Chapter 8

Conclusions

We organize our conclusions into three sections. First, we summarize our description of the extent of structural change in cattle and hog slaughter. Next, we discuss the major findings of the cost analyses, along with their implications for cost modeling in slaughter. Finally, we link the two by discussing the impact of industry cost structure on structural change.

Structural Change in Cattle and Hog Slaughter

Major consolidation occurred in each industry, as large plants supplanted small and now dominate production. In each case, the shift to large plants occurred quite rapidly, over a short time period—from 1977 to 1992. Consolidations on such a dramatic and rapid scale are quite rare in U.S. manufacturing.

Consolidation in slaughter proceeded apace with consolidation in related animal production sectors, as cattle feeding shifted toward large commercial feedlots and hog production shifted toward large hog farms. Because meatpacker procurement generally occurs over a limited geographic area, slaughter plants are closely linked to local feeding and finishing operations. As cattle feeding and hog production shifts geographically, slaughter plants follow. In new areas with limited networks of producers and slaughter plants, buyers and sellers are less likely to rely on spot market cash transactions to arrange for the transfer of animals, and more likely to use alternatives such as contracts and vertical integration.

In cattle slaughter, where the demand for cattle declined through time, consolidation was accompanied by sharp increases in market concentration, as the number of independent plants fell sharply. In hog slaughter, where the market grew slowly, concentration increased, but less so than in cattle. In poultry industries, where market growth was rapid, concentration changed little despite a consolidation of production in large plants.

Consolidation was accompanied by important changes in product mix in each industry. Large cattle plants

now ship more output as boxed beef and ground beef instead of whole and half carcasses, thereby taking on tasks that had been performed in distribution facilities. Hog plants moved to perform a similar set of tasks, but from a different starting point. That is, hog slaughter plants now commonly perform slaughter and byproduct processing, and also cut carcasses up for shipment much like boxed beef. But many hog plants used to process carcasses into hams, bacon, sausages, and other prepared products. Specialist processors are more likely to perform those tasks today.

Slaughter Industry Cost Structure

Our cost analysis emphasized the estimation of economies of scale—the effects of plant size on unit costs. We found that scale economies were modest but extensive. The largest plants maintained only small cost advantages (1 to 3 percent) over smaller plants, but these modest scale economies appeared to extend throughout all sizes of 1992 plants (the last year of our cost data). The very largest plants in that year did not exhaust all possible scale economies. Still, scale economies were larger and more extensive at the end of the study period (1992) than in earlier years.

Large meatpacking plants traditionally paid higher wages than small, and this pecuniary diseconomy limited the technological cost advantages that scale economies offered large plants. However, size-based wage premia disappeared during the 1980's, reinforcing the effects of expanding technological scale economies.

The second major emphasis of our cost analysis was on product mix. Product and input mix influences costs, and mixes vary widely across plants and over time. Because product mixes are correlated with plant size (larger cattle plants produce greater proportions of boxed beef, for example), their omission in models can lead to biased estimates of scale economies and of the extent of technological change and productivity growth. Finally, our measures show that there may be small economies of scope in cattle slaughter, in that

larger plants can combine slaughter and fabrication at lower cost than smaller plants.

The distinctive feature of slaughter plant operations, compared with other manufacturing operations, is the importance of materials, particularly animals, in total costs. By implication, labor, capital, and energy expenses form much smaller shares of costs in slaughter industries than elsewhere. It is this importance that ensures that scale economies have modest effects on costs, because scale economies primarily arise in the use of other inputs—labor, capital, and energy—at slaughter plants. Moreover, although there is some theoretical scope for substitution between animals and other inputs in the production of meat, our analyses show that there is virtually no actual substitution; one can reasonably estimate "value-added" cost functions for slaughter under the assumption of no substitution.

From Costs to Structure: Did Scale Economies Cause Consolidation?

Our evidence shows modest scale economies in cattle as well as hog slaughter: large plants can produce meat at slightly lower costs than small slaughter plants. These advantages became more important in the 1980's, as the industries consolidated and production shifted to large plants. That is, the existence of scale economies, and the timing of their appearance, suggests that consolidation occurred because of scale economies.

But scale economies cannot be a complete explanation for consolidation because the cost advantages held by large plants are not particularly large. Small plants appear to survive, and consolidation is staved off, in many industries with larger scale economies than those found in meatpacking (see, generally, the discussion in McKinsey Global Institute, 1993, or its related summary in Baily and Gersbach, 1995). For modest scale economies to lead to consolidation as massive as that in meatpacking, the industry was likely subject to strong price competition. That is, small plants will close if market prices are below small plant unit costs; for market prices to be below small plant costs, they must in turn be quite close to large plant unit costs, due to small differences between small and large plant unit costs.[29]

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[29] Strictly speaking, average variable costs, but variable costs in meatpacking are very close to average total costs.

The labor strife of the 1980's, as reported in chapter 4, may also reflect strong price competition in the industry. While unionized plants had substantially higher wages than nonunion plants in the 1970's, the effect on costs would be small because the share of wages in total costs was small. For small cost differences to lead to plant closures and lockouts, the higher cost unionized plants would have to have been under strong competitive price pressures from the nonunion plants.[30]

Our conclusions about price competition in slaughter must be more speculative, because they are based not on our own work but on the published literature, with far more information for cattle than for hogs. The existing literature suggests that departures from competition in cattle slaughter have been small and rare. In competitive markets, product prices should equal marginal costs of production, while prices paid for inputs (like cattle) will equal the value of the input's marginal product. Attempts to measure departures from competition take two forms. Researchers may attempt to directly estimate the gap between prices and the corresponding competitive magnitudes (marginal costs or marginal value products), relying on the econometric estimation of demand and cost models. Alternatively, they may attempt to see if prices vary systematically with variations in competitive conditions, while trying to hold (or assuming) constant other cost and demand factors.

Most early studies took the latter approach. For example, Marion and Geithman (1989) examined how prices paid for slaughter cattle varied with buyer concentration across buying regions, while also controlling for interregional differences in labor costs and interseller differences in feedlot size. They found that buyers in more concentrated markets paid less for cattle, but that the differences were small: prices for cattle fell by 3.4 percent, at most, as one moved from the least concentrated to the most concentrated region. Other early studies, surveyed by Azzam and Anderson (1996) found similar results: concentration effects, if they existed, were small.

More recently, the Texas A&M Agricultural Market Research Center (1996) used far superior data to arrive

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[30] Large plants may also realize marketing advantages over smaller plants through export markets and nationwide shipping. However, marketing advantages are difficult to identify in these data sets (or in other existing ones).

at a familiar conclusion. They were able to control for a wide array of cost, cattle characteristic, and demand measures, and found that prices paid for cattle in 1992 were lower in more concentrated regions, but that cattle prices fell by only 2.4 percent as one moved from the least to the most concentrated market. Moreover, the most concentrated regions in these studies are remote areas that host some relatively small plants. The less concentrated regions are the areas of consolidation of large plants in the Plains: there, prices are slightly higher.

Studies that rely on direct estimation of gaps between prices and corresponding competitive values reached similar conclusions. Those based on reliable estimation of demand and cost functions may disagree as to whether prices equal competitive magnitudes, but none found large departures of prices from those magnitudes. For example, Morrison (1998) found that product prices exceed marginal costs of production (the competitive magnitude) by a small gap, 5 to 10 percent, which indicates that plants had very limited market power in product (wholesale meat) markets. She further found that prices paid for animals in input (cattle) markets were not below competitive levels.

Finally, measures of farm-to-wholesale price spreads did not increase over time as concentration increased. The aggregate USDA measure of the farm-to-wholesale price spread for choice beef reflects transportation, slaughter, and fabrication costs (Nelson and Hahn, 1998). Adjusted for inflation, the spread fluctuated during the 1970's, but fell steadily and sharply from 1979 through 1992, the period of sharpest consolidation, even as plants added more fabrication and the attendant costs. Farm-to-wholesale margins did

rise sharply between 1992 and 1995, but then fell back again in 1996 and 1997.

Several factors, whose effects are difficult to measure, may have helped to increase concentration in meatpacking—these include economies of operating multiple plants, large firm marketing advantages (particularly in exports), and mergers among packing firms. But if the pricing evidence is correct, then the following three measurable factors clearly combined to help increase concentration in cattle slaughter: (1) shifts in scale economies provided larger plants with modest cost advantages; (2) aggressive price competition forced prices to quickly move near the costs of the low-cost market participants; and (3) slow demand growth limited the number of efficient large plants in the market. In hogs, scale economies and strong price competition have also forced small plants to exit the industry, but faster demand growth allowed for more plants and lower concentration.

Our evidence suggests that once new and extensive scale economies emerged in meatpacking, intense price competition led to the exit of high-cost small plants, their rapid replacement by larger and more efficient plants, and significant increases in market concentration. The policy challenge for the future is to ensure that a result of the process, high concentration, does not erode a key contributing factor—price competition among packers. The analytical challenge is to continue to update the evidence so that we can effectively monitor competitive conditions in an industry that is now concentrated, and to ensure that we adequately understand the causes and effects of continued change in the industry.