

## The Changing Structure of the U.S. Livestock and Poultry Industries

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### Findings

- Technological change, adjustments to risk, and transaction costs have been primarily responsible for the changes in the structures of the U.S. livestock and poultry industries.
- The U.S. beef industry is unlikely to evolve to a structure similar to that of the poultry and pork industries because of differences in economies of size, risks, and transaction costs.

### Introduction

The U.S. livestock and poultry industries have undergone significant structural change in recent decades. Both the broiler and hog industries have evolved to a structure including vertical integrators that contract with producers to raise animals under strict specifications. In both industries, technological change has been rapid, leading to consistent quantities and qualities of products that meet consumer demand. The U.S. beef industry has evolved toward greater vertical coordination, but the structure of today's industry is very different from that of its competitor industries. This study examines why the structure of the beef industry differs from its competitors and provides insight as to how the industry might be structured to better compete.

Three major trends are apparent in the three industries. First, firm sizes have increased dramatically in recent years, especially in the hog and broiler industries. This has been primarily because of rapid technological change associated with raising hogs and broilers indoors. Second, consumption patterns have changed over the past 50 years, with poultry per capita consumption increasing dramatically, while beef per capita consumption has decreased since the mid-1970s. These changes in consumption are attributed to health concerns associated with red meat, lower prices of chicken relative to beef, and an increase in value-added poultry products. Third, vertical coordination has increased. Practically all U.S. broilers and about one-third of U.S. hogs are produced under contract. The beef industry is less coordinated, though captive supplies and retained ownership of calves have increased in recent years.

### Experimental Approach

To examine the evolution of these industries, a proven economic model is useful. Reimund et al. presented a model depicting the evolution of agricultural industries to vertical coordination. In the first stage, new technology is developed and adopted by producers. The industry typically shifts in location (stage 2) as new regions have an advantage in producing under the new technology. The industry grows and develops as firms expand to take advantage of the economies of size associated with the new technology. Finally, the larger firms face greater risks and transaction costs than they did when they were smaller. To compensate, they adopt risk- and transaction cost reducing business arrangements. Government or industry policies can either speed or slow this evolution. This model is used in this study to show the evolution of the three industries.

### Results and Discussion

*The U.S. Broiler and Hog Industries.* In 1997, 46 vertically integrated firms controlled more than 95% of U.S. broiler production (Thornton). Contract growers provide housing, equipment, utilities, labor, and bedding to raise contractor-owned birds to specified weights, using contractor specifications, and contractor-owned feed, services, and supplies. Contractors typically own feed mills, hatcheries, and processing. Before the 1950s, broiler production was primarily a sideline operation. Advances in feeding, health, breeds, housing, processing, shipping, and management allowed for increased efficiency. Today, 1.8 pounds of feed yield 1 pound of broiler, compared with 3.8 pounds of feed in 1950.

Gillespie et al. discussed changes in location of the broiler industry. From 1945 to 1995, U.S. broiler production increased 3,278%. The top three broiler-producing states in 1945 were Delaware, Maryland, and Virginia; by 1995, the top three were Georgia, Arkansas, and Alabama. Why did production shift south? New technology required different housing and processing facilities. Producers in new areas were not hampered by capital investment tied to earlier production methods. The many underemployed farmers and favorable climate in the new region favored broiler production (Reimund et al.). The industry grew as vertical integration became the



industry standard and companies became increasingly attuned to consumer demand.

Several forces encouraged vertical coordination. In adopting new technology and expanding operations, growers faced increased market risk. They sold greater volumes and often specialized in broiler production. Contracts that reduced price risk increased in acceptance. Tournament contracts, which pay growers based on production relative to all other growers selling at the same time, shifted some of the production risk to the integrator. "Transaction costs" also increased. More market transactions associated with purchasing inputs and selling broilers increased costs of conducting business. Contract production could reduce these costs. In addition, new facilities were expensive and had no use other than for broilers. With tight margins, growers were forced to keep facilities employed year-round to cover payments on the investment. Contracts helped with timeliness. Many producers could not secure a loan for the expensive facilities without the assurances of a contract. Feed mills and processors also had incentives to contract. Both needed to maintain full operational capacity. Coordinating the scheduling of birds allowed this to occur. Also, the market called for birds of certain specifications. Control of contract specifications ensured that the processor could procure these birds with minimal transaction costs.

Independent producers continue to be involved in U.S. hog production, though contracting similar to that in the broiler industry is on the rise. Some producers have formed cooperatives to benefit from many of the positive aspects of contracts while maintaining independence. Indoor confinement of hogs allowed rapid technological change. From 1954 to 1994, U.S. average litter size increased from 5.3 to 8.7 pigs (Census of Agriculture). Shifts in production location also occurred. From 1987 to 1992, Iowa, Illinois, and North Carolina increased production by 14%, 5%, and 108%, respectively. North Carolina replaced Illinois as the second largest hog-producing state. Environmental regulations, anti-corporate farming laws, and the willingness of producers in traditional broiler-producing states to accept contracts partially explain the location shift. Other non-traditional states have recently increased production. Industry growth followed.

As with broilers, risk has influenced large-scale hog producers to accept contracts. Some of the price and production risks are shifted to the contractor. Large investments in hog-specific facilities encourage contracts that ensure facilities are used at full capacity. Transaction costs associated with procuring inputs and selling output may be reduced with contracts.

Independent production continues, with many independents forming cooperatives to produce consistent quantity and quality of hogs to compete with the integrators. Many of the incentives of broiler processors and feed mills to integrate with broiler production also hold for the hog industry.

***The U.S. Beef Industry.*** The cow-calf segment is present in every state. Stocker producing firms are, in some cases, separate from the cow-calf segment. The U.S. feedlot segment is located mainly in the High Plains, but also in the West and Midwest. Animals remain in the feedlot 90 to 240 days before slaughter. Some vertical coordination exists among the segments, though no single type of coordination is an industry standard. Most calves and stockers are sold via conventional auction; others are sold via video auction, direct-to-order buyer, or over the Internet. Retained ownership has limited use by cow-calf and stocker producers, whereby they maintain ownership of cattle through the feedlot. This allows producers to increase average returns and obtain data on the calf's feedlot performance. Captive supplies, including packer feeding, basis forward contracts, and exclusive marketing/purchasing agreements between packers and feedlots, have limited use. These mechanisms allow packers to schedule slaughter in advance and accounted for about 20% of steer and heifer slaughter in the early 1990s (Ward et al.). The beef breeding segment differs greatly from its competitor industries. Many purebred breed associations exist, each consisting of many independent operators. Crossbreeding is common. Relatively few U.S. beef cattle (about 15% to 20%) result from artificial insemination.

Vertical coordination has increased, but the beef market remains inefficient in transferring consumer preferences to producers via the pricing mechanism. Each industry segment has different goals. Cow-calf producers emphasize calving rate, birth and weaning weights, milk production, and calving ease. Stocker operators emphasize feed conversion, breed, rate of gain, condition, and animal color. Cattle feeders emphasize feed conversion, cattle and feed prices, quality and yield grades, and rate of gain. Though an increasing portion of fed cattle is priced on a value-based system, packers continue to buy most cattle in lots, so they are sold on an average price basis. The result is confusing price signals from consumer to breeder.

Technology in the beef industry has progressed, but cattle productivity has not increased as fast as its competitor industries. Dressed beef production per cow increased 25% from 1980 to 1995; dressed pork production increased 90% (Brester et al.). The longer

generation interval for cattle and single-birth capacity partially explains this. The large number of beef breeds, however, disallows concentrated efforts on a few genetic lines. Little packer coordination has emerged to encourage fed cattle uniformity, resulting in many breeds. The major shift in location of production has been with the feedlot segment, from the Midwest to the High Plains in the early 1970s, because of the High Plains expansion of irrigated grain and its sparse population.

Vertical coordination in the beef industry has been limited. Why? The limited capital investments in buildings and equipment in the cow-calf and stocker segments do not provide incentives for contracting. Fixed assets used in cattle production, such as fencing and buildings, are useful for enterprises other than cattle production. In addition, economies of size in the cow-calf and stocker segments appear to be limited, with relatively small operations continuing to operate. Cattle producers sell product rather infrequently, sometimes as rarely as once per year, so transaction costs are relatively low. If a vertical coordinator were to contract with a cattle producer, it would be difficult to accurately assess the producer's effort, given the high level of risk associated with outdoor production, as compared to the more controlled environment with indoor production. In comparison with the broiler and hog industries, price risk is lower because of the smaller economies of size, transaction costs are lower because of less frequent sales, and initial investment in cattle-specific technology is lower. In short, cow-calf and stocker producers have little incentive to contract. Examining the four stages of industry evolution, it can be argued that development of high-investment cattle-specific technology has been limited; thus, the higher risks and transaction costs that typically result from this type of technology have not arisen.

**Where Is the Beef Industry Headed?** Since the beef industry is not poised to move toward a structure resembling poultry and pork, what can the industry do to increase its efficiency and become more competitive? We argue that packers must be the primary instigators of a more efficient industry structure. Increased use of value-based pricing would provide greater incentive for feedlots to offer prices for calves and stockers that reflect consumer demand. Better efficiency in pricing to the feedlot and, ultimately, to calf and stocker producers would increase animal quality consistency sent to the feedlots. Cooperatives and strategic alliances could be formed by producers to provide large quantities of consistent quality animals that reflect the needs of feedlots and, ultimately, packers and consumers. With more uniform

animals, packers would be better able to specialize in the products they handle, increasing value-added products that reflect consumer preferences. The call for more consistent animals would result in a subset of breeds being identified as superior. More concentrated research on increasing the efficiencies of this subset of breeds could then occur, increasing feed efficiencies and reproductive capacities. Individual sires and families within a breed could be identified that lead to superior meat products. Beef breed associations and state cattlemen's associations could serve as facilitators for a more efficient industry by inviting packer buyers to their meetings to discuss the types of animals they prefer. In summary, by increasing the efficiency by which prices that reflect the true value of cattle are made, the industry can progress to a lower-cost product that also meets the demands of consumers.

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