price, or detail a formula to determine price; and most are based on carcass grade and weight. In a vertically integrated system there is no market or sale price per se, only a transfer or accounting price.

An analysis of pricing method competitiveness is influenced by conditions under which the method functions. Intuitively, auction pricing, where several potential buyers bid for livestock in an organized manner, is more competitive. However, the intuitive appeal of auction pricing competitiveness is dampened when public auctions are observed having only two or a few prospective buyers present for low volume sales. Attendance at some local auctions leaves the uncomfortable impression that there are prearranged bidding procedures among the two or few buyers. Johnson, among others, points out the appeal of a national teletype exchange system or regional/local telephone auction system in terms of competitiveness (12). Considering the manner in which auction pricing operates in many areas, private negotiation pricing is more appealing than auction pricing in its traditional form. In private negotiation pricing, potentially more information is exchanged between buyers and sellers. In feeding areas dominated by farm feedlots, only one or two buyers may visit each lot, reducing the potential competitiveness of private negotiation pricing. In commercial feeding areas, several buyers regularly visit each lot. There, private negotiation as a competitive pricing method has more

appeal, though again prearranged buying strategies among packers are possible. Another appealing feature of auction pricing is that prices and bidding are conducted publicly, aiding the exchange of important prior transaction information. Whether pricing is by private negotiation or auction, the high level of concentration within States may be a problem. Many feeders may only have one or two buyers available to bid on cattle, despite the number and type of markets and marketing agencies.

Pricing accuracy of alternative pricing methods is difficult, but studies have estimated pricing accuracy of live weight versus carcass weight and grade selling (24, 27, 31). Studies found carcass weight and grade pricing superior to live weight pricing from the standpoint of accurately reflecting value differences based on wholesale prices. Other studies, however, indicate the variability in carcass weight and grade selling procedures (25). Variability in such sales may explain why a higher percentage of slaughter cattle are not sold by a method considered to be superior.

Risk and control--Rapidly changing prices increase price risk, especially during periods of rising costs, narrow margins, and higher debt to equity ratios. While shifts toward direct marketing methods may have reduced volume instability, characteristic of public markets, it has not reduced price instability (26). Public markets do little to reduce price risk for feeders. Direct marketing does little also, but does improve feeders bargaining position because sales are consummated prior to moving cattle from feedlots. Rhodes believes packers have

greater control over the timing of sales and over daily slaughter than daily prices when procurement is by direct versus public market methods (26).

Forward contracts, futures market contracts, and to some extent vertical integration enable reducing some price risk for feeders and packers. Forward contracts specifying a sales price are a hedge for feeders against declining prices but restricts their opportunity to benefit from prices rising above the contract ceiling. For packers, such contracts protect them from rising prices but limits them from procuring the same cattle at prices below the contract floor when prices decline. Thus, for each contracting party, the hedge is against a unidirectional movement in price. Increased uncertainty of price movements, direction and magnitude, may explain the less than expected popularity in forward contracts with sale price quoted in them. Forward contracts tied to a future spot market price do not reduce price risk. Formula prices in forward contracts usually are linked to some future price and do little to reduce price risk. Contracts linking spot price with futures market prices enable feeders to place a futures market hedge through a packer rather than a broker. Nearly all forward contracts transfer some control from feeders to packers, control over quantity, quality, and timing; but as noted above, may not transfer a commensurate reduction in price risk.

A survey of Kansas and Nebraska feeders indicated that between 1967 and 1971, 17.9 percent of Kansas feeders and 20.9 percent of Nebraska feeders responding to the survey hedged cattle (28). A higher percentage of commercial feeders in each State hedged cattle with

futures market contracts than farm feeders. Of the same respondents, 35.9 percent and 31.7 percent of Kansas and Nebraska feeders, respectively, believed futures markets were useful in establishing cattle prices. In 1973, Leuthold found that 2.0 percent of Illinois cattlemen responding to his survey had traded live cattle futures market contracts (13). He found that among the 82.5 percent of respondents which never traded futures market contracts, the primary reason was inadequate knowledge of how futures markets operate. Other responses included: in order of frequency; farming operation was too small, lack of interest in contracting or forward pricing, insufficient time to follow the futures market, inadequate level of capital, and futures markets were too risky.

Vertical integration may reduce some degree of price risk if the firm is considered to be a single profit center because firms spread risk over 2 or more stages. Where each activity is a profit center, vertical integration may do little to reduce price risk.

Traditionally, producers control such marketing decisions as; quantity, quality, weight, and timing of sales. With public markets, feeders retain those decisions but with direct methods some control shifts to packers. Packers were found to conduct as much as one-half of a week's transactions in a single day in the Texas High Plains (26). Thus, packers controlled the timing and volume of sales, though control may be less evident in areas dominated by farm feedlots. Similarly, packers may control whether sales are on live weight or carcass weight and grade basis by simply purchasing on a single basis at a given time. Considering the transfer of control they may be largely responsible for

the sharp shift towards direct procurement. As noted, forward contracts limit feeders' control over marketing decisions at the time cattle are ready for market because quantity, quality, timing, and delivery provisions are specified in the contract. However, the initial decision whether or not to enter into a forward contract remains with feeders. By definition, vertical integration centralizes control over all activities at 2 or more stages into a single firm.

Costs and financing--Marketing charges to producers for all markets and agencies in the U.S. and for all livestock species were \$3.20 in 1966, and by marketing method were: terminal markets, \$3.13; public auctions, \$2.45; and dealers, \$6.24 (1). In 1974, revenue per marketing unit for all livestock was \$3.50 for terminal markets, ranging from \$2.75 in Arkansas to \$5.05 in Indiana; and \$3.88 for public auctions, ranging from \$2.52 in Wyoming to \$6.74 in Louisiana (21). Johnson estimated direct or out-of-pocket costs to sellers, consisting of commission and yardage charges; direct buying costs, consisting of maintaining buyers; and indirect costs, including transportation costs and yield and killing efficiency differences (12). Results showed highest total marketing costs for terminal markets, followed by public auctions, direct marketing (order buyers purchasing cattle from feedlots for packers), and country commission firms. Forward contracting costs most nearly coincide with direct marketing as used by Johnson. Based on that study, the physical efficiency of marketing fed cattle has risen with the shift toward direct marketing methods. Marketing costs were estimated by Johnson to be least for a national teletype marketing

system, followed closely by telephone auction systems (12). However, he did not consider vertical integration where marketing costs probably are even less.

Eliminating costs of vertically integrating two or more stages, forward contracts and futures market contracts are the only vertical coordination methods which affect financing. Forward contracts which include an advance payment, provide feeders with two payments, though the level of payment is unlikely to affect his operation significantly. Futures market contracts aid feeders from the standpoint of enabling them to more easily obtain credit from some sources.

Ability and willingness to change and adjust--Some cattle feeding, meat packing, and intermediary marketing firms have adjusted to changing conditions, while others have changed comparatively little over time. All groups influence coordination and overall efficiency of the subsector system. A glance at public market operations reveals few changes over time, implying that cattle feeding, meat packing, and direct marketing firms more rapidly adjust to changing conditions. Of those three groups, cattle feeding and meat packing firms generally are thought to have the most influence. Considering the discussion of control, packers may have the greatest influence. Adjustments by direct marketing firms, especially order buying firms, probably lagged feeders and packers.

Though some firms have the ability to change, they may lack the willingness, which is influenced by institutional rigidities and limitations. Public auctions may be in a better position than other

firms to develop and implement electronic exchange systems, especially cooperatives which have the legislative basis to form marketing agencies in common. Potentially they could implement regional telephone or teletype exchange systems for slaughter cattle but lack the required member commitment. Meat packers probably have the resources required to greatly expand vertically integrated arrangements but may be unwilling to pursue that strategy because of public pressures.

Summary and Conclusions

In summary, major changes in cattle feeding and slaughtering include: (1) increased concentration; (2) more ownership and control by nonfarm/nonagricultural firms; (3) increased dependance on nonfarm/nonagricultural financing; and (4) greater reliance on direct marketing/procurement and private negotiation pricing. Probably, the combined effect on vertical coordination is positive in an aggregate sense and especially in commercial feeding areas, but that is difficult to evaluate.

Direct marketing/procurement seems to improve quantity and quality coordination over time and space, physical efficiency, and pricing accuracy, in that more sales are based on carcass weight and grade. However, its positive benefits are more evident in commercial rather than farm feeding areas, and it raises many questions.

The competitiveness of direct marketing and private negotiation pricing is a concern, especially in farm feeding areas. Direct marketing has a positive effect on information exchange per each negotiated transaction but less price information becomes public. Price

and nonprice information are analyzed and translated into price information; meaning that an unequal distribution of information benefits the party with the most effective information system, meat packers in this case. That gives them a bargaining advantage in private negotiation pricing. In addition, if private negotiation pricing relies on price quotations from public markets where volume is declining, then larger numbers of cattle are priced on the basis of a smaller number of cattle. Control over some marketing decisions shifts toward packers in direct marketing, without a commensurate shift in price risk.

Therefore, positive benefits of direct marketing are offset by concerns over market access and competitiveness, distribution of information and bargaining power, and transfer of control without transferring risk.

Though feeder-packer integration has evolved less rapidly than anticipated, it and development of coordinated agribusiness systems could expand rapidly. Effects on price when a given volume bypasses the market price system are unclear but important if integrated/coordinated agribusiness systems continue to evolve.

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Appendix A
Slaughter Cattle Sales Contract

AGREEMENT made this _____ day of _____, 19____, between _____ of _____ (hereafter referred to as Seller) and _____ of _____ (hereafter referred to as Buyer), witnesseth:

1. QUANTITY: Seller hereby agrees to sell and deliver and Buyer agrees to buy and receive _____ pounds of live cattle (the equivalent of _____ units of 40,000 lbs. each), based on gross delivered weight at _____ less ____% shrink, or the equivalent thereof, producing a net delivered weight.
2. QUANTITY VARIATION: In the event of variation in quantity delivered, Seller has the option of adding to or subtracting from the number of delivered in order to bring the net delivered weight to 40,000 lbs. per unit, or Seller may instruct Buyer to adjust the amount of total payment to the extent that the variation in delivered pounds will be multiplied by the price differential between the contract price and the Buyer's prevailing prices for these weights and grades in effect at time of delivery. However, no variation beyond 2,000 lbs. per unit will be permitted.
3. DESCRIPTION AND PRICE: Cattle shall be described and priced as follows:

Steers weighing between 1,000 and 1,200 lbs. live weight at a price of \$ _____ per live cwt. When the live price is divided by the equivalent dressed price is \$ _____ per cwt. for dressed beef carcasses weighing 612 to 816 lbs. (hot weight).

Heifers weighing between 900 and 1,050 lbs. live weight at a price of \$ _____ per live cwt. When the live price is divided by the par dressing percent of 62.75%, based on hot carcass weight, the equivalent dressed price is \$ _____ per cwt. for dressed beef carcasses weighing 510 to 714 lbs. (hot weight).

4. GRADE REQUIREMENTS: All cattle shall be U.S.D.A. quality graded and shall consist of 80% Choice, balance Top Good.

All cattle shall be U.S.D.A. yield graded and shall consist of 80% Yield Grade 3, balance yield grade 4. Additional Yield Grade 3 carcasses shall be priced in accordance with the par dressed price, and additional Yield Grade 4 carcasses shall be priced at \$2.00 per dressed cwt. under the Yield Grade 3 price. Yield Grade 1 and 2 carcasses shall be priced at \$1.00 per dressed cwt. over the Yield Grade 3 price. Yield Grade 5 carcasses shall be priced at \$5.00 per dressed cwt. under the Yield Grade 3 price.

All carcasses shall be free of yellow fat, excessive bruise or grub damage, or other abnormalities. In the event that more than 10% of

the cattle produce carcasses damaged by grubs or bruises, all damaged carcasses above and beyond the allowable 10% shall be reduced in price by \$2,00 per dressed cwt.

Cattle with a higher dressing percent or higher grade than herein provided, or cattle not meeting dressing percent, weight, or grade specifications will be priced in accordance with Buyer's prevailing price differentials for these weights, and grades in effect at the time of delivery.

5. DELIVERY DATE AND LOCATION: Said cattle are, or will be, located at _____ in _____ County, State of _____. Said cattle are to be delivered by Seller at _____ on the day specified by Buyer during the week commencing _____, 19____, in good and merchantable condition and suitable for immediate slaughter to produce meat for human consumption. Title to said cattle shall pass to Buyer upon delivery. By mutual agreement of Buyer and Seller, the delivery date may be changed to the week prior to or the week following the date specified herein. Any further variation in delivery date shall be subject to the provisions of Section 9 below.
6. CREDIT REQUIREMENTS: Seller agrees to furnish Buyer necessary credit information and documentation, and upon approval by Buyer's Credit Department, Buyer agrees to pay Seller \$1,000 per 40,000 lbs. unit as part payment for said cattle. In the event that Buyer's Credit Department fails to approve this contract within 20 days from the date of this contract, Seller or Buyer shall have the right, at its option, to cancel this contract upon written notice to the other party, provided that this notice is mailed or delivered within 30 days of the date of this contract.
7. FINAL PAYMENT: Buyer agrees to pay Seller the balance of the purchase price for said cattle before the close of the next business day following delivery and determination of the amount of the purchase price.
8. LIENS, SECURITY INTEREST: Said cattle are, on the date hereof, subject to a lien, security interest, or chattel mortgage, in the amount of \$_____ in favor of _____, Seller represents and warrants that he will obtain the release of all liens, security interest, and chattel mortgages on said cattle prior to final payment therefor and will submit proof thereof to Buyer. In the event Seller fails to submit proof of such release, final payment for said cattle will be made jointly to Seller and lien holder.
9. BREACH OF CONTRACT: Upon Seller's failure for any reason whatever, to deliver to Buyer all cattle purchased hereunder as herein required, Seller shall promptly refund to Buyer all money advanced on such undelivered cattle and shall also be liable to Buyer in the amount by which the prevailing market price on the date such cattle should have been delivered exceeds the contract price for such undelivered cattle. Seller shall reimburse Buyer for its reasonable expenses incurred in the collection of damages herein provided.

10. ENTIRE AGREEMENT: This contract contains the entire agreement between Buyer and Seller and cannot be varied orally. It shall be binding on the respective heirs, successors and assigns of the parties.

IN WITNESS WHEREOF, the parties have executed this agreement on the date first above written.

By _____
Seller

By _____
Buyer