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Minnesota


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Notes

DECENTRALIZATION IN THE LIVESTOCK SLAUGHTER INDUSTRY

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Most people imagine a livestock slaughter plant as a place where cattle, calves, sheep, and hogs from a nearby terminal market are driven in at one end and ham, sausage, steaks, leather, and glue come out the other.

While this image remains descriptive, recent trends have made it less accurate than before. To an increasing degree, the new picture is a slaughter plant near a small town where cattle or hogs are unloaded from a truck into a chute on one end of the plant. A few hours later, carcasses are loaded onto a refrigerated van from the opposite end.

Two important characteristics are involved in this changing image. One is the reorientation in **location** of slaughter plants—away from centralized market centers to concentrated livestock production areas. The other is a reorientation in the industry's **economic organization**. This situation includes the changing relative importance of (1) large meatpacking firms, (2) slaughtering of all livestock species in each plant, and (3) slaughtering and processing in a complete operation.

This issue of "Minnesota Farm Business Notes" describes and explains the changing economic organization of the livestock slaughter industry.¹ A subsequent issue will describe the industry's changing locational orientation.

Data used here came from a study of all federally inspected (FI) meatpacking firms operating between 1950-62.² This data included all plants and firms which met federal health and sanitation standards for interstate meat shipment. In 1962, these plants accounted for approximately 77 percent of the cattle slaughtered, 66 percent of calves, 84 percent of sheep, and 85 percent of hogs. The FI sector includes a growing proportion of the industry. Therefore, conclusions in this article have general applicability, even though non-FI firms may be subject to slightly different forces.

Economic Organization

The slaughter industry has changed in two economic dimensions:

- The **functional** organization of the industry—the way that various processes involved are organized within and among packing plants.
- The **size** distribution of firms.

FUNCTIONAL ORGANIZATION

Two characteristics of functional structure in the livestock slaughter in-

dustry are: (1) **horizontal organization**—the number of different livestock species slaughtered, and (2) **vertical organization**—the number of different meatpacking processes performed.

The fully centralized slaughter plant slaughters all livestock species and completely processes all meat products. The fully decentralized plant slaughters a single livestock species and conducts no further processing. Since 1950, there has been decentralization in both the vertical and horizontal dimensions.

Specialization in Species and Processes

Livestock slaughter plants have become increasingly specialized in the slaughter of a single livestock species (table 1). So, there has been a tendency toward horizontal decentralization.

In 1950, 175 FI plants slaughtered all four major livestock species. But by

1962, there were only 84 such plants. During the same time, the number of plants slaughtering only one species increased—from only 73 to 193.

Most of these new single-species plants are specialized cattle plants. The growth in beef production relative to pork and lamb partially explains this unequal change. In 1950, only 34 plants specialized in cattle slaughter; by 1962, there were 127. The number of specialized hog plants has also increased—from 37 to 60.

Over the 1950-62 period, specialization did not progress at the same rate in cattle as in hog slaughter. In each 4-year period between 1950 and 1962, about 30 additional specialized cattle plants appeared. However, most of the increase in specialized hog slaughter plants came after 1958. This increase was largely due to a reorientation in function and location of plants rather than expansion in total output.

In addition to a growing number of single-species plants, the number of two-species specialized plants has also increased greatly (table 1). Like the one-species plant, almost all of these plants slaughter cattle. Virtually all horizontal specialization is associated with cattle or hog slaughter.

In addition to the trend toward species specialization, plants have also become more specialized in the vertical dimension. Rather than engaging in both slaughter and processing, they are specializing in just **one** function. Only 1961 data were available for meat processing by FI plants (table 2). This data did not show a time trend in slaughter-processing specialization. But a trend toward slaughter specialization began before 1961 and continues.

In 1961, only 49 FI slaughter plants did not do any meat processing (table 2). But a rather high proportion of the slaughter plants were doing only limited processing. Half of the slaughter plants engaged in meat processing activity processed only an average of 14 percent of their production.

These limited operations tended to consist of some boning, carcass breaking, and other **fresh meat** operations. Specialization in meat processing—curing, smoking, and fabricating—appears to be greater than in slaughtering; 65 percent of the processing plants performed no slaughter operations.

Why Functional Specialization

This trend toward increasing specialization differs from what is occurring in many other agricultural processing industries. For example, the dairy industry is becoming increasingly centralized and integrated. Why is

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¹ This study is contributed to Phase 6, North Central Regional Marketing Project 25.

² Anthony, W. E., *Structural Characteristics of the Federally Inspected Livestock Slaughter Industry*, ERS, USDA, Agr. Econ. Rept. 83, Aug. 1965.

Table 1. Horizontal FI slaughter plant specialization by species slaughtered, West North Central States and United States, 1950, 1954, 1958, and 1962

Year	Species slaughtered														Number of species slaughtered				
	Cattle		Calves	Sheep	Hogs	Cattle, calves, sheep, hogs	Cattle, calves, sheep	Cattle, calves, hogs	Cattle, sheep, hogs	Cattle, calves	Cattle, sheep	Cattle, hogs	Calves, sheep	Calves, hogs	Sheep, hogs	1	2	3	4
	Calves	Sheep																	
.....number of plants.....																			
West North Central States																			
1950	17	0	0	9	37	1	8	1	0	13	0	3	0	0	0	26	16	10	37
1954	27	0	0	10	32	3	7	1	0	7	0	6	0	0	0	37	13	11	32
1958	39	0	0	10	26	1	2	2	0	6	1	11	0	0	0	49	18	5	26
1962	53	0	0	14	14	1	4	5	0	5	4	22	0	0	1	67	32	10	14
United States																			
1950	34	2	0	37	175	68	55	3	2	49	5	21	4	1	1	73	81	128	175
1954	64	2	2	41	143	66	56	6	1	68	1	25	2	1	1	109	98	129	143
1958	97	4	1	43	127	69	48	8	2	70	5	34	2	0	1	145	112	127	127
1962	127	3	3	60	84	71	42	22	1	77	16	52	7	0	2	193	154	136	84

functional decentralization occurring? The answer is not simple.

Increased specialization by species has resulted from changing patterns of livestock production, changing marketing channels, and developments in slaughter plant technology. These factors have been coupled with a transportation and freight rate structure facilitating functional reorganization.

In recent years, geographic specialization in livestock production has increased. This trend has been particularly apparent in beef cattle production and, to some extent, in hog production. However, the relative geographic specialization has not been the same for all species.

Consequently, if a new slaughter plant is built in a cattle feeding area, other livestock species must be shipped

Table 2. Vertical FI slaughter plant specialization by slaughter and processing, West North Central States and United States, 1961

	West North Central States	United States
Slaughter plants:		
Total number	116	570
Number not processing	16	49
Percent plants not processing	14	9
Percent slaughter in specialized plants	4	4
Slaughter-processing plants:		
Processing under 50% slaughter:		
Number	50	283
Percent plants	43	50
Average percent processed	8	14
Processing 50-100% slaughter:		
Number	15	57
Percent plants	13	10
Average percent processed	80	73
Processing over 100% slaughter:		
Number	35	181
Percent plants	30	32
Average percent processed	323	333
Processing plants:		
Total number	183	1,483
Number not slaughtering	83	962
Percent not slaughtering	45	65

in from some distance or the plant must be specialized. To avoid long distance shipping and a high transportation bill, slaughter plants near specialized cattle feeding areas tend to specialize in cattle slaughter if production costs do not offset procurement economies. A similar pattern tends to develop in hog slaughter plants if there are no diseconomies of specialization.

Important developments in technology have allowed production specialization to develop. On-the-rail dressing, mechanical knives, and efficient refrigeration permit relatively small plants to operate efficiently. Therefore, it is possible to take advantage of procurement savings in species specialization over a relatively small geographic area.

While these considerations would explain plant specialization with a completely specialized pattern of livestock production, the pace of plant specialization has been faster than the pace of production specialization. Other factors explain this increase.

The trend toward specialization has been from a pattern of highly diversified plants. One factor contributing to the early construction of diversified terminal plants was that a large proportion of all species of livestock was marketed at terminals. Since no particular disadvantage existed in slaughtering all species under one roof, plants were horizontally diversified to slaughter all species at the terminal.

As livestock production has shifted to new areas, and as producers have become larger and more specialized, terminal marketing has relatively declined. When all species are not assembled in one spot, there is no advantage in assembling all species solely for slaughter. In fact, unless all species are equally produced in an area, disadvantages may result from excessive transportation costs. So new nonterm-

inal plants have specialized in one or two livestock species.

The trend toward specialization in slaughtering and processing has been due partly to another set of factors. Apparently, no particular cost advantage results from slaughtering and processing under the same roof. But some advantage exists in processing in and around consumption areas (often near large cities) rather than production areas because:

1. Product differentiation is important in processed meat, so it is often advantageous to cultivate the "hometown" atmosphere in processing.

2. Many processing firms, by limiting sales to a restricted metropolitan area, can operate on a nonfederally inspected basis.

3. Service to retail stores may be provided more effectively when located near consumption points due to communications and merchandising programs.

4. Many "old" plants, formerly used for slaughter and processing, can be maintained for meat processing.

As long as the economic factors affecting the location of slaughter relative to processing are different, the specialization trend probably will continue.

DECENTRALIZATION OF SIZE STRUCTURE

Size structure refers to the degree that a small proportion of slaughter firms dominates the output of an entire industry. It tends to indicate the competitive potential of an industry. For example, an industry controlled by a small number of large firms is more likely to exhibit collusion and non-competitive action than one in which many firms are of about equal size.

Concentration of slaughter in the hands of the 4 or the 10 largest firms

is one measure of dominance by large firms. Such dominance has declined. The four largest firms did 50 percent of total FI slaughter in 1950 but only 35 percent by 1962 (table 3). Percent of slaughter by the four largest firms decreased from 52 to 30 percent for cattle, from 58 to 40 percent for calves, from 70 to 59 percent for sheep, and from 49 to 39 percent for hogs.

Concentration of slaughter in the four largest firms has not been extremely high. But, the 10 largest FI slaughter firms have had a substantial proportion of slaughter (table 3). Although their share decreased from two-thirds in 1950, they still controlled nearly one-half of total FI slaughter in 1962. Furthermore, although the share of the four largest firms declined, the share of the next six large firms remained relatively constant because they grew at about the same rate as total slaughter increased. The largest four firms grew very slightly so their share decreased.

Concentration of FI slaughter in the four largest firms is somewhat greater in the West North Central States³ than the nation as a whole. In this region the four largest firms accounted for 46 percent of FI cattle slaughter, 97 percent of FI calf slaughter, 60 percent of FI sheep slaughter, and 51 percent of FI hog slaughter in 1962. But, the proportion held by the four largest firms has been declining.

The 10 largest firms also have a greater share of total slaughter in the West North Central States than in the nation as a whole. However, this share

also has been declining in all species except calves. The picture of size structure that emerges from this data shows relatively high but declining concentration of slaughter by the largest slaughter firms.

Two developments have produced the declining concentration. First, new firms have entered the industry and are slaughtering an increasing portion of the increased livestock production. Between 1950-62, the number of FI slaughter firms increased from 336 to 441.

Secondly, small firms that have stayed in the industry have grown in size at an average rate more than eight times greater than large firms. So they have taken an increasing share of slaughter.

Many of the same factors producing specialization in slaughter have also affected the industry's size structure. Technological developments have made the entry of relatively small plants economically feasible; these small plants can now be as efficient as large ones. Furthermore, slaughtering costs in a specialized plant are apparently no greater than in a diversified plant. Therefore, new firms with limited capital find it advantageous to construct a specialized slaughter plant of sufficient size to achieve scale economies rather than a diversified plant of insufficient size.

Transportation technology and freight rates, coupled with increased specialization of livestock producers, have made nonterminal plant locations economically feasible. So small firms have been able to enter the industry without jockeying for a terminal plant location and terminal market receipts.

Federal inspection and grading have also facilitated growth of small firms by allowing them to enter the national dressed meat market on the same basis as large firms. Moreover, the growing predominance of chain stores in the retail meat trade has facilitated the growth of small slaughter firms. Retail chains generally have not been interested in merchandising brand name fresh meats.

Therefore, small slaughter firms have competed for fresh meat sales without advertising campaigns or sales organizations. With newer and more efficient plants, they often have had a cost advantage relative to the larger, older firms. So, they have secured increasing shares of the fresh meat business.

Finally, large slaughter firms may be expanding slowly because of other investment alternatives. Often, a large meatpacking firm can invest in meat processing or other industries such as chemicals and sporting goods.

The large firm has these investment opportunities because of a large "purse" and access to national financial markets. But, a small slaughter firm interested in reinvesting its capital may not have other profitable alternatives.

CONCLUSIONS AND IMPLICATIONS

Decentralization in the livestock slaughter industry has implications for rural communities, livestock producers, livestock slaughterers, and livestock service agencies.

A successful plant need not integrate all slaughtering and processing functions. Therefore, the relative capital requirement for a successful specialized plant is less than for the older type of integrated plant. Furthermore, federal inspection and grading have enhanced the probability of success for a small, independent slaughter plant. As a result, a small community may now attract or organize a slaughter plant more easily than once was the case.

On the other hand, decentralization in the industry has been accompanied by great organizational and promotional activity for slaughter plants. Many developers and community development groups have proposed and built slaughter plants. Some proposals were not carefully considered beforehand and the plants failed. In the flurry of promotional activity, the small community should carefully analyze all implications for potential success of a proposed slaughter plant—success in one community is no guarantee of success in every community.

Trends identified here also have implications for livestock producers. The increased number of small firms at the point of livestock production means increased nearby outlets for livestock. Therefore, net returns may be increased.

Reduced transportation costs do not necessarily mean increased net returns to producers. Many new plants are highly specialized by species and class. The market may not have been broadened in some geographic areas for certain livestock. Therefore, some producers may still wish to move livestock elsewhere for sale in order to use selling services located at other points.

Assuming that the factors generating these trends persist, livestock slaughter firms will have to continue to decentralize in both horizontal and vertical functions in order to take advantage of locational and functional economies. These adjustments will, in turn, affect both the location and the type of market agencies handling livestock. ■

Table 3. Percent of FI slaughter by the largest slaughter firms, United States, by species, 1950, 1954, 1958, and 1962

Size rank	1950	1954	1958	1962
.....percent cattle slaughter.....				
1-4	51.5	45.2	35.7	29.5
5-10	8.7	10.0	10.5	10.4
1-10	60.2	55.2	46.2	39.9
.....percent calf slaughter.....				
1-4	58.0	59.3	49.7	39.9
5-10	12.9	11.7	13.9	16.3
1-10	70.9	71.0	63.6	56.2
.....percent sheep slaughter.....				
1-4	69.6	68.7	64.4	58.9
5-10	15.9	16.1	17.2	17.1
1-10	85.5	84.8	81.6	76.0
.....percent hog slaughter.....				
1-4	48.5	48.4	41.3	39.0
5-10	22.1	23.0	23.4	21.5
1-10	70.6	71.4	64.7	60.5
.....percent total slaughter.....				
1-4	50.8	46.6	38.9	35.0
5-10	15.8	16.1	15.9	14.1
1-10	66.6	62.7	54.8	49.1

³ Minnesota, Iowa, Missouri, North Dakota, South Dakota, Kansas, and Nebraska.

the outlook corner

The preceding article identified changes in the size structure of livestock slaughter firms. These changes were generated by both unequal growth rates and entry and exit patterns among firms of varying sizes.

Generally, the pattern has been one of increasing numbers of firms in the medium size categories. Since size structure of firms is thought to have some market performance implications, knowledge of the future size patterns would be beneficial.

Unfortunately, many factors needed to predict these patterns have not been identified. However, assuming that forces which generated observed changes in the past remain approximately the same in the future, projections of probable size distribution can be made.

A method—the Markov process—has been devised to obtain such projections.¹ With this statistical technique, it is possible to specify the future size distributions which would result if patterns of entry, exit, and growth of firms continue as they have. Specifically, the technique provides a basis for projecting the future size distributions of slaughter firms which would result if patterns of entry, exit, and growth during 1950-62 continue. By using this device, future size distributions of cattle and hog slaughter were projected.

CATTLE SLAUGHTER FIRMS

In 1962, most FI cattle slaughter firms were in the middle size classes (table 4). Nearly three-fourths of them

slaughtered between 3,043 and 63,910 head. The remaining firms were distributed rather evenly in both the smaller and larger classes.

If patterns of entry, exit, and size change during 1950-62 continue for another 12-year period, size distribution will change. The proportion of firms in the two middle size classes will decrease to just over one-half. Numbers of firms in the smaller classes will decline but numbers in the larger classes will increase. However, there will still be a substantial number of firms with annual slaughter of less than 3,000 head, and there will still be relatively few with more than 1 million head. The projected increase in number of large firms reflects the relatively greater growth rate of small firms during 1950-62, as small firms tended to grow into the larger size classes.

HOG SLAUGHTER FIRMS

The greatest numbers of FI hog slaughter firms were in the larger size classes in 1962 (table 5). Nearly three-fifths of them were in the four largest classes. Nevertheless, almost one-fourth of the plants slaughtered less than 4,233 head annually.

If the 1950-62 pattern of entry, exit, and size change continues, the total number of hog slaughter firms would decline by 1974. But the number of firms in the two largest size classes would increase. Approximately three-fifths of the hog slaughter firms would still be in the four largest size classes; the number slaughtering over 951,751 head would increase.

Hence, in both the cattle and hog slaughter segments of the industry, the number of large firms would relatively increase. However, there would also be a considerable number of smaller slaughter firms. The implications of these projections for the livestock producer are, of course, conjectural. However, a size structure in which there are large firms, coupled with a large number of small firms, is often associated with competition.

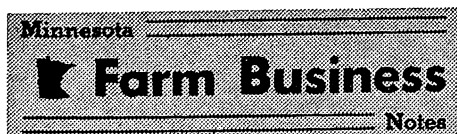
Table 4. FI cattle slaughter firms by size class, actual 1962 and projected 1974

Year	Number head, annual slaughter							
	Less than 145	146-666	667-3,042	3,043-13,970	13,971-63,910	63,911-293,800	293,801-1,341,000	Over 1,341,000
	number of plants.....							
1962	6	19	23	94	178	53	4	2
1974	3	13	15	62	152	66	9	2

Table 5. FI hog slaughter firms by size class, actual 1962 and projected 1974

Year	Number head, annual slaughter							
	Less than 115	116-696	697-4,233	4,234-25,741	25,742-156,500	156,501-951,750	951,751-5,786,000	Over 5,786,000
	number of plants.....							
1962	11	12	25	33	43	52	11	2
1974	9	10	20	27	32	51	15	2

¹ Padberg, D. I. The Use of Markov Process in Measuring Market Structures, *J. Farm Econ.* XLIV (1): 189, Feb. 1962.



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