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STRUCTURAL CHANGES IN MEAT PACKING AND PROCESSING: THE PORK SECTOR

by

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STRUCTURAL CHANGES IN MEAT PACKING AND PROCESSING: THE PORK SECTOR

INTRODUCTION

This report provides an overview of the recent structural changes in the hog slaughter/processing industry. The structure of an industry is characterized by the number of its firms as well as the size, efficiency, location, and ownership of these firms. Structure is determined by economic variables such as profitability, consumer preferences, and the state of technology. It is important to understand the structure of an industry because it affects the pricing and input decisions made by firms. Changing structure is also associated with new products emerging in an industry.

The pork sector can be viewed as a stream. The stream begins with the farmer or hog producer and ends with the purchase of pork products by the consumer. These products include fresh pork items such as chops and roasts, as well as more processed items like ham, sausage, pizza toppings, luncheon meats and ingredients for such convenience products as Hormel's Top Shelf.¹

The hog slaughter/processing firm serves as an intermediate step between hog producer and pork product consumer. Slaughter firms buy live hogs, kill them, and then cut the carcass for further processing. Some of these cuts, e.g., loins and shoulders, are sold directly to retailers who process them into fresh pork products. Other parts of the carcass are processed further and sold to firms that specialize in hams, cold cuts, pizza toppings, sausages, and other meat products.

The Increasing Role of Commercial Hog Slaughter and Regional Concentration

Hog production and slaughter is concentrated primarily in the Corn Belt. This region includes Iowa, Illinois, Minnesota, Nebraska,

Indiana, Ohio, and Missouri. Cheap and plentiful corn (a major cost of production) is an important reason for high levels of hog production in the Corn Belt. The relatively high costs of transporting live hogs is a major factor in locating slaughter facilities close to production areas. In addition to the cost of operating trucks, hauling live hogs results in hog stress, shrinkage, and some death loss. These costs increase with the distance hauled, therefore encouraging farmers to sell to nearby slaughter facilities. Indeed most hogs are sold to plants within 100 miles of the farm.²

Although a high percentage of the hog slaughter occurs in the Corn Belt, there are significant slaughter operations in states such as California and Virginia. These operations are close to major population centers making it economically feasible to ship in live hogs from the western and eastern Corn Belt states. The major slaughter/processing firm in California is Clougherty. Clougherty ships in most of its slaughter hogs although it may start a hog operation close to its plant to save transportation costs.³ The major slaughter/processing firm in Virginia is Smithfield. Although Smithfield ships in many hogs, it is currently moving away from this through vertical integration techniques.⁴ Major hog slaughter firms such as IBP, ConAgra, and Excel (Cargill) are found in the Corn Belt.

Iowa has been the dominant state in hog slaughter and production for many years. In 1969 Iowa had 25 percent of commercial hog slaughter. Minnesota was second with 6 percent of commercial hog slaughter (Table 1). Iowa has maintained its position of dominance over time. Illinois has moved into second place with 9 to 10 percent in recent years, while Minnesota has continued to slaughter approximately 6 percent.

Total U.S. slaughter is categorized by the National Agricultural Statistics Service (NASS) into three categories: federally inspected slaughter, other commercial slaughter, and farm slaughter (Table 2). Commercial slaughter is the sum of federally inspected slaughter and other commercial slaughter. Farm slaughter comprised 6.1 percent of total U.S. hog slaughter in 1960. It declined rapidly during the early 1960s and then more gradually, reaching 0.3 percent in 1989. Thus,

Table 1
Top Ten Commercial Hog Slaughter States, Various Years

	1961		1965		1969		1973		1977		1981		1985		1989	
	state	percent	state	percent	state	percent	state	percent	state	percent	state	percent	state	percent	state	percent
1	IA	18.4	IA	20.1	IA	24.7	IA	25.3	IA	24.1	IA	26.4	IA	25.0	IA	28.9
2	MN	25.7	MN	27.9	MN	32.0	IL	32.8	IL	30.1	IL	33.0	IL	33.9	IL	38.5
3	IL	32.0	OH	34.3	IL	38.5	MN	39.7	MN	37.2	MN	39.1	MI	39.8	MN	44.4
4	IN	38.1	IL	40.6	OH	43.8	MI	44.7	NE	42.2	MI	45.1	NE	45.8	NE	50.2
5	NE	43.5	IN	46.0	PA	48.5	OH	49.0	OH	47.2	OH	50.4	MN	51.3	MI	55.7
6	OH	48.7	NE	50.7	IN	52.8	PA	53.3	MI	52.2	NE	55.3	OH	56.4	VA	60.7
7	MO	53.6	MO	54.8	VA	56.6	WI	57.3	IN	56.7	MO	58.9	VA	61.3	IN	65.0
8	WI	57.7	WI	58.9	MO	60.3	VA	60.9	WI	60.8	VA	62.4	IN	65.6	IN	69.2
9	PA	61.4	IN	62.8	WI	64.0	IN	64.5	MO	64.9	SD	65.8	MO	69.4	MO	73.3
10	KS	65.0	TN	66.0	IN	67.4	TN	68.0	TN	68.8	IN	69.0	SD	73.0	OH	76.7

Source: Annual Livestock Slaughter, NASS, various issues.

Table 2
 Percentage of U.S. Hog Slaughter by Type of Slaughter,
 Various Years

<u>Year</u>	<u>Commercial Slaughter</u>			<u>Farm Slaughter</u>
	<u>Federally Inspected</u>	<u>Not Federally Inspected</u>	<u>Total</u>	
1960	78.6	15.3	93.9	6.1
1963	82.2	13.5	95.7	4.4
1966	84.6	13.7	98.3	1.7
1969	89.1	9.6	98.7	1.3
1972	91.9	6.9	98.8	1.1
1975	93.0	5.4	98.4	1.6
1978	94.6	4.0	98.6	1.4
1981	95.0	4.1	99.1	1.0
1984	96.3	3.2	99.5	0.6
1987	96.9	2.7	99.6	0.4
1989	97.0	2.7	99.7	0.3

Source: Annual Livestock Slaughter, NASS, various issues.

commercial hog slaughter increased from 93.9 percent of total hog slaughter in 1960 to 99.7 percent in 1989. Federally inspected slaughter as a percentage of total U.S. hog slaughter has increased over the past 30 years, from 78.6 percent in 1960 to 97.0 percent in 1989.

Geographic slaughter concentration has been steadily increasing since the 1960s. One measure of this concentration is the number of states that account for 90 percent of commercial hog slaughter (Table 3). From 1960 to 1966 about 90 percent of all commercial slaughter took place in 21 states. That number has declined over the years to 15 states in 1988 and 1989.

One of the major trends in swine slaughter during the 1980s was the replacement of inefficient slaughter facilities with much larger modern facilities. In 1981 0.7 percent of all federally inspected hog slaughter plants killed 1.5 million head or more per year. These plants (less than 1 percent of all federally inspected plants) accounted for 21 percent of all federally inspected hog slaughter. In 1989, plants

Table 3

Number of States that Accounted for Approximately
90% of U.S. Commercial Hog Slaughter, 1960-1989

<u>Period</u>	<u>Number of States</u>
1960-1966	21
1967-1972	20
1973-1976	19
1977-1981	18
1982-1985	17
1986-1987	16
1988-1989	15

Source: Annual Livestock Slaughter, NASS, various issues.

slaughtering 1.5 million or more head annually made up 2.2 percent, with a shared control of 62 percent of federally inspected hog slaughter (see Tables 4 and 5 below).

CONCENTRATION AND STRUCTURAL CHANGE IN MEAT PACKING

The Early 20th Century

The meat packing industry is concerned with the slaughter and processing of hogs as well as other species such as cattle and sheep. Because there are similarities between hog packing and other types of meat packing, structural issues in the meat packing industry as a whole are considered. In this section it is noted that there is historical precedent for undue firm concentration in meat packing.

The turn of the last century was marked by high concentration in the meat packing industry. In 1916 five firms (Armour, Swift, Morris, Wilson, and Cudahy) controlled more than 60 percent of all cattle slaughter.⁵ In 1917 the Federal Trade Commission conducted an investigation of the meat packing industry. The FTC concluded that with a four-firm concentration ratio of 60 percent there was no longer

Table 4

U.S. Federally Inspected Hog Slaughter Plants by Size, 1981-1989

Plant Size (Number of Head Slaughtered Annually)	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>
	----- Percent -----								
1,500,000 or more	0.7	0.5	1.1	1.0	1.1	1.5	2.0	2.3	2.2
1,000,000-1,499,999	2.0	2.1	1.4	1.5	1.5	0.8	1.1	0.6	0.8
500,000-999,999	1.7	1.3	1.7	1.6	1.2	1.4	2.1	1.0	1.2
250,000-499,999	1.9	2.4	2.1	1.4	1.7	1.4	1.1	0.7	0.9
100,000-249,999	1.7	1.3	1.6	1.9	1.3	1.3	1.1	1.3	1.9
10,000-99,999	7.9	8.3	7.6	8.0	8.0	7.9	7.5	8.2	8.1
1,000-9,999	19.4	17.3	18.1	18.0	17.0	17.0	16.6	17.9	18.7
9,999 or less	64.8	67.0	66.5	66.7	68.2	68.8	68.6	68.1	66.3

Source: Annual Livestock Slaughter, NASS.

Table 5

Percent of U.S. Federally Inspected Hog Slaughter by Plant Size, 1981-1989

Plant Size (Number of Head Slaughtered Annually)	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>
	----- Percent -----								
1,500,000 or more	21.1	16.2	31.7	31.6	34.8	49.5	55.8	65.9	62.0
1,000,000-1,499,999	38.7	43.5	26.6	29.7	32.0	16.5	13.0	12.2	14.2
500,000-999,999	19.6	16.2	20.7	19.3	15.1	16.6	16.1	9.4	11.0
250,000-499,999	11.3	14.5	11.7	8.2	9.5	8.1	7.0	3.9	4.6
100,000-249,999	4.2	3.6	4.1	5.7	3.2	3.7	3.1	3.1	3.9
10,000-99,999	3.9	4.8	4.0	4.3	4.1	4.4	3.9	4.6	3.5
1,000-9,999	0.9	0.9	0.9	0.9	0.8	0.9	0.8	0.7	0.7
9,999 or less	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3

Source: Annual Livestock Slaughter, NASS.

significant competition in the meat packing industry. A four-firm concentration ratio of 60 percent means that the four largest firms account for 60 percent of all industry sales.⁶

In February of 1920, the attorney general of the U.S. filed a petition under the Sherman Act against these dominant firms. The petition stated that the five major packers had succeeded in subverting competition in the purchase of livestock and the sale of fresh meat. The case was not contested and by mutual agreement a consent decree was issued that effectively reduced the packers' economic power.⁷ When the consent decree was issued, the combined market share of the five major packers was estimated at 50 to 75 percent. The FTC report also led Congress to pass the Packers and Stockyards Act of 1921. The major purpose of this act was to ensure fair competition and trade practices in livestock marketing and in meat packing.

The consent decree of 1920 led to a gradual reduction of market concentration in the meat packing industry. However this decline in concentration has recently been reversed. This pattern can be seen in the four-firm concentration ratio in cattle given in Table 6.

Conglomerates and Structural Change: The 1960s and Onward

This section introduces the major participants in the meat packing business. As will be seen, most major packers have ties with large conglomerates. These connections provide access to funds needed for investment into large scale modernized plants.

Many observers of the U.S. meat packing industry during the 1960s and 1970s felt the industry had become more competitive over time.⁸ Until the 1960s, old line packers such as Swift, Armour, and Morrell led the industry using multi-species plants. In the 1960s specialized beef slaughtering plants operated by "new breed" packers such as IBP began to enter the industry locating new plants in the western Corn Belt and High Plains where cattle feeding was starting to increase.⁹ Today plants are frequently specialized by species (e.g., hogs, cattle or lamb) and by function (slaughter or processing).

Table 6

Concentration Ratio for U.S. Commercial Livestock Slaughter, 1909-1987

<u>Year</u>	<u>Cattle</u>	<u>Sheep</u>	<u>Hogs</u>	<u>Year</u>	<u>Cattle</u>	<u>Sheep</u>	<u>Hogs</u>
Percent Controlled by Five Leading Packers ¹				1960	24	53	35
1909	36	44	34	1961	24	55	34
1910	38	46	32	1962	24	55	34
1911	38	49	35	1963	23	55	34
1912	38	49	34	1964	23	57	35
1913	41	54	35	1965	23	58	35
1914	40	55	36	1966	22	59	32
1915	44	56	38	1967	22	58	30
1916	47	57	39	1968	22	54	30
1917	53	60	41	1969	23	60	34
1918	55	59	45	1970	21	53	32
Percent Controlled by Four Leading Packers ¹				1971	21	53	32
1920	49	62	42	1972	25	57	32
1930	48	68	38	1973	24	56	33
1940	43	66	44	1974	24	56	34
1950	36	64	41	1975	22	57	33
1951	32	63	41	1976	22	53	35
1952	34	64	39	1977	22	55	34
1953	34	63	38	1978	24	56	34
1954	32	62	39	1979	29	64	34
1955	31	61	41	1980	28	56	34
1956	30	62	40	1981	31	52	33
1957	29	58	39	1982	32	44	36
1958	27	57	36	1983	36	44	29
1959	25	54	34	1984	37	42	35
				1985	39	51	32
				1986	42	51	33
				1987	54	75	37

¹From 1909 to 1918, the percent held by the Big Five packers (Armour, Cudahy, Morris, Swift, and Wilson, where commercial slaughter includes federally inspected and other wholesale-retail establishments. From 1920, the four largest firms in each species or type. However, in 1923 Armour acquired Morris, so from 1923 to 1959 the top four cattle-slaughtering firms equal the former Big Five.

Source: Concentration Issues in the U.S. Beef Subsector, pp. 24-25.

Conglomerate influence also began in the 1960s. In the mid 1960s Wilson was acquired by LTV, a large, diverse conglomerate involved in such industries as steel and ship building. Morrell was acquired by United Brands, the fruit giant. Armour was bought by the Greyhound corporation. Instead of being bought by a conglomerate, Swift became one. In 1973 Swift became Esmark and diversified into other operations such as oil products and women's undergarments.¹⁰

Early conglomerate ventures found that pork slaughtering, a cyclical industry with chronic overcapacity, did not meet corporate profit objectives.¹¹ In 1981, after closing many slaughter plants in the hopes of increasing profitability, LTV finally converted Wilson Foods into an independent corporation. Also in 1981 Esmark let go of its slaughtering operations by forming Swift Independent Packing Company (SIPCO) and selling SIPCO's stock to the general public while maintaining a minority interest. Esmark retained the Swift brand name and the more profitable processed food products such as Swift ham and bacon, the Sizzlean lines, and Butterball turkeys.¹²

Oscar Mayer, a well-known hog slaughterer/pork processor, was bought by General Foods Corporation in 1981. In 1983 Greyhound sold three Armour hog slaughter/processor plants to SIPCO and the rest of Armour foods to ConAgra. Bluebird, a relatively small slaughter firm but a large ham processor, receives its pork from its Cudahy and mid-south subsidiaries. Northern Foods, an English conglomerate, owns Bluebird.¹³

Finally, it is noted that the current livestock slaughtering giant, IBP, is controlled by Occidental Petroleum.¹⁴ Purina, a large feed company involved in hog slaughter (Mariah Packing Co.) is owned by British Petroleum.¹⁵ Mitsubishi (the Japanese conglomerate) and Central Soya (a subsidiary of an Italian based conglomerate and grain company) opened a hog slaughter operation in Indiana during 1990.¹⁶

Reorganization and Innovation: The Separation of Hog Slaughter and Processing

The profitability of incumbent firms in hog slaughter was poor relative to processing during the 1980s. During this time firms such as IBP saw opportunities for profitable hog slaughter by building large scale modernized plants and using low cost labor. The general result was a division between firms that slaughtered hogs and the firms that processed these hogs.

Esmark's creation of Swift Independent Packing Company in 1981, thereby divesting itself of slaughter operations while retaining its processing divisions, typifies the turbulence of the hog slaughter/processing industry of the 1980s. Pork processing, with its branded products such as hams, cold cuts, and hot dogs received significantly higher profit margins than hog slaughter and fresh pork products.¹⁷ Figures based on a 1985 financial operations survey of the meat industry give a dramatic indication of this. For firms dealing in more than two-thirds fresh pork, profits were 21 cents per 100 dollars of sales. In contrast, firms involved with less than one-third fresh pork had profits of \$2.59 per 100 dollars of sales.¹⁸

One of the reasons for the poor profit margins in slaughtering was the inefficiency of older, more labor-intensive slaughter plants still around from the 1940s and 50s.¹⁹ Joseph Schumpeter, the Harvard economist from the first half of the century, recognized that there were cyclical time periods of corporate innovation. These periods of innovation are the means of finding a new basis for production and profitability in a sagging industry. Schumpeter argued that these periods of innovation are accompanied by "gales of creative destruction." Those firms which are least able to adopt the new methods and technology fail. The result is an economic Darwinism.²⁰

Thus, when innovative technology enters an industry, competitive pressures increase. The least productive firms are forced out of the industry and average productivity rises. Schumpeter's idea of creative destruction implies that the rate at which firms fail should be positively related to the extent that successful firms are undertaking

innovative measures. Indeed, the number of federally inspected hog slaughter plants was 1,388 in 1981 and 1,114 in 1989, a drop of 20 percent.²¹

Cutting Costs: The Labor Situation

Labor costs were reduced by both entering and incumbent firms to increase profitability in hog slaughter. Labor unions and expensive benefit plans were the main targets of cost reduction.

The 1980s were a time conducive to breaking unions and reducing labor costs. Hormel dealt with its labor costs by leasing its slaughter facilities to other firms. For example, in 1987 Excel (owned by Cargill) signed a three-year lease to operate Hormel's slaughter and cutting operation in Ottumwa, Iowa.²² In 1988 a state-of-the-art slaughtering facility in Austin, Minnesota, (opened by Hormel in 1982) was shut down. Quality Pork Processors of Dallas signed a letter of intent to lease Hormel's Austin plant.²³ After three days of production, the nonunion operation was shut down by an arbitrator's ruling in favor of the local union, because the lease violated Hormel's union contract. Hormel could have sold the plant to release itself from the contract but did not want to pursue this option.²⁴

Hormel was not alone in the use of this tactic. In 1989, Monfort Pork (a subsidiary of ConAgra) agreed to lease its hog slaughtering and processing facility in Marshalltown, Iowa to MSP Resources Inc. effective October, 1989.²⁵ Union employees were notified that all positions would be permanently terminated. MSP, however, indicated that they would recruit current employees.²⁶ MSP's lease was thwarted by an alarmed city government. According to mayor Stan Brown, "MSP was going to lease the plant, and then there was going to be a termination that would have had the effect of breaking the existing union, including wiping out seniority and other benefits."²⁷ After the announcement of the lease the city stopped local incentives estimated at about 2 million dollars to the plant. As a result of the city's protest Monfort stopped the leasing plan and continued operation.²⁸ Evidence also indicates that livestock slaughterer IBP was able to reduce labor costs by

speeding up operations and maintaining a high labor turnover rate to avoid seniority benefits.²⁹ Higher line speed and labor turnover appear to be a factor in worker injury.³⁰

Injury and Illness in Meat Packing

Data on injury and illness is summarized only by rather broad standard industrial classifications (SIC). Swine slaughter and processing is included in meat packing firms, SIC 2011, firms primarily engaged in the slaughtering of cattle, hogs, sheep, lambs, and calves for meat. Hogs and cattle are the primary types of animals slaughtered by firms in SIC 2011.³¹ Thus, hogs are an important part of this fairly broad classification and the data should provide insight into injury and illness within hog packing.

Meat packing falls into the SIC division of manufacturing. Firms in manufacturing engage in the mechanical or chemical transformation of materials or substances into new products. These firms are usually described as plants, factories, or mills, and characteristically use power driven machines and materials handling equipment.³²

Definitions of occupational injuries and illnesses follow the recording and reporting requirements of the Occupational Safety and Health Act (OSHA) of 1970. Definitions of injuries and illnesses are given in Appendix A. Table 7 gives BLS injury and illness rates for the private sector, manufacturing, and meat packing.

In the ten year period from 1977 to 1986 work-place injury and illness rates generally fell. This improvement was relatively small for meat packing. In meat packing the 1982-1986 average injury and illness rate was 6 percent lower than the 1977-1981 rate, while the corresponding declines were 13 percent in the private sector and 18 percent in manufacturing (Table 7). Personick and Taylor-Shirley report that the meat packing industry had an average illness rate of 4.4 per 100 full-time workers for the 1982-1986 period compared to an average rate of 2.5 from 1977 to 1981. Thus, the increase in the illness rate from 1982 to 1986 partially offset the improvement in the injury rate

Table 7
Occupational Injury and Illness Rates, 1977-86

<u>Incidence Rates Per 100 Full-Time Workers</u>						
<u>Year</u>	<u>Private Sector</u>		<u>Manufacturing</u>		<u>Meat Packing Plants</u>	
	<u>Illnesses</u>	<u>Injuries</u>	<u>Illnesses</u>	<u>Injuries</u>	<u>Illnesses</u>	<u>Injuries</u>
1977	0.3	9.0	0.5	12.6	2.1	31.5
1978	0.2	9.2	0.4	12.8	2.2	30.6
1979	0.3	9.2	0.5	12.8	2.7	34.2
1980	0.2	8.5	0.4	11.8	2.5	31.0
1981	0.2	8.1	0.4	11.1	3.1	29.7
1982	0.1	7.6	0.3	9.9	3.0	27.7
1983	0.1	7.5	0.3	9.7	4.0	27.4
1984	0.2	7.8	0.4	10.2	4.4	29.0
1985	0.2	7.7	0.4	10.0	4.1	26.3
1986	0.2	7.7	0.4	10.2	6.4	27.0
Avg:						
77-81	0.2	8.8	0.4	12.2	2.5	31.4
81-86	0.2	7.7	0.4	10.0	4.4	27.5

Source: Personick and Taylor-Shirley.

resulting in the small improvement in meat packing's overall injury/illness rate in this period.

As reported in a 1986 Bureau of Labor Statistics survey, meat packing had an injury/illness rate two to three times that of manufacturing which itself had an injury/illness rate above the national average.³³ Meat packing is thus considered a high risk industry. Two criteria used to measure the physical danger of an industry are: (1) the incidence rate of recordable injuries and illnesses, and (2) the incidence rate for injuries severe enough to require workers to take time off of work or to be restricted in work activity. With respect to criterion (1), the 1986 Bureau of Labor Statistics (BLS) annual survey ranked meat packing plants as #1 with an annual rate of 33.4 per 100 full-time workers. The top ten industries ranged from 33.4 to 23.5.³⁴

Regarding criterion (2), meat packing ranked #8 with an annual rate of 12.2 per 100 full-time workers. The top ten industries ranged from 17.2 to 12.0.³⁵

In their review of health and occupational risks in meat packing, Personick and Taylor-Shirley discuss reasons for the high incidence rates.³⁶ First, meat packing is a labor intensive business. In 1986 an estimated 57 percent more production worker hours were needed in meat packing than in manufacturing to produce an additional dollar in value added sales.³⁷ Having many production employees working in close proximity with sharp tools may contribute to the injury rate. Secondly, from 1976 to 1981 output per worker hour increased at an average annual rate of 3.4 percent (as compared to the 3 percent increase in manufacturing).³⁸ The assertion is that the increased speed of assembly line work may be a factor in the reported incidence rates.

Finally Personick and Taylor-Shirley cite high turnover rates as a factor. Traditionally, the cyclical nature of the industry, has meant high layoff and recall rates, but quit rates have almost always been below manufacturing. However in 1979, 1980, and 1981 quit rates were also higher than those in manufacturing. This occurred about the same time that the relative pay advantage in meat packing started to decline. In 1977 average meat packing pay exceeded manufacturing by 16 percent, in 1982 it was 6 percent above, and in 1986 it was 15 percent below.³⁹

In a 1988 government report, "Sweatshops in the U.S.: Opinions on their Extent and Possible Enforcement Options," a sweatshop was defined as a business that regularly violated labor laws concerning wages, safety and health, and child labor. Meat processing was among the three most often cited industries having serious problems with the violation of labor laws.⁴⁰

Examples of violations in these industries include: failure to keep required records of wages, hours worked, overtime compensation, and injuries, and the existence of work procedures with a high potential for causing crippling illness. The report cites causal factors as being a large immigrant work force, low profit margins in labor intensive industries, too few inspectors, and inadequate penalties.

The Underreporting of Injuries

Before tying together the labor situation in meat packing and the structural changes in the hog slaughter/processing industry, it is interesting to note a Congressional report entitled, "Here's the Beef: Underreporting of Injuries, OSHA's Policy of Exempting Companies from Programmed Inspections Based on Injury Records, and Unsafe Conditions in the Meat Packing Industry." The report focuses on the practices of the largest meat packing/processing firm IBP.⁴¹ The report also mentions the number eight firm, John Morrell and Co.⁴² For knowingly and willfully underreporting job related injuries, OSHA proposed fining IBP 2.6 million dollars.⁴³ For similar actions OSHA proposed fining John Morrell and Co. 0.69 million dollars.⁴⁴

IBP is a profitable firm. Its profits in 1985 were 144 million dollars.⁴⁵ To its credit, IBP has achieved its success in part through technological efficiency. A large part of its success is also due to its ability to reduce labor costs. The Congressional report implies that this labor cost reduction has resulted in the proliferation of safety risks for IBP workers. High turnover rates (as high as 80 percent per year) reduce employer benefit payments.⁴⁶ New employees receive lower wages and are not immediately eligible for fringe benefits. As a result of high turnover IBP actively recruits workers. Many of the people hired are young and/or immigrants for whom the pay is attractive. Twenty percent of the workers in IBP's Dakota City plant are Southeast Asians.⁴⁷ Many new recruits are inexperienced young men and women directly out of high school. The \$6.50 base pay is appealing to these people who would otherwise be facing minimum wage jobs. The report indicates that inexperience, coupled with poor training and harsh working conditions, in addition to insensitivity to high turnover rates is a major cause of IBP's high injury incidence.

The picture painted so far might imply that the meat packing industry has little regard for the welfare of its labor. However, in light of the problems discussed, the American Meat Institute (AMI) has initiated a safety campaign.⁴⁸ The AMI has also signed a contract with the National Safety Council to publish a practical guide to meat packing

safety issues. The industry has also established a committee to develop safer knife designs and other improvements to combat safety concerns.⁴⁹ Whether these actions will lead to improvements remains to be seen.

The Labor Situation and Structural Change

There appears to be a connection between the labor problems discussed above and the structural change that the meat packing industry went through beginning in the late 1970s and continuing through the 1980s. Between 1980 and 1985 at least eleven major hog slaughtering plants closed. These plants had a combined annual kill capacity of about 9.7 million hogs.⁵⁰

These closings in the early 1980s reflected, in part, the obsolescence of many hog slaughtering plants. Many of the plants closed were multi-storied packing plants that had been in use for 30 to 40 years and that had relatively high labor requirements. The replacements are single-story plants that reduce labor input through improved layout and increased automation.⁵¹ Table 8 gives an indication of how the modern single-story plants affected average productivity in meat packing. The index of output per production worker hour relates real industry output (a composite of products produced) to employee (production worker) hours. The index does not measure the specific contributions of labor but rather a joint effect of many interrelated influences such as changes in technology, capital investment per worker, level of output, utilization of capacity, managerial skill, and the skills and efforts of the workforce.⁵² As can be seen, output per production worker hour has risen greatly from 1977 to 1986.

The increase in new plants gave pork packers excess capacity for hog supplies.⁵³ Thin profit margins that many hog packers operated with quickly led to financial loss. The firms that operated mostly in fresh pork in 1983 lost an average of 14 cents per dollar of sales.⁵⁴ Due to the labor intensiveness of the industry, firms naturally turned to reducing labor costs as a way of preventing losses.

Table 8

Productivity of Meat Packing Plants (SIC 2011): 1977-86, (1977 = 100)

Index of:

<u>Year</u>	<u>Output Per Production Worker Hour</u>	<u>Industry Output</u>	<u>Production Worker Hours</u>
1977	100.0	100.0	100.0
1978	100.9	98.2	97.3
1979	103.9	99.1	95.4
1980	107.4	101.3	94.3
1981	111.9	102.4	91.5
1982	117.6	101.8	86.6
1983	122.4	102.3	83.6
1984	122.9	104.1	84.7
1985	126.5	105.1	83.1
1986	122.0	99.8	81.8

Source: Productivity Measures for Selected Industries and Government Services, BLS, Feb. 1989, Bul. 2322.

In 1983 most major packers had an agreement with the United Food and Commercial Workers Union for a wage of \$10.69 per hour. About this time IBP purchased a slaughter plant in Storm Lake, Iowa from Hygrade. IBP remodeled the plant and reopened it with labor paid \$6.50 an hour.⁵⁵ This difference in pay started a scramble among the other packers to obtain wage concessions.

A sample of other firm activity to reduce wage rates: Wilson Foods filed for bankruptcy,⁵⁶ Oscar Mayer attempted to cut wages, Greyhound sold most of its Armour plants to ConAgra,⁵⁷ and Hormel entered into a bitter labor dispute.⁵⁸ Later, Excel (a division of Cargill) purchased slaughter facilities from Oscar Mayer.⁵⁹ What is emerging is a group of companies that specialize in low cost slaughter (e.g., IBP, Excel, and ConAgra) and other firms that specialize in the

higher margin business of processing (e.g., Wilson, Hormel, and Oscar Mayer).

Table 9 shows that real wages in meat packing fell drastically (31%) from 1977 to 1986. The Consumer Price Index (CPI) given in Table 10 was used to deflate nominal earnings data to get Table 9. The CPI gives a measure of inflation for consumer goods. For example, Table 10 indicates that what cost \$1.00 in the 1982-1984 period cost only 61 cents in 1977 and about \$1.10 in 1986.

What has occurred in the industry is a disappearance of older, smaller, less efficient plants, relying on high cost labor and the appearance of larger modernized plants relying on lower cost labor. Firms like Hormel found it unprofitable to slaughter hogs with expensive unionized labor. Hormel, by leasing its Ottumwa plant to Excel,⁶⁰ for example, could move more of its operation into the higher margin processed meat sector while having access to cheaper input from low cost slaughter firms.

FORCES SHAPING THE FUTURE OF MEAT PACKING

Changing Consumer Preferences and Pork Products

The overall consumption of pork per capita (measured by total pork disappearance) has been fairly stable in the 1970s and 1980s.⁶¹ However, the composition and quality of the pork consumed has changed substantially, reflecting changing consumer preferences. This is indicated by consumers paying a premium for convenience meat products such as Hormel's Top Shelf. Consumers also want more quality consistent branded pork items which economize on information and time. "Leanness" is an issue spurred by consumer demand both at the national and international level.

Recently, the nation's top exporter of pork (Morrell) introduced a carcass merit marketing plan, where the price paid producers will be based on electric back-fat/loin-eye depth readings.⁶² Under this program, producers will receive premiums of 0.25 to 2.00 dollars or more per hundredweight, depending on quality. Such carcass merit marketing techniques are already being used extensively in Denmark and Canada, who are major exporters of pork.

Table 9

Real Earnings for Production Workers in Manufacturing
(SIC Division D) and Meat Packing (SIC 2011), 1977-1986

<u>Year</u>	<u>Manufacturing (\$ Per Hour)</u>	<u>Meat Packing (\$ Per Hour)</u>
1977	\$9.37	\$10.84
1978	9.46	10.87
1979	9.23	10.65
1980	8.82	10.30
1981	8.79	9.87
1982	8.79	9.33
1983	8.87	9.11
1984	8.85	8.56
1985	8.85	7.53
1986	8.88	7.52
Percent Change 1977-86	-7%	-31%

Source: BLS earnings data (adjusted by the
Consumer Price Index (see Table 10)).

Table 10

Consumer Price Index (all items) (1982-84 = 1.000)

<u>Year</u>	<u>Consumer Price Index</u>
1977	0.606
1978	0.652
1979	0.726
1980	0.824
1981	0.909
1982	0.965
1983	0.996
1984	1.039
1985	1.076
1986	1.096

Source: Statistical Abstract of the United States, 1990.

Currently Morrell sells about 65 percent of its pork boneless, compared to only 5 percent just ten years ago.⁶³ As a final indicator of changing consumer demand it is noted that some sources cite a 30 percent decrease in fat in average pork cuts. "In 1955, a 237 pound hog yielded almost 35 pounds of lard; today a pig that is 10 pounds heavier produces just 11 pounds of lard."⁶⁴ Also, a study reported in 1990, indicates that cooked trimmed pork is 31 percent lower in fat, 17 percent lower in calories, and 10 percent lower in cholesterol than in 1983.⁶⁵

The demand for "leanness" may also be showing itself in the recent glut of pork bellies. It is interesting that the demand for pork bellies (the source of bacon (which has a high percentage of fat)) is being helped by an increase in demand for pizza toppings. Between 1973 and 1985, the number of franchise establishments selling pizza rose almost 400 percent (2,920 to 14,417).⁶⁶ The increase in demand for frozen pizza as well as delivered pizza once again indicates that consumers are economizing on time by purchasing more convenience foods which are sold at a premium.

Food Safety Concerns: A Look at Pork

Most of the pork consumed in the U.S. comes from federally inspected hog slaughter and processing firms. From 1985 to 1989 about 97 percent of hog slaughter was federally inspected (Table 2). The Food Safety and Inspection Service (FSIS), a USDA agency, is responsible for ensuring that meat and poultry products moving in interstate commerce for use in human consumption are accurately labeled, safe, and wholesome. By the USDA's definition of interstate commerce, about 98 percent of market hogs going into pork production, fall into the interstate commerce category.

In October of 1986 the Processed Products Inspection Act was passed by Congress. Under this Act, the USDA's Food Safety Inspection Service (FSIS) no longer has to perform daily inspections at processing plants where it is satisfied safety standards are being met.⁶⁷ Budget reductions during the Reagan administration forced FSIS to tighten its

belt. The Processed Products Inspection Act expected to reduce inspection costs by 27 million dollars a year. Among the leading backers of the new inspection law was the American Meat Institute (AMI), the largest meat packing trade association. According to Bob Hibbert, an AMI vice president, the law "helps pave the way for greater efficiency for those plants that want to take greater control of its operations."⁶⁸

The FDA and the Center for Disease Control estimate that between 6.5 to 33 million Americans get sick each year from microorganisms in their food.⁶⁹ This type of illness is most often associated with salmonella type food poisoning. The reported cases of salmonellosis was significantly higher in the 1980s than in previous decades.⁷⁰ The most serious microbial contamination results in botulism, which fortunately, is very rare. In pork, trichinosis is also a problem.

The other type of food safety risk concerns chemical residues and additives. In pork, nitrites, which are used in processing, pose a possible health risk. Chemical residues like sulfamethazine and nitrofurons have also been deemed a problem. Of the two types of safety concerns, most toxicologists and food scientists believe that microbial pathogens are a more serious problem than chemical residues.⁷¹ In addition to the above, new technologies such as food irradiation and animal growth enhancers (e.g., porcine somatotropin and Beta-Agonists) have some consumers worried about safety problems. Table 11 summarizes some of the major food safety issues.

Table 11
Food Safety Issues

<u>Microbial Pathogens</u>	<u>Chemical Residues</u>	<u>New Technology</u>
Salmonella	Nitrites	Irradiation
Trichinosis	Sulfa drugs	Animal growth enhancers
Botulism	Nitrofurons	

Recent surveys confirm that American consumers desire improved safety of the foods they eat and are willing to pay more for safety.⁷² This trend has become a focal point for meat producers who want to assure wary consumers that their meat products are wholesome. This sentiment was expressed at the February 1989 meeting of the National Livestock and Meat Board held in Chicago. At the meeting food safety was discussed as a key issue confronting all aspects of meat production.⁷³

Microbial contamination in pork includes trichinosis and salmonella causing parasites. On the farm, pigs can receive almost continuous exposure to environmental salmonella.⁷⁴ One estimate has salmonella costing Iowa hog producers over one million dollars per month in 1989. The total cost of treatment, loss from death, and prevention of salmonellosis was second only to swine dysentery for Iowa producers.

Trichinosis causing parasites are also a concern to the pork industry. Meat irradiation has been approved by the FDA to treat pork for these parasites.⁷⁵ The process exposes pork to radiation emitted from radioactive substances such as cesium 137 or cobalt 60. Exposure ensures trichina-free pork and allows for less cooking time. Higher radiation doses may partially replace sodium nitrite in bacon, ham, and cold cuts as well as extend the shelf life of pork.⁷⁶

Studies indicate that there is no risk associated with irradiated foods in the sense that the meat does not become radioactive. However, consumer groups oppose irradiation for other reasons. Opponents argue that irradiation has been oversold, that proper cooking adequately handles microbial contamination. A prime concern about irradiation is the transportation and use of dangerous radioactive material across the country.⁷⁷ In the treatment process a plant built to irradiate food would need a secure and heavily shielded radiation source.⁷⁸ Consumer groups believe that the potential accidents are more serious than the proposed benefits of irradiation. In response to consumer concerns, legislation was introduced in 1987 that would stop the FDA and USDA from allowing foods to be irradiated.⁷⁹

The use of salt peter (sodium nitrate) to cure meat led to the use of sodium nitrite in cured meats in the 1920s. Nitrite has become an

ubiquitous meat preservative for three reasons: (1) nitrite protects meat from the bacteria that causes botulism, (2) nitrite protects meat from rancid flavor development caused by the oxidation of fat, (3) nitrite leads to the development of the characteristic flavor and odor of cured meats.⁸⁰ Unfortunately nitrites and nitrosamines (a nitrite derivative notably present in well done crisp bacon) have been linked to cancer in laboratory animals.⁸¹

Chemicals used in hog production have also led to food safety concerns. The use of nitrofurans and sulfamethazine in swine feeds has been at the forefront of the controversy. One nitrofuran, furazolidone, is an antibiotic used to promote growth in hogs and is a drug of choice for starting baby pigs. Another product, nitrofurazone, is an antibiotic used to control salmonellosis. Nitrofurans were introduced in the 1940s but their safety was called into question in the mid 1960s. A ban on the use of nitrofurans was proposed in the 1970s when they were linked to tumors in rats. In November 1986 the FDA cited substantial new evidence that nitrofurans caused cancer in humans and animals.⁸² Upon reviewing this evidence, a federal judge agreed with the FDA that nitrofurans should be pulled from the market.

Sulfamethazine is another feed additive used in hog production that has come under recent fire. In 1988 FSIS started a sulfa residue inspection program for the largest packing plants. A 1988 study showed a link between sulfamethazine and cancer in laboratory animals. Beginning April 4, 1988 FSIS sulfa tested six hogs each day in the country's twenty largest packing plants. By May 9, 2,608 hogs had been tested, with thirteen (0.5 percent) showing residue levels that violated regulations.⁸³ Hogs that have residues higher than government standards are confiscated by the FSIS. When this happens someone loses money. Before widespread hog identification, the packer took the loss. In 1988 Hormel and Morrell offered sulfa testing to increase pork producers awareness of the problem. In many instances farmers did not even know that they were feeding sulfa.⁸⁴

A swine identification program that was initiated and supported by a large segment of the hog industry, was put into effect by the USDA in 1988. In part this support by the hog industry came from the

realization that food quality and safety are important to the consumer. The idea of the program is to trace problem hogs, those carrying disease or drug residues, back to the farm of origin.⁸⁵ This will help identify individual producers using improper practices that reduce the competitiveness of pork. The program will also allow packers to identify the source of condemned hogs and penalize the supplier appropriately.

The Pork Industry: Present and Future Market Conditions

A salient aspect of structural change in the meat packing industry has been the separation between slaughter and hog processing. This separation was in part caused by the labor cost situation of the early 1980s. But it also seems that pork profitability is becoming more dependent on product and marketing issues reflected by consumers' changing preferences.

What does this mean for the future structure of the pork industry? If vertical coordination or ultra-large hog farms mean that product quality is more easily monitored, how will these incentives manifest themselves? One such ultra-large hog production plant is already underway in Kersey, Colorado. The company, National Hog Farms Inc., expects the operation to produce 336,000 market hogs each year.⁸⁶

As we enter the 1990s it is clear that market availability for small producers is shrinking. However, with the overcapacity in the slaughter industry it is unclear if there have been negative price effects. A recent study that uses hog price spreads to measure noncompetitive behavior indicates that there has not been a detrimental change in competition.⁸⁷ In fact some have argued that modernization and the entrance of ultra large packing plants may have given hog prices a boost during 1990. IBP's new 40 million dollar, 365,000 sq. ft. slaughter and boning complex in Waterloo, Iowa started operating in May, 1990.⁸⁸ It is argued that overcapacity and demand for market share contributed to record breaking hog prices in May of 1990 (\$68 per cwt).⁸⁹ The competition for hogs between IBP and ConAgra, both of whom

are trying to increase market share, may have helped to increase prices.⁹⁰

The current competition for slaughter hogs is taking its toll on some packers.⁹¹ Many smaller packers are operating at a loss. Farmstead Foods has recently shut down its slaughter operations at Albert Lea, Minnesota. However, competition remains strong in the area with six plants within a 125 mile radius of the facility continuing to bid for hogs.⁹²

While packer numbers may still be large enough to maintain competition in the Corn Belt, elsewhere the situation appears less attractive. Packers such as Roegelein Co. in San Antonio (sales of 77 million dollars in 1988)⁹³ and Gooch Packing in Abilene, Texas have recently closed.⁹⁴ According to Leon Kothman, executive director of the Southwest Meat Association, "There is not one pork slaughtering plant of any size left in Texas, Oklahoma, New Mexico, Arkansas, or Louisiana. Most hogs now go to Bryan Foods, West Point, Mississippi or Clougherty Packing Co., Vernon, California (a community of greater Los Angeles)."⁹⁵

Even with the high 1990 prices for hogs in the Corn Belt, producers might have reason to be nervous of the growing trend in concentration. Beef packing, an industry similar to the hog packing industry, with many of the same major players (e.g., IBP, ConAgra, and Excel (Cargill)) has recently gone through quick and unprecedented increases in concentration.⁹⁶

Packer Concentration and Live Animal Prices

In testimony presented at hearings held by the House Agricultural Committee of the Iowa State Legislature, December, 1988, economist Bruce Marion discussed concentration activity in beef packing:

National concentration of fed steer and heifer slaughter increased from 27.4 percent for the largest four packers in 1972 to 32.3 percent in 1977. Four-firm concentration then rose sharply over the following eight years to 56 percent by 1986 (Packers and Stockyards Administration data). As a result of three large acquisitions by ConAgra (E.A. Miller, Monfort and Swift Independent) and Excel's acquisition of Sterling Beef, all

in 1987, four-firm concentration increased to about 68 percent by the end of 1987. The industry is now dominated by three large companies, IBP, ConAgra and Excel (Cargill), which collectively slaughter over 60 percent of all steers and heifers in the U.S. This rate of concentration increase is unprecedented. There is no parallel in any of the industries--food and nonfood--with which I'm familiar.⁹⁷

The impact of packer concentration on prices paid to beef producers has been a topic of some study and considerable debate. On the one hand, Quail et al. found annual fed cattle prices in 13 regions from 1971 to 1980 to be inversely related to the concentration of fed cattle slaughter in the regions.⁹⁸ Schroeter also found statistically significant monopoly/monopsony price distortions in slaughter cattle and wholesale beef markets using annual data from the U.S. beef industry from 1951 to 1983.⁹⁹ However, a recent GAO study notes that the number of statistical studies is small and the models used may have methodological limitations. The GAO study also notes that some industry analysts believe steer and heifer prices paid may be higher because of the increased efficiencies and excess capacity that accompanied the concentration of the 1980s.¹⁰⁰

On a national level, four-firm concentration ratios in hog slaughter are not very high (Table 6).¹⁰¹ But, as mentioned earlier, the live hog market is somewhat regional in nature making a regional analysis of the competitive effects of buyer concentration more appropriate. Regional data on slaughter concentration are not available for pork but the concentration ratios for pork slaughter by state are very high (Appendix B, Table 12). While national data tend to understate market concentration in hog slaughter, state level concentration data tend to overstate concentration levels. Miller and Harris, using state level concentration data for 1978, performed a cross-sectional study and found that buyer concentration was negatively related to hog prices.¹⁰² As the GAO study suggests, further study of this issue is needed to provide definitive results.

Vertical Integration Between Hog Producers and Packers

Some independent hog producers are more concerned with the impact of vertical integration on access to slaughter hog markets than price distortions from market power.¹⁰³ This is a legitimate concern. In the poultry industry, vertical integration has shut out the independent producer. Now poultry farmers primarily work on contract.¹⁰⁴ Significant vertical integration in the pork industry is a possibility. Clougherty, California's largest hog slaughter/processor operation is currently developing a 1000 sow commercial herd in California.¹⁰⁵

The largest integration story concerns Smithfield, the Virginia based packer. Meat and Poultry magazine ranked Smithfield Foods, Inc. of Smithfield, Virginia as the number 17 meat packing company in the U.S. with 916 million dollars in sales in 1988.¹⁰⁶ Smithfield announced in 1986 that it would produce up to 2 million hogs annually in a joint venture with Carroll Foods.¹⁰⁷ Carroll would coordinate the hog production and Smithfield the hog slaughter. Environmental concerns about the large hog units have slowed Smithfield's expansion. Smithfield-Carroll had an annual farrow/finish capacity of 20,000 head in Virginia in May, 1990.¹⁰⁸ Smithfield also has plans to build a 15,000 head per day, 50 million dollar slaughter plant in southeast North Carolina.¹⁰⁹

Another potential spot for major vertical integration is in Indiana. Central Soya and Mitsubishi opened a state-of-the-art hog packing plant in Carroll County, Indiana in 1990.¹¹⁰ Central Soya is a large grain operation and some form of vertical integration is a possibility. Interestingly, there is also a prospective expansion of hog contracting in northern Indiana. Continental Grain is rumored to be planning a 50 thousand sow contracting effort in the region.¹¹¹

CONCLUSION

The structural change of the hog slaughter/processing industry in the 1980s was caused by two major factors: lack of profitability in hog slaughter and outdated inefficient slaughter facilities. The overall trend in slaughter has been one of increasing geographic concentration since the 1960s. The innovations, plant construction, mergers and buyouts accelerated the concentration in the 1980s. In the 1980s firms such as Wilson, Hormel, and Oscar Mayer divested of slaughter operations and focused on processing. The slaughter market was taken over by entrants such as IBP, ConAgra, and Excel who cut costs through labor concessions and the opening of modernized plants. To make slaughter profitable these firms utilized large scale plants that use labor more efficiently. The end result has been a separation of slaughter and processing. Profitability in slaughtering is related to a guaranteed supply of hogs, a large number of hogs slaughtered, and low input costs. It seems quite possible that vertical integration techniques might also be used to increase the profitability of hog slaughter. Hog producers are concerned about vertical integration since it has the potential of closing hog markets. Large scale slaughter is also a concern if it leads to undue market concentration, which could depress market prices for hogs. Factors such as changing consumer preferences for pork products as well as food safety concerns have also had an impact on pork processing and slaughtering. The desire for convenience items and quality assurance through branded products has influenced pork processing and slaughtering as well.

ENDNOTES

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²⁶"Monfort Pork," p. 37.

²⁷"Monfort Cancels Lease on Marshalltown Plant," Pork '89 (October 1989), p. 35.

²⁸"Monfort Cancels," p. 35.

²⁹Committee on Government Operations, Here's the Beef: Underreporting of Injuries, Osha's Policy of Exempting Companies from Programmed Inspections Based on Injury Records, and Unsafe Conditions in the Meatpacking Industry, 42nd Report. (Washington: U.S. Government Printing Office, 1988), pp. 10-12, 14.

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⁴²Size ranking as reported by "Meat and Poultry's Top 100," p. 14.

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⁴⁴Committee on Government Operations, p. 6.

⁴⁵Committee on Government Operations, p. 13.

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APPENDIX A

Work Injury and Illness Definitions

Definitions of occupational injuries and illnesses are in accordance with the Occupational Safety and Health Act of 1970 and Part 1904 of Title 29, Code of Federal Regulations.

Recordable occupational injuries and illnesses are:

1. occupational deaths, regardless of the time between injury and death, or the length of illness; or
2. nonfatal occupational illnesses; or
3. nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work motion, transfer to another job, or medical treatment (other than first aid).

Occupational injury is any injury, such as a cut, fracture, sprain, amputation, and so forth, which results from a work accident or from exposure involving a single incident in the work environment.

Occupational illness is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or disease which may be caused by inhalation, absorption, ingestion, or direct contact.

Source: Personick and Taylor-Shirley.

APPENDIX B

Table 12
Concentration Ratios for Hog Slaughter and Distribution
by State, 1978

State/Region	Four-Firm 1978	Distribution of U.S. Hog Slaughter
	-----Percent-----	
New England	100.0	(0.1)
New York	100.0	0.4
New Jersey	100.0	0.3
Pennsylvania	87.2	3.7
Ohio	62.0	4.7
Indiana	88.0	4.1
Illinois	82.3	7.7
Michigan	94.0	4.6
Wisconsin	99.7	3.8
Minnesota	99.8	6.8
Iowa	51.7	26.1
Missouri	95.9	3.7
North Dakota	100.0	(0.1)
South Dakota	100.0	3.5
Nebraska	93.1	5.1
Kansas	99.9	1.5
Delaware/Maryland	100.0	0.4
Virginia	92.3	3.8
West Virginia	100.0	(0.1)
North Carolina	91.2	1.7
South Carolina	92.0	0.4
Georgia	76.9	2.2
Florida	100.0	0.1
Kentucky	95.2	2.5
Tennessee	76.9	3.2
Alabama	91.0	0.6
Mississippi	97.9	1.6
Arkansas	91.3	0.2
Louisiana	97.1	0.2
Oklahoma	90.1	1.0
Texas	84.4	1.3
Montana	100.0	0.4
Idaho	96.8	0.1
Wyoming	100.0	(0.1)
Colorado	100.0	0.6
New Mexico	100.0	0.1
Arizona	100.0	0.2
Utah	100.0	0.1
Nevada	--	--
Washington	99.3	0.7
Oregon	95.1	0.2
California	99.8	2.1
Alaska	--	--
Hawaii	--	--
United States	34.4	100.0

Source: Concentration ratios are from Packers and Stockyards Administration, USDA, Washington, DC. Distribution of slaughter is from Livestock and Meat Statistics, USDA, Washington, DC, 1979. Also, (0.1) indicates values less than 0.05%.