

## Cost Structures of Pork Slaughter and Processing Firms: Behavioral and Performance Implications

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### ASL-R1503

#### Introduction

The pork slaughter and processing industry is rapidly becoming more concentrated. Packers are more closely linked to producers via production and marketing contracts or vertical integration into hog production. The USDA reports that the number of plants with over a half million dollars in sales fell 42 from 1984 to 1994. The top four firms accounted for 34% of hog slaughter volume in 1980, rising to over 57% in 1997. The slaughter and processing industry is populated by smaller number of firms, but an increasing number of multiplant companies. Double shift plants processing 12 - 17,000 hogs per day are commonplace, and the largest plant now processes over 26,000 head per day. Costs of slaughtering and processing livestock are seldom analyzed by economists. Yet costs are important considerations in a number of issues in the livestock industry, including profitability, farm-wholesale-retail margins, the standards to be able to meet or beat if entry into the packing industry is being contemplated. In addition, cost structures for packers may be a contributing factor to their stronger linkages with hog producers, or their entry into hog production enterprises.

In late 1996 and early 1997 personal interviews were conducted with managers of eight firms responsible for over 70% of industry slaughter volume, including the six largest firms and two firms with the newest plants. Their own costs were directly provided in most cases; in others, their own costs served as reference points for their estimates of representative industry cost structures. Because many plants are now double shift plants, managers were asked to estimate typical costs in plants operating either one or two shifts near sustainable full capacity (approximately 95% of rated capacity) at the approximately 1,000 head per hour rate typical in the industry today (or their own operating rate).

Fixed costs were typically defined narrowly as plant and equipment costs amortized over their useful economic life, plus interest on that investment, and any other related costs (e.g. property tax, insurance, etc.). Variable costs were defined as all other costs associated with operating a pork slaughter and processing plant, except the cost of the market hog, including shared administrative costs from

corporate headquarters in multiplant firms. The extent of processing built into their cost estimates was either what the firms actually did recently, if they supplied their own costs, or what they considered typical in the industry if they were estimating representative cost levels. Typically, in the largest firms sampled, approximately 50% of fresh bone-in product such as loins and hams are being deboned, most bone-in loins and butts are being further trimmed, and a majority of bellies are skinned within the plant where the hogs are initially slaughtered, though the extent of further processing varies widely by plant and company.

#### Variable Costs

The focus on costs in this paper is on the costs other than livestock costs. Livestock costs will vary cyclically and seasonally, averaging around 70% of all costs. We focus on the other variable costs per hog processed for single-shift and double-shift plants. For all respondents, the extreme range in variable cost estimates was from \$16 - 32 per animal processed for plants involved in the typical range of pork slaughter and processing functions. The typical single-shift costs were mostly in the \$20 - 25 range compared with \$16 - 25 for double-shift plants (Table 1). Most two shift estimates were near \$20, whereas the single shift estimates averaged \$22 per head. The average of the two shift estimates was \$20, with a range of \$16 - 25. These estimates

**Table 1. Pork slaughter and processing costs 1996 - 97.**

	Variable costs, \$ per head	Fixed costs, \$ per head
Single shift		
Average	22	6
Range	20-25	3-10
Double shift		
Average	20	3
Range	16-25	1-6

included all in-plant costs and allocation of administrative costs from corporate headquarters in multiplant operations. The biggest variable cost differences among plants were usually attributable to the extent of further processing and fabrication of pork products in a plant - more deboning and further processing involves much higher labor costs. Labor costs typically comprise approximately 50% of in-plant and administrative costs,

with approximately 50 - 60% of those labor costs for production workers in the plant. Packaging is another significant cost factor, comprising approximately 10% of variable costs in the mid-1990s. Cryovac or similar vacuum packaging of most pork products can cost \$1.50 - 2.00 per head.

### **Fixed Costs**

Annual amortization rates of fixed costs per head differ for one- and two-shift plants, and at varying capacity utilization rates. Estimates of fixed costs per animal for single shift plants operating near full capacity ranged from \$3 - 10 per head, whereas double- shift plant fixed cost estimates ranged from \$1 - 6 per head. The plants covered in the survey varied from new ones with varying degrees of financial assistance from local economic development authorities, to plants that had been closed, then bought at very low cost relative to building a new plant, and refurbished extensively, often with assistance from local or state agencies. Mean estimates were \$6 per head for single-shift plants, and \$3 for double-shift plants. Replacement costs sometimes would be higher than the fixed cost estimates provided here.

One industry expert suggested that adding a double shift usually would add 20% to building and equipment costs (for extra cooler capacity, etc.), but volume would increase approximately 95%. This would suggest that double-shift fixed costs are approximately 60% of single-shift costs per head processed (close to the survey results).

### **Capacity Utilization**

Fixed costs per head for plant and equipment also will vary dramatically in direct relation to the percentage of capacity utilization. The pork sector exhibits both significant seasonal and cyclical variation in hog production and slaughter, and typically has excess capacity even at times of peak industry slaughter (although the practical capacity limit temporarily was reached in late 1994).

Because pork packers typically guarantee to pay their unionized plant labor force for 32 or 36 hours work per week, this cost is essentially fixed in the short run once a plant begins operating in a week. When the number of hogs purchased is below the number necessary to fully employ their workers for the guaranteed hours, packers often are more willing to bid significantly higher prices to increase their capacity and labor force utilization. The marginal costs of purchasing, slaughtering and processing additional animals, even at sharply higher purchase prices, can still be lower than the expected prices for the end products. Packers bidding higher prices to more fully use fixed labor commitments can optimize profitability in the

short run, with revenues covering all marginal costs in the short run. In so doing, they also maintain long-term customer and supplier relationships, and reduce labor force turnover. Market prices sometimes surge when hog supplies are less than expected in mid-week, and extended periods of poor returns for packers are symptoms of the frequent periods of excess capacity and the marginal cost structure found in this industry.

When livestock numbers are quite large, running a plant on Saturdays usually involves overtime time and a half wage rates for hourly production workers. Some managers indicate that the incremental increase in variable

cost per head on Saturday is approximately equivalent to the reduction in fixed cost per head associated with the larger volume processed.

When hog supplies are low, firms have to choose among bidding higher prices for a larger share of the hogs, closing one shift at double shift plants, or closing an entire plant and shipping some hogs longer distances to their other plants. The plants and firms with the most variable sources of hog supplies are most vulnerable in the low volume stage of the hog cycle, especially in fringe areas of hog production. The growth in production contracts, self production or long term contracts has been much faster in areas such as North Carolina and Oklahoma, where uncertain hog supplies have a much greater opportunity cost than in the Midwest. But long term marketing contracts with producers are rapidly increasing in the Midwest now, in competitive response to some packers locking up high quality hogs and high volume producers via marketing contracts, which forces other packers bear more of the brunt of cyclical and seasonal supply downturns if they do not follow similar purchasing strategies.

### **Multiplant Incremental Costs**

Adding a plant to a firm with two or three plants would reduce variable costs for each plant by approximately \$1 per head, while adding a plant to a single plant firm would reduce costs slightly more than that. This is clearly an incentive to continue increasing the size of firms in the pork slaughter and processing industry.

### **Other Size Influences**

As plant and firm volume increase, the ability of these operations to serve the largest volume export and domestic customers is enhanced. There is a larger population of hogs from which to select products to meet demanding customer specifications, and provide high volumes with fewer transaction costs. Having more plants reduces the risk of supply interruptions for the customer, as a storm, strike, or fire at one plant can be offset by volume

changes at other plants. Increased research and development becomes more feasible, and advertising and promotion costs per unit decline. More further processing or by-product salvage operations become feasible with larger volume at a plant. However, transport costs may rise to serve more distant locations, additional sites may be more difficult to purchase and get approved for use as a meat packing plant, etc. But once a site is found and approved, doubling volumes by double-shifting a plant is much less expensive than building another at a different site, if inadequate hog production density or labor supply, and low cost, excess competitive slaughter capacity in the area do not make expansion prohibitive.

### **Summary**

The cost structures outlined here are significant influences to the changing structure and coordination systems employed in the pork sector. Increased market concentration seems likely in response to the economies of size, both within plants and in multiplant operations. Stronger long-term vertical linkages between packer and hog producer (or vertical integration) will continue to increase in importance to reduce quality and quantity risks that are quite costly to packers. Overall efficiency is likely to be enhanced, but market power issues will become more frequently raised if current trends continue.