A Crossroads for the Cattle Industry

By Alan D. Barkema and Mark Drabenstott

A decade of mergers, buyouts, and declining cattle numbers has brought the nation's cattle industry to a crossroads as it enters the 1990s. One road would continue the path of the past decade—toward a smaller, more concentrated industry. The other road would change direction and allow some expansion in the industry, although most segments might remain highly concentrated. Which road the industry takes will depend on consumers and their willingness to purchase beef instead of other meats.

The future course of the cattle industry will have great impact on the farm economy in the region. At the farm level alone, cattle account for nearly $15 billion of annual farm income in the seven states of the Tenth Federal Reserve District—Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Wyoming. The economic activity associated with beef processing is even greater. District states are home to some of the nation's largest beef feedlots and beef packing plants, a critical economic base for many rural communities in the region. For these communities, the two roads ahead spell two very different futures: one road leads to economic stagnation or decline and the other road leads to economic growth.

The future of the cattle industry depends on whether it can lower its costs while satisfying the consumer's demand for leaner, more convenient beef products. The industry has little prospect for cutting costs further through traditional methods. But a new industry effort to deliver beef products better suited to today's consumers could also unlock significant cost savings. If successful, the new strategy would push the district's cattle industry toward expansion.

The first section of this article reviews the downsizing and increased concentration that occurred in the cattle industry over the past

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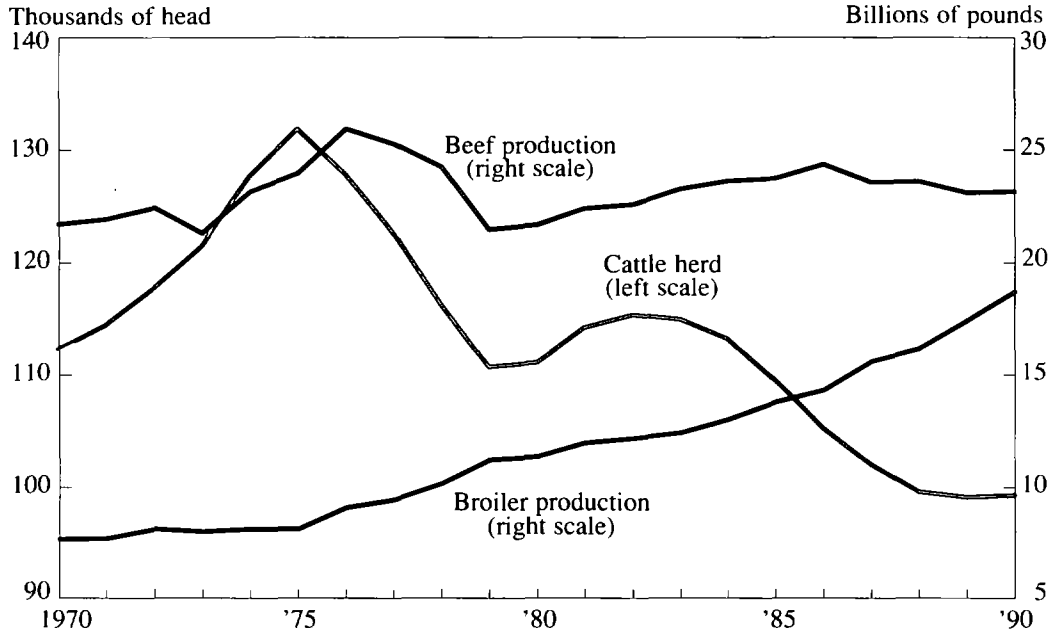
Chart 1
Cattle Herd Size and Meat Production



Source: U.S. Department of Agriculture, *"Agricultural Outlook"*; U.S. Department of Agriculture, *"Cattle."*

decade. The second section examines the cost and marketing problems that led to a sharp decline in beef consumption, the economic force that set in motion the downsizing and drive to concentration in the industry. The third section explores the cost-cutting and marketing alternatives available to the industry in the 1990s, and considers how each alternative may affect the regional economy.

I. A Decade of Concentration for the Cattle Industry

The cattle industry has just finished a decade of remarkable structural change. Cattle numbers fell to the lowest level in 30 years. And while most observers expected the industry to become more concentrated in the 1980s, the industry's move toward concentration was faster than expected. In addition, the cattle feeding and beef packing segments of the industry became more integrated throughout the decade.

Industry size

By simple measures, the cattle industry shrank in the 1980s. One overall indicator of the industry's size is the number of cattle in the United States. The nation's cattle herd peaked at 132 million head in 1975, fell to 111 million in 1980, and fell further to 99 million in 1990 (Chart 1). Today's herd is the smallest since 1960.

But while cattle numbers fell throughout the decade, the amount of beef produced has stayed relatively constant. During the 1980s, U.S. beef production stayed within a fairly narrow range of 21.6 to 24.4 million pounds. The anomaly of

falling numbers of cattle and relatively steady beef production is explained by a change in the *type* of cattle slaughtered. Beef packers increasingly slaughter larger, heavier cattle.

Although beef production held fairly steady in the 1980s, beef fared poorly compared with other meats. Chicken production increased nearly two-thirds during the past decade and turkey production increased 88 percent. Pork production, like beef, was essentially constant. Thus, while beef output was relatively steady in the decade, beef was an ever smaller share of a growing overall meat market.

Industry concentration

The beef industry became much more concentrated in the 1980s. In addition, the tendency toward larger firms was not equally shared across the entire industry. Of the industry's three main segments—processing, feeding, and ranching—concentration was most pronounced in packing and feeding.

The most important change in the cattle industry in the 1980s was the dramatic concentration that occurred in beef processing. Following a flurry of buyouts and plant closings, beef processing in the United States moved into the control of fewer and larger companies. At the beginning of the 1980s, the largest four firms controlled slightly more than a third of the cattle slaughtered. By the end of the decade, their market share had more than doubled to 70 percent.

The cattle feeding segment of the industry followed a strong, if somewhat slower, trend toward concentration. Farm feedlots controlled a quarter of the nation's cattle on feed in 1980, but just 16 percent in 1988—the last year for which data are available (Table 1). Commercial feedlots, on the other hand, increased their overall share from 43 percent in 1980 to 50 percent in 1988. The largest commercial feedlots now control nearly a third of the cattle slaughtered.

Table 1

Structure of the Cattle-Feeding Industry
Share of Feedlot Cattle Sold
(Percent)

	1980	1988
Farm feedlots (less than 1,000 head)	25.0	16.3
Medium-sized feedlots (1,000 to 16,000 head)	32.3	33.5
Commercial feedlots		
Medium (16,000 to 32,000 head)	20.4	18.7
Large (more than 32,000 head)	22.3	31.6

Source: U.S. Department of Agriculture, Statistical Reporting Service, *Cattle*.

Ranching was the only segment of the cattle industry that stayed relatively unchanged in the decade of the 1980s. Ranching has always been less concentrated than cattle feeding because calf production uses more land, labor, and management per unit of output. Thus, it is less amenable to economies of size than cattle feeding or processing. The smallest ranches still control about 15 percent of the nation's beef cows, while large ranches control about 30 percent.

Industry integration

As cattle feeding and beef processing became more concentrated, these two key segments of the industry also became more integrated. Processors want to keep their large plants operating at or near capacity since average operating costs rise very rapidly if a plant is not operated at its optimum rate. For example, operating costs rise nearly $8 per head

if a modern slaughtering and fabrication plant is operated at only 80 percent of its optimal rate. An $8 rise in costs cuts in half a large plant's cost advantage over a smaller plant (Ward 1988).

To ensure their large plants work near capacity, beef processors have promoted new market mechanisms to "capture" their future supply of slaughter cattle. The term captive supply has been given to cattle that packers arrange to be delivered far in advance of slaughter to guarantee a major part of their future slaughter needs. Captive supplies are now a significant part of the market; an estimated 19 percent of cattle slaughtered in 1988—the only year for which data exist—were captive supplies (Purcell 1990).

Processors have used three market innovations to capture supplies: feeding their own cattle, forward contracting with feedlot operators, and purchasing agreements with livestock feeders. While some processors own feedlots, the practice of a processor feeding its own cattle is still uncommon. Under a forward contract, a processor signs a contract to purchase a certain number of cattle at a specified price on a particular date. This practice is becoming quite common. Under a purchasing agreement, a feedlot agrees to market a certain number of cattle to the processor on a predetermined schedule with the price set in a specified manner. This practice is also gaining wider acceptance.

A key to the future of the cattle industry will be whether more steps are taken to integrate cattle feeding and processing. Further integration might significantly cut the cost of producing beef, a critical determinant of beef's competitiveness in the retail market. But greater integration will also affect which firms survive in the future. Smaller feedlots that are unable to meet the volume or quality specifications of large processing firms may have limited opportunities to market their cattle.

II. What Drove the Cattle Industry Toward Concentration?

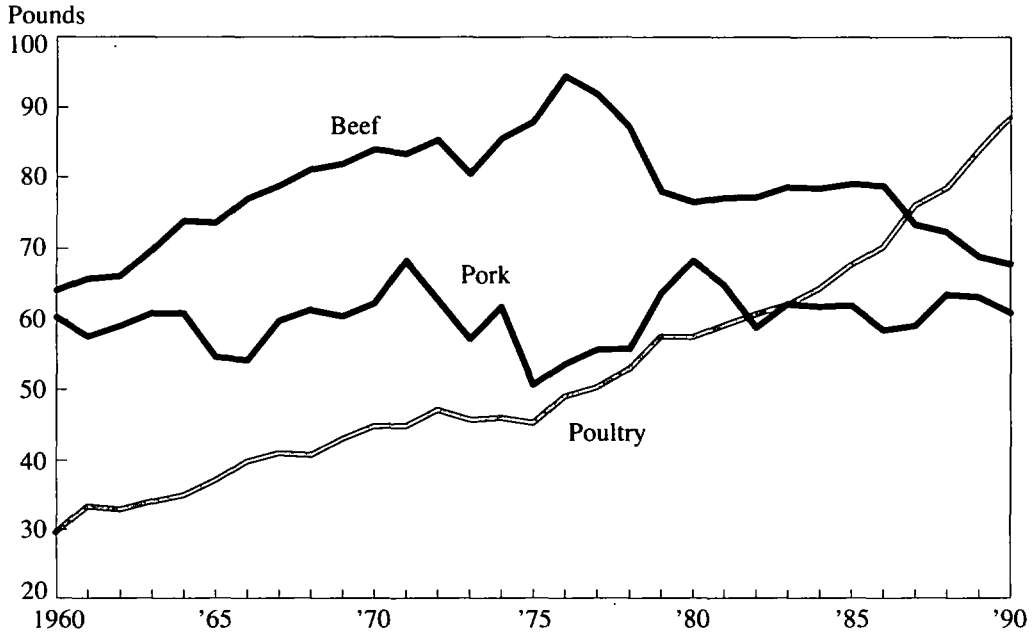
What caused the cattle industry to change so fundamentally in the 1980s? The answer, in a word, is consumers. A striking decline in per capita demand for beef appears to be the force behind the drive to concentration. Throughout the past decade and a half, consumers bought more poultry and less beef. The slump in beef demand squeezed profit margins throughout the beef industry, triggering a scramble for cost reductions that ultimately resulted in a more concentrated industry.

While industry observers agree that consumers were the driving force behind the industry's concentration, they disagree sharply on *why* consumers cut back on beef purchases. Consumers may have changed their diets because lifestyles changed or because of health concerns related to consuming red meat. On the other hand, consumers may have cut beef purchases simply because retail beef prices remained higher than other meats, especially poultry. Which explanation is more telling not only explains demand developments during the past decade but will also have a dramatic effect on the future of the cattle industry.

What happened to beef consumption?

Beef consumption began falling in the mid-1970s, and the decline persisted throughout the 1980s. Per capita beef consumption peaked at 95 pounds in 1976, a year after the nation's cattle herd reached its crest (Chart 2).[1] Consumption then began to plummet, eventually falling to an estimated 67.8 pounds in 1990—only modestly higher than in 1960. While beef consumption was falling, growth in poultry consumption accelerated. Per capita poultry consumption is expected to be nearly 91 pounds in 1990, about 75 percent more than in 1976 when the slide in beef consumption began. And while U.S. con-

Chart 2
Per Capita Meat Consumption



Source: U.S. Department of Agriculture, *"Agricultural Outlook."*

sumers have cut back on beef, the rise in poultry consumption has been big enough to push consumption of all meats and poultry to an all-time high of 221.8 pounds in 1990. In short, beef's share of a growing meat market has fallen from nearly half in 1976 to less than a third in 1990.

The cause of the striking shift in meat consumption from beef to poultry is vitally important to the future of the cattle industry, but the cause is sharply disputed. Two possible explanations are at the center of an ongoing debate in the cattle industry. The *lifestyles explanation* suggests consumers chose to eat less beef due to health concerns and changes in lifestyles. The *relative-prices explanation* suggests consumers switched from beef to poultry because beef became relatively more expensive than poultry.

The lifestyles explanation

The lifestyles explanation attributes the decline in beef consumption to two key elements of today's consumer lifestyles. The first element is the consumer's elevated concern for maintaining a healthful diet by reducing saturated fat and cholesterol in the diet. For example, consumers may be paying more attention to the health recommendations of groups like the American Heart Association (AHA). The AHA recommends consumers limit total intake of meat, seafood, and poultry to no more than 6 ounces per day, use chicken or turkey (without the skin) or fish in most main meals, and substitute meatless main dishes for regular entrees (American Heart Association 1985).

The second key element of consumer life-

styles that may have affected beef consumption is the reduced time consumers are willing to devote to meal preparation. For example, the number of single-individual and dual-income households has risen sharply in recent years, and both types of households are believed to spend less time preparing meals than traditional families.[2] In brief, meals-on-the-run has become a national norm. The poultry industry's leadership—and the beef industry's delay—in developing a wide menu of conveniently prepared food products may have boosted poultry consumption at the expense of beef consumption.

Changes in consumer lifestyles and their links to consumer behavior in the market are difficult if not impossible to measure directly. As a result, empirical evidence supporting the lifestyles explanation is generally gained only indirectly. That is, changes in meat consumption that cannot first be attributed to changes in meat price relationships or consumer incomes are often attributed to changing lifestyles.[3]

Notwithstanding the data difficulties, some empirical evidence does show a direct link between changes in consumer lifestyles and changes in beef consumption. One recent study suggests the proliferation of fast-food restaurants in recent years led to increased poultry consumption at the expense of beef (Wohlgenant 1989). That conclusion is based on two facts. First, the proportion of beef consumed as hamburger rather than higher priced retail cuts has increased sharply in recent years, presumably due to the increased popularity of fast-food restaurants. Second, meat market data indicate consumption of hamburger declines more than consumption of higher priced cuts of beef when poultry prices fall. Consumers, apparently, are more willing to substitute poultry products for hamburger than for sirloin. In brief, head-to-head competition between beef and poultry may have increased as consumers grew willing to substitute poultry products for their fast-food hamburgers.[4] Thus, consumers' increased demand for mealtime convenience—as reflected in the increased number of fast-food restaurants—may have promoted the substitution of poultry for beef.

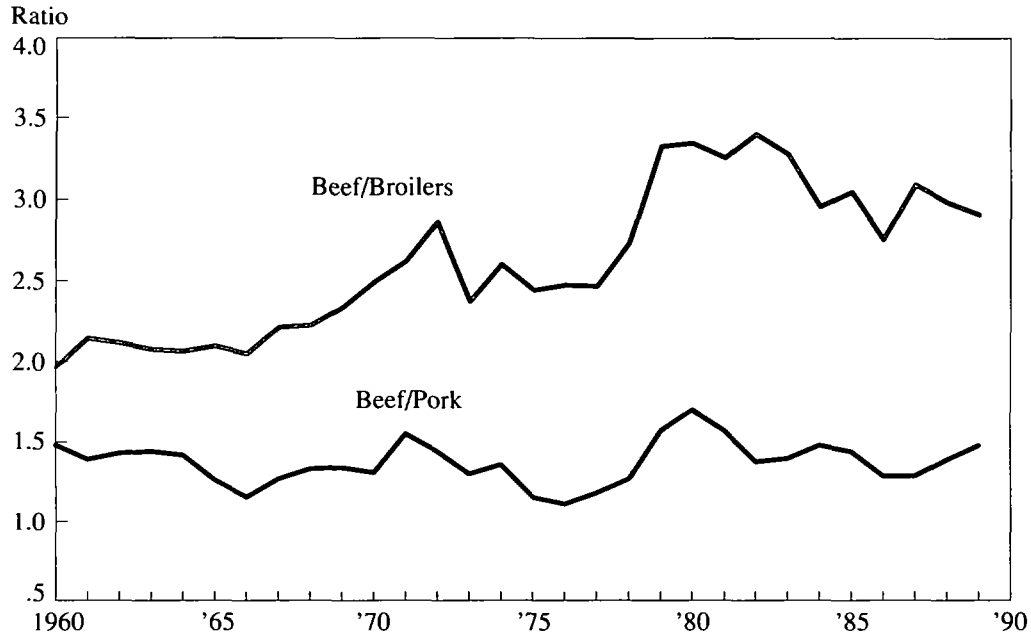
The relative-prices explanation

The relative-prices explanation suggests beef consumption fell because beef became more expensive than other meats. The sharp decline in beef consumption since the mid-1970s occurred as consumer incomes rose and retail beef prices fell, changes that would generally be expected to boost beef consumption. From 1976—when beef consumption peaked—to 1989, real per capita income increased more than a fourth. At the same time, real beef prices fell. Real beef prices at retail in 1989 were nearly a third below the peak that occurred in 1979 and about a fifth lower than in 1960. Thus, rising incomes and falling beef prices should have given consumers the means to purchase more beef.

But beef consumption fell because other meat prices fell even more. Retail broiler prices, in particular, fell faster than retail beef prices. From 1976 to 1982, when the sharpest decline in beef consumption occurred, the ratio of retail beef prices to retail broiler prices rose from about 2.5 to a peak of 3.4 (Chart 3). Since then, beef prices have fallen faster than broiler prices, pushing the beef-broiler price ratio down to 2.9 in 1989. Still, the beef-broiler price ratio remains more than a fifth higher than in the mid-1970s, providing some strong evidence to support the relative-prices explanation for declining beef consumption. Retail pork prices, on the other hand, fell at roughly the same rate as beef prices from 1976 to 1989. As a result, the ratio of retail beef prices to retail pork prices has remained about 1.5 for the past three decades.

The relative-prices explanation is much

Chart 3
Retail Price Ratios



Source: U.S. Department of Agriculture, *"Agricultural Outlook."*

easier to test than the lifestyles explanation because changes in meat prices are relatively easy to measure. One recent study examined the relationship between food consumption and food prices for 40 food groups from 1954 to 1983 (Huang and Haidacher 1989). The results indicated that, other things equal, a 10 percent increase in beef prices was associated with a 6.2 percent decline in beef consumption, a 1.9 percent increase in pork consumption, and a 2.9 percent increase in chicken consumption. Overall, the study claimed that 95 percent of the variation in per capita consumption of beef, pork, and poultry during the 30-year span could be explained by changes in relative meat prices and consumer incomes. A more recent study extended the analysis through 1987 with similar results (D. Johnson and others 1989). Both studies agree that less than 5 percent of the decline in beef consumption since 1976 has been caused by changes in consumer lifestyles.

Which explanation is correct?

Neither explanation for the decline in beef consumption can be easily dismissed as incorrect. Nevertheless, empirical evidence lends somewhat greater support to the relative-prices explanation than the lifestyles explanation. The evidence shows that beef, pork, and poultry can substitute for one another in the consumer's diet. In addition, consumption of all three meats increases as consumer incomes rise. When poultry prices decline relative to beef prices, as happened in the late 1970s and early 1980s, consumers are encouraged to buy more poultry and less beef.

Empirical evidence supporting the lifestyles

explanation is generally not as strong as that supporting the relative prices explanation. Frequently, studies that provide support for the lifestyles explanation are subject to the criticism that a causal link between meat price relationships and consumption has been overlooked (S. Johnson 1989). But lack of direct support for the lifestyles explanation does not necessarily prove the explanation false. Instead, the lack of support may simply reflect the inadequacy of current economic theory, empirical techniques, and data sources to capture the effects of changes in consumer lifestyles.[5]

Some evidence does suggest consumers have become more willing to accept poultry as a substitute for red meat in recent years. But the evidence does not support a strong conclusion on *why* consumers have adjusted their meat consumption. Health concerns and an increased demand for mealtime convenience may have both played a role in the consumer's switch from beef to poultry.

The link between slumping demand and industry concentration

How did the slump in demand push the cattle industry toward consolidation over the past decade? The link depends on two factors: the effect of retail demand on cattle prices and producer profits and the ability of the industry to cut costs through consolidation (see appendix).

Reduced beef consumption drove down real beef prices at retail and at the feedlot. From their peak in 1979 to 1989, inflation-adjusted prices for retail beef fell 30 percent. The soft retail market led to an even steeper fall in prices for fed cattle. Inflation-adjusted prices for fed cattle fell 40 percent from their peak in 1979 to 1989 (Chart 4). The fall in producer prices created big losses for many producers. The resulting squeeze on profit margins triggered a scramble for cost efficiencies throughout the cattle industry. The result was a wave of consolidations aimed at cutting costs.

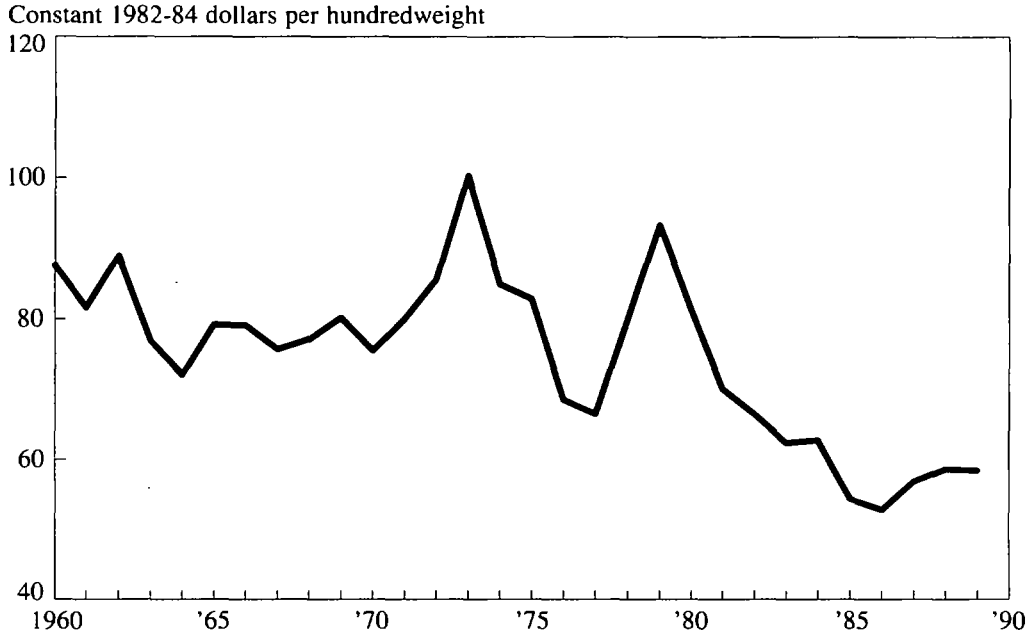
An effective way to reduce costs and bolster sagging profit margins is to combine operations into larger units, thereby capturing economies of size.[6] Economies of size have been found throughout two key segments of the cattle industry, cattle feeding and beef processing. One study of Texas feedlots found total feeding costs in 50,000-head feedlots were nearly 20 percent lower than in 2,000-head feedlots.[7] Similarly, large-scale cattle slaughter and fabrication plants operate more cheaply than smaller plants. For example, combined slaughtering and fabrication costs are about $17 per head (about 25 percent) lower in a 700,000-head-per-year plant than in a 300,000-head-per-year plant.[8]

The lower costs of operating larger feedlots and processing plants provided a strong incentive for increased concentration. As shown in the previous section, the consolidation in cattle feeding and beef packing has proceeded apace in the 1980s. What remains unknown is whether the industry will be forced to undergo further consolidation in the 1990s.

III. The Road Ahead for the Cattle Industry

Beef prices and consumer lifestyles figure prominently in explaining changes in the cattle industry over the past decade. They also promise to be central to the future of the industry. The outlook for the cattle industry over the coming decade might be summed up by two questions: First, can the industry cut costs to make the price of beef more competitive? And second, can the industry deliver new products that respond to consumer demands for nutrition and convenience? Given the dominant role of cattle in the farm and rural economies of the Tenth District, the answers to these questions will be important to the regional economy.

Chart 4
Fed Cattle Prices



Source: U.S. Department of Agriculture, *"Agricultural Outlook."*

The industry's two-pronged challenge

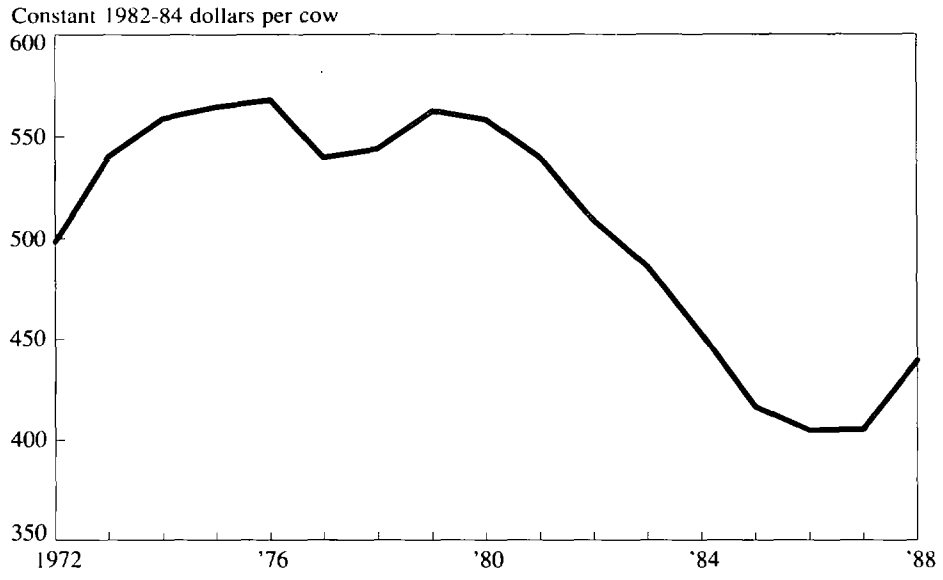
The cattle industry's outlook in the coming decade may ultimately rest on the industry's ability to link efforts to cut costs with efforts to deliver new products. Further consolidation and emerging technology appear to offer only incremental cost savings. Meanwhile, the industry appears to have few new products on the shelf. But a new industry initiative to produce leaner cattle could help cut costs and provide a more attractive consumer product.

After spending a decade on consolidating and lowering production costs, the cattle industry may have more difficulty making the next generation of costs cuts. Still, some additional cost savings will likely be found in all three segments of the industry. With beef prices still relatively high compared with chicken prices, market pressures will encourage the search for greater efficiency.

The industry has a strong track record in cutting costs. Adjusted for inflation, beef production costs have been cut across all segments of the industry. From the late 1970s to the mid-1980s, cattle ranching costs fell more than a fourth and cattle feeding costs more than a third before higher feed costs in the last half of the 1980s pushed up beef costs (Charts 5 and 6). Processing costs, reflected in the difference between beef prices at retail and the farm, fell more than a fifth during the 1980s (Chart 7). These sweeping cost reductions enabled the industry to keep beef production essentially constant in the 1980s in the face of a 30 percent decline in retail beef prices.[9]

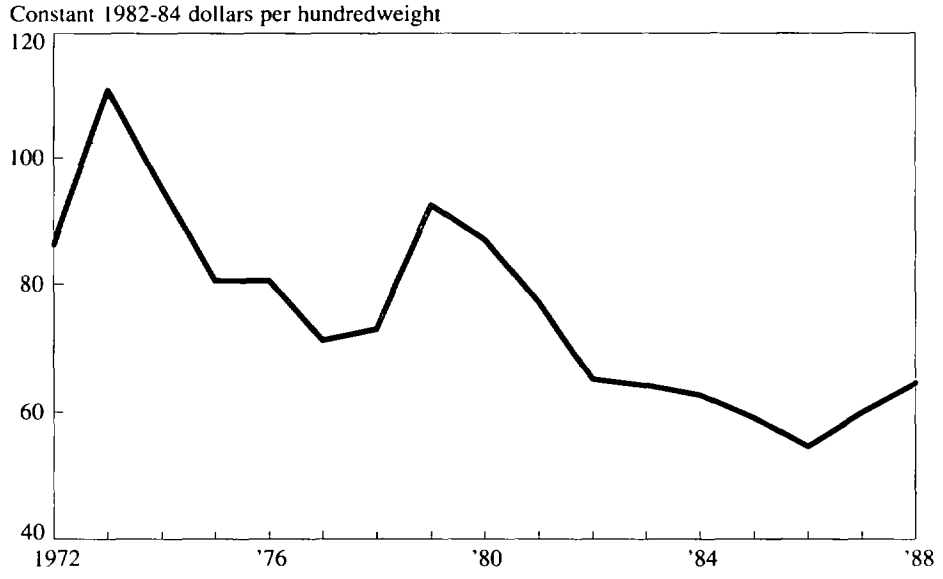
Where the cattle industry will find cost reductions in the 1990s is not clear. Further

Chart 5
Cow-Calf Production Costs



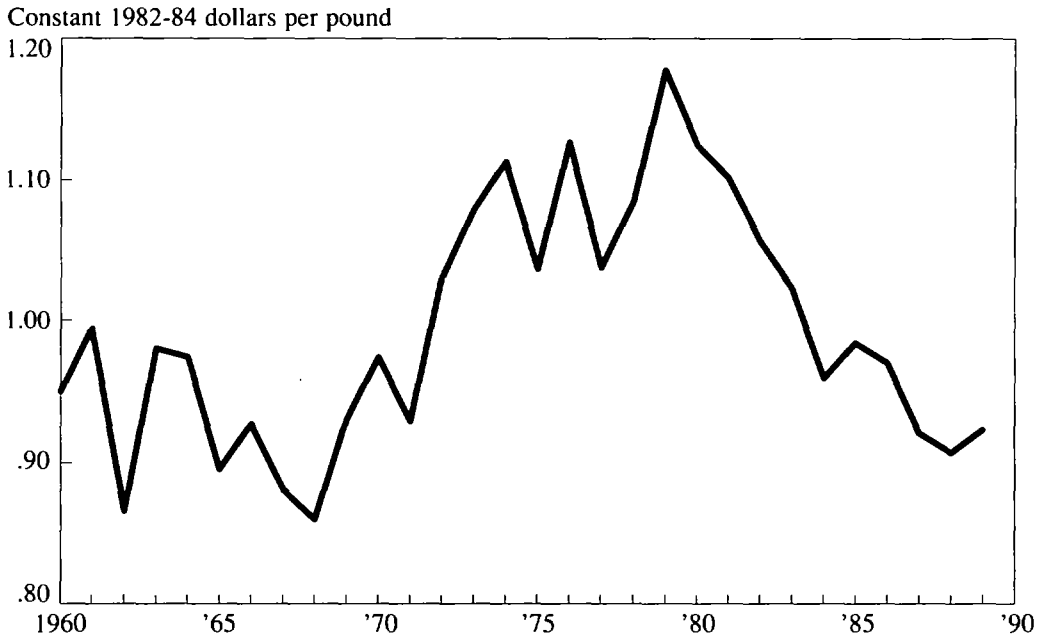
Source: U.S. Department of Agriculture, *"Economic Indicators of the Farm Sector: Costs of Production."*

Chart 6
Feedlot Production Costs



Source: U.S. Department of Agriculture, *"Economic Indicators of the Farm Sector: Costs of Production."*

Chart 7
Beef Farm-Retail Price Spread



Source: U.S. Department of Agriculture, *"Agricultural Outlook."*

consolidation promises some cost savings for feedlots and slight gains for processing plants. With half of the nation's cattle in farm or medium-sized feedlots, consolidation is likely to proceed in the 1990s, thereby reducing overall feeding costs for the industry. But most beef processing plants have already grown to a size that captures most available cost economies.[10] Thus, the industry will have to look elsewhere to achieve substantial cost reductions.

Ranchers and feedlot operators may be able to lower costs through new developments in biotechnology. For example, potential breakthroughs in genetic engineering could boost reproductive efficiency and growth rates. Such advances would reduce the two biggest cost items in cattle ranching and feeding: feed and feeder cattle. Feed is now about a quarter of both ranching and feedlot costs (Tables 2 and 3). And feeder cattle are the biggest single cost item for feedlots, more than three-fifths of total costs. Thus, technologies targeting these two major cost items are likely to be among the most effective in reducing costs in these two industry segments.

One comprehensive study of agriculture's emerging technologies suggests efficiency gains in ranching will outstrip gains in the feedlot in the next decade (U.S. Congress, Office of Technology Assessment 1986). By the year 2000, gains in reproductive efficiency could boost the average number of calves a cow produces each year 14 to 18 percent. Meanwhile, projected gains in feed efficiency, as measured by pounds of beef produced per pound of feed consumed, would be a more modest 3 to 4 percent.

Despite these advances, beef may gain little if any ground on other meats in the technological

race. Projected gains in reproductive efficiency of poultry and swine are expected to equal or slightly exceed those of cattle. But gains in feed efficiency for both poultry and swine are expected to exceed by a wide margin the modest gains expected for cattle. In sum, new technologies appear likely to offer some cost reductions for the cattle industry, but reductions will probably be matched or surpassed by its competitors.

The beef industry could discover some sizable cost savings through a new marketing initiative that would encourage producers to market cattle with less fat (National Cattlemen's Association 1990). Current beef grading standards encourage producers to market cattle with high fat content. But consumers no longer want retail cuts with excess fat. Thus, cattle go to market carrying fat that is later trimmed away by processors and retailers. Industry observers estimate that the cost of producing and then trimming the excess fat is at least $2 billion a year. The industry's new marketing initiative hopes to reduce this loss by reducing excess fat 20 percent and increasing lean meat production 6 percent by 1995.

The new marketing initiative also targets the processing and retailing steps that on average account for more than 40 percent of the retail cost of beef. In addition to encouraging ranchers and cattle feeders to produce leaner cattle, the initiative urges processors and retailers to develop conveniently prepared beef products. The costs of producing several of these new products are likely to be lower than the cost of producing conventional boxed beef.[11] For example, the industry is already experimenting with shipping retail cuts of beef in vacuum-sealed, retail-ready packages rather than as conventional boxed beef, which is subsequently cut and packaged at the grocery store. By centralizing the packaging step, labor costs are cut, and retail beef prices could be reduced by approximately 10 cents a pound. Although costs are lower, consumers may resist these new products, which may have a darker color than usual (Farris and others 1990).

Overall, the cattle industry appears likely to reduce beef production costs incrementally in the 1990s. Most of the gains from consolidation have already occurred. Advances in biotechnology promise unknown gains in efficiency. But in the end, the cost of producing beef appears likely to remain relatively high simply because cattle are relatively inefficient in producing offspring and processing feed. Technology appears unlikely to unlock these two biological puzzles and put a sizable dent in the current cost advantage held by poultry.

Eliminating the production of excess fat may be one of the industry's best opportunities for reducing costs. A new marketing initiative launched by the National Cattlemen's Association targets the production of excess fat but would also answer the consumer's call for leaner, more convenient beef products. The outcome of the new initiative remains uncertain, however, given the industry's relatively weak record of translating consumer needs into production decisions.

The importance of the marketing initiative is underscored by the fact that the industry has almost no new products on the shelf. New forms of packaging may bring a new look to beef products on retail counters. But the beef industry has not displayed the product innovation found in the poultry industry. To the contrary, the beef industry has a long history of taking beef's niche in the meat market for granted.

The future for the cattle industry in the region

The road the cattle industry takes in the 1990s will have a great effect on the farm and rural economy of the Tenth Federal Reserve District. Cattle account for about 60 percent of the cash receipts in the seven states of the dis-

Table 2

Distribution of Cow-Calf Production Costs

(Percent)

	1972-75	1976-79	1980-84	1985-88
Feed	31.4	25.2	23.6	22.6
Other variable expenses	12.5	12.0	13.6	13.5
Overhead, taxes, insurance	6.7	8.3	8.7	12.6
Capital replacement	11.6	10.9	12.7	13.8
Imputed returns to land, labor, and capital	37.9	43.6	41.4	37.5
Total costs	100.0	100.0	100.0	100.0

Source: U.S. Department of Agriculture, Economic Research Service, *Economic Indicators of the Farm Sector: Costs of Production*, various issues.

Table 3

Distribution of Feedlot Production Costs

(Percent)

	1972-75	1976-79	1980-84	1985-88
Feeder cattle	51.5	56.8	61.4	61.8
Feed	36.7	30.0	26.3	22.0
Other variable expenses	3.9	4.8	5.1	5.8
Overhead, taxes, insurance	1.5	1.7	1.9	4.0
Capital replacement	2.4	2.6	1.7	2.5
Imputed returns to land, labor, and capital	3.9	4.1	3.5	3.8
Total costs	100.0	100.0	100.0	100.0

Source: U.S. Department of Agriculture, Economic Research Service, *Economic Indicators of the Farm Sector: Costs of Production*, various issues.

trict, and meat packing employs nearly 45,000 workers in the region. What does the outlook for the industry suggest for the district farm and rural economies in the decade ahead?

In simple terms, the industry's outlook depends on its success or failure in meeting the twin challenges of cutting costs and improving marketing. Lower costs and better marketing would make beef both more economical and attractive to consumers, leading to a stabilization or possible expansion of beef's share of meat purchases. While such growth will preserve some market niches for small producers, there would still be market pressures for all available economies of size to be realized. Failure to meet the challenges, on the other hand, would simply extend the industry trends of the past decade. Consumer demand would probably fall further, pushing real beef and cattle prices down. The resulting squeeze on profits would force the industry to cut costs aggressively. Only large, efficient producers would likely survive.

The region clearly stands to benefit from successful efforts to reduce costs and enhance marketing. Regional gains would likely take the form of expanded cattle numbers and higher value beef products leaving the region.

Expansion in cattle production will be concentrated in the Tenth District. District states contain 27 percent of all cattle in the nation and an even higher percentage of beef cattle. From ranching to processing, the district cattle industry is both big and efficient, suggesting that a significant portion of the industry's expansion will occur here. Such expansion would boost the already large portion of district farm income tied to cattle production.

Successful introduction of new value-added beef products would significantly boost the region's economy. When and if developed, the next generation of beef products will be designed to enhance both nutrition and convenience. To achieve that objective, products will receive more processing before being shipped to retail markets. In short, greater economic value will be created where the beef is processed, and that would benefit communities now dependent on large processing plants.

Meat packing plants in the district already account for more than a quarter of shipments from the nation's meat packing plants. Most district plants produce boxed beef, an intermediate product that requires additional processing at retail centers. Increased processing would add value to the production of district plants and, correspondingly, boost employment and income in communities where packing plants are located. Depending on the success of the new beef products, this boost could be substantial.

If the cattle industry fails to meet its challenges, market pressures will lead to failure of some firms. Compared with other parts of the nation, however, the region will fare well overall. Most cattle ranches in the district are relatively large, although Missouri, an important calf producing state, has predominantly small producers. District feedlots and processing plants are among the nation's largest and operate at low per-unit cost. Thus, further decline in the cattle industry will probably squeeze out cattle producers and processors in other regions first.

Cattle ranching in the district will be well positioned if cattle numbers shrink further in the 1990s, but some ranches may be forced from business. District states produce more than a fifth of the nation's calf crop, and four district states rank among the top eight producing states. Although Missouri ranks second in feeder calf production, a downturn in the industry appears likely to have the biggest effect there.

Missouri cattle ranches are small, pointing to significant consolidation ahead if profits worsen. The average ranch in the state has only 21 cows compared with an average of 115 cows in Wyoming. While most Missouri ranchers sub-

sidize ranching with off-farm income, declining profit margins would almost certainly bring a sorting out of small, inefficient producers.

On the other hand, relatively large ranches and low land costs elsewhere in the district suggest that district ranches will compete well against other important cow-calf production areas, such as the Southeast. Across wide stretches of the district, ranchland has little if any alternative use and thus is likely to remain in ranching under almost any future scenario.

District cattle feeders will be in a strong position to compete in the future even if the feeding industry shrinks. The district is the heart of the cattle feeding industry and now accounts for 43 percent of the nation's cattle on feed, up from 34 percent when cattle numbers peaked in 1976. Large and efficient, the district feedlots concentrated in Colorado, Kansas, and Nebraska appear likely to operate near capacity even if cattle prices are weak. In short, many farm feedlots in the Corn Belt and elsewhere may be squeezed out of production before the commercial feedlots of the High Plains.

Similarly, the big beef processing plants concentrated in Colorado, Kansas, and Nebraska appear likely to be survivors even if industry profits are squeezed. The plants are modern and relatively new; most were built since 1975. Labor costs are much lower than in older plants in the Great Lakes region. The plants are far from major consumer markets, but the advent of boxed beef, which is cheaper to ship than whole carcasses, has diminished that location disadvantage.

IV. Conclusions

The cattle industry is at a crossroads entering the 1990s. After a decade of dramatic restructuring, the industry faces two futures. One road would continue the trends of the past decade to a smaller industry with fewer, larger firms. These firms would remain profitable due to their efficiency and low cost. Because the Tenth District is home to many of the nation's large ranches, feedlots, and processing plants, the region would likely maintain its cattle activity even if the industry shrinks overall. The other road would stem a decline in beef demand and perhaps lead to some growth in per capita consumption. Any expansion in beef output would be based in Tenth District states. Moreover, development of new beef products might expand processing in the region, boosting employment and incomes in areas where processing plants are located.

The road taken depends on the ability of the industry to meet twin challenges of lower costs and improved marketing. Further consolidation appears to hold little promise to lower the costs of producing beef. Advances in biotechnology offer unknown gains in efficiency, but gains in other meats probably will be equal or greater. The best chance to cut costs may be found in an industry marketing initiative to discourage the production of excess fat. If successful, this initiative could begin the process of tying production decisions more closely to consumer preferences. With few new consumer products now on the shelf, integrating production and marketing decisions appears to be an essential first step for the industry.

Appendix

How Changing Beef Demand Affects the Cattle Industry

The decline in per capita beef consumption and the subsequent structural changes in the beef industry are illustrated in the three panels of Figure 1. The effect of a structural decline in beef consumption on beef prices and per capita beef consumption is shown in Panel A. The beef demand curve (D_b) shows the quantities of beef consumers are willing to purchase at various beef prices, and the beef supply curve (D_s) shows the quantity of beef producers are willing to produce at various prices. At the initial equilibrium price (P_b), determined at the intersection of the beef demand and supply curves, the quantity consumers are willing to buy (q_b) is equal to the quantity producers are willing to produce. A decline in the amount of beef consumers are willing to buy at any price is shown by the leftward shift of the beef demand curve to D_b*. As the demand curve shifts, the quantity of beef sold to consumers falls to q_b* and the equilibrium price of beef is pushed down to P_b*.

The effect of the decline in beef consumption on the structure of the beef industry is shown in Panels B and C. Curve C_1 in Panel B, the short-run average cost curve for older beef processing plants, shows per-unit costs for various beef processing volumes. At the initial price of beef P_b, all plants of this type are processing beef at a rate of Q_1 and covering all costs equal to P_b per pound. With the decline in beef prices to P_b*, however, older processing plants can no longer cover their costs and are eventually forced to close.

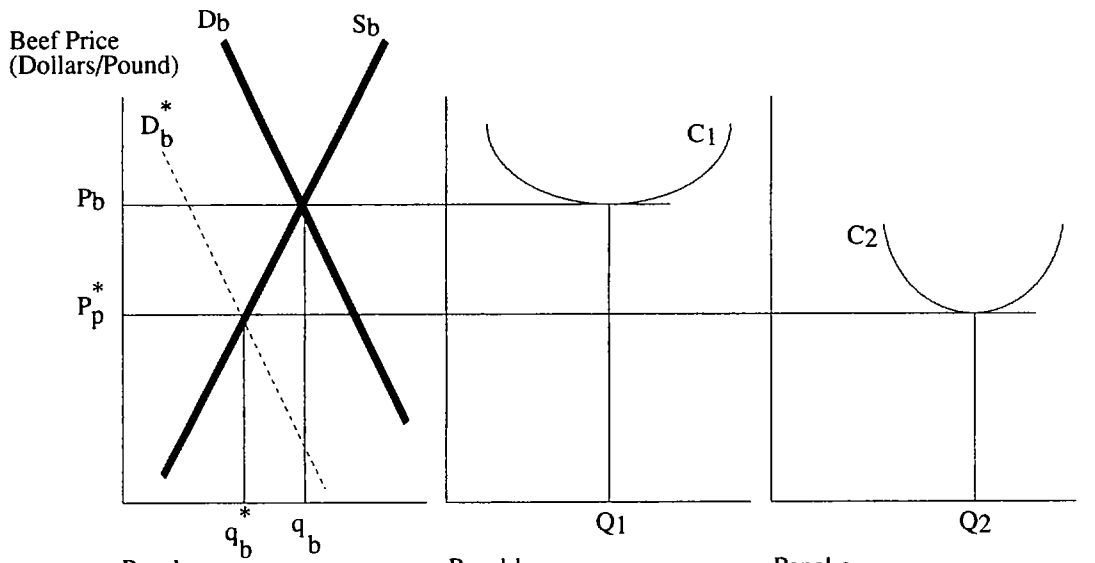
As processing technology evolves, more modern processing plants that operate at lower cost are developed (Panel C). Even at the lower price P_b*, these newer, more efficient plants can cover all costs. The newer plants, however, operate at a much larger processing volume (Q_2) than the smaller plants they replaced. As a result, the industry's processing activity becomes more concentrated in fewer, larger plants.

Although the modern plants have lower operating costs than the older plants, costs rise quickly in the new plants if they are not operated at the optimal rate. As a result, the average cost curve in Panel C slopes up sharply as the plant's output changes from the optimal level Q_2. For example, if a temporary shortage of fed cattle forces a modern, high-capacity beef processing facility to operate at less than its optimal rate, average operating costs rise sharply. This characteristic of high-capacity beef processing plants encourages plant managers to enter marketing arrangements with large-scale cattle feeders that can ensure timely supplies of cattle for the processing facility. These marketing arrangements, a loose form of vertical integration, can limit marketing opportunities for smaller scale cattle feeders.

The cause of the initial leftward shift of the beef demand curve in Figure 1, Panel A, is the topic of considerable debate in the beef industry. One explanation is a change in consumer health concerns and lifestyles that resulted in less consumption of beef regardless of its price.

An alternative explanation for the decline in beef consumption is a decline in the price of other meats that made them more attractive to budget-minded consumers. This alternative explanation for reduced beef consumption is

Figure 1
Structural Changes in the Beef Industry

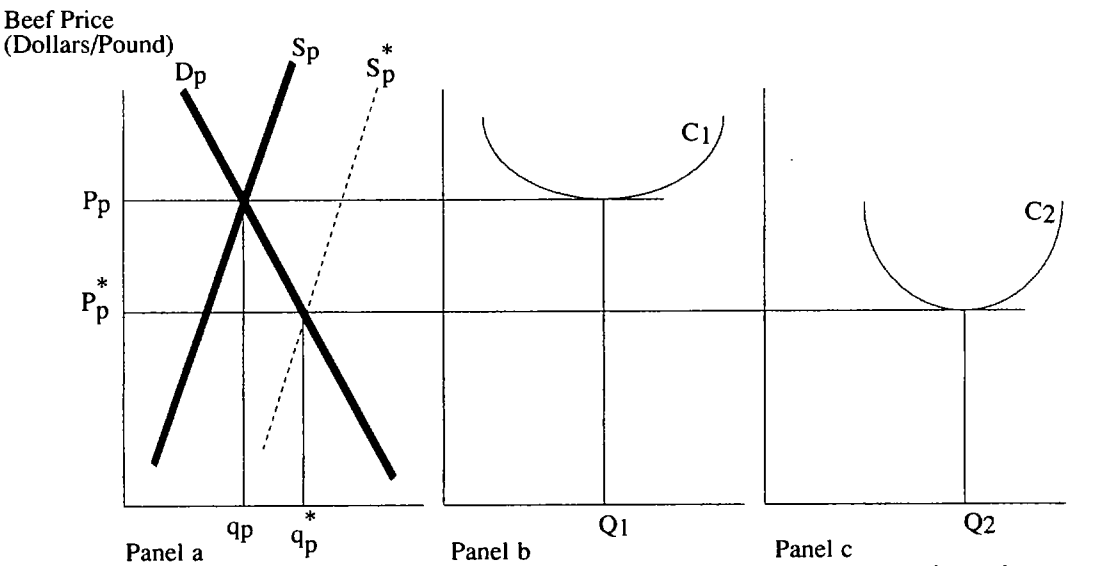


Panel a
Per capita beef supply and demand

Panel b
Average costs in old beef plants

Panel c
Average costs in modern beef plants

Figure 2
Structural Changes in the Poultry Industry



Panel a
Per capita poultry supply and demand

Panel b
Average costs in old poultry facilities

Panel c
Average costs in modern poultry facilities

diagrammed in Figure 2. The three panels of Figure 2 are nearly identical to the corresponding panels of Figure 1, with the exception that Figure 2 is drawn for the poultry industry. Figure 2 shows how concentration in the poultry industry has resulted in an expansion of poultry supplies at lower cost. Consolidation of poultry production in fewer, larger, more efficient plants has reduced unit costs of poultry production (Panels B and C). The result is a rightward shift of the poultry supply curve from S_p to S_p*, a decrease in poultry prices from P_p to P_p*, and an increase in per capita poultry consumption from q_p to q_p* (Panel A). As consumers buy more poultry, beef consumption is curtailed, resulting in the leftward shift of the beef demand curve in Figure 1, Panel A. Most evidence suggests that a rapid expansion in poultry supplies and the attendant reduction in poultry prices shown in Figure 2 played a major role in the decline in beef consumption shown in Figure 1.

Endnotes

[1] Changes in per capita meat consumption reflect shifts in market share among the various kinds of meat. Recent shifts in meat consumption are less pronounced when viewed in terms of total (rather than per capita) consumption, because population growth masks the decline in market share held by beef. While per capita beef consumption has declined sharply in recent years, total beef consumption has been relatively stable due to population growth. After growing rapidly during the 1960s and early 1970s, total beef consumption crested at more than 27.5 million pounds in 1976. Beef consumption edged down in the late 1970s and stagnated at an annual average of about 24.6 million pounds in the 1980s. While beef consumption remained flat in the 1980s, broiler and turkey consumption surged and pork consumption made modest gains. As a result, total consumption of all red meats and poultry climbed to nearly 63 million pounds in 1989, a record that is expected to be broken in 1990.

[2] Nearly a fourth of all U.S. households were single-person households in 1989, up from 21 percent in 1976. Both spouses of about half of U.S. married-couple families worked in 1990, up from 37 percent in 1976.

[3] Thurman, for example, states, "It seems impossible to conclusively attribute meat expenditure trends to any particular cause. In this case, it is particularly difficult to document changes in consumers' perceptions. I will only remark here on the plausible coincidence of the observed expenditure trends and increased health concerns in the 1970s" (Thurman 1989).

[4] The share of U.S. beef consumption eaten as nonfed beef averaged 43.8 percent from 1967 to 1973 and 56.6 percent from 1974 to 1981. Hamburger is typically ground from nonfed beef while higher priced cuts are typically cut from fed beef. Wohlgenant estimated the elasticities of demand for nonfed and fed beef with respect to prices of several kinds of meat. The elasticity of demand for nonfed beef with respect to retail poultry prices increased from 0.26 in 1958 to 0.61 in 1982. The elasticity of demand for fed beef with respect to retail poultry prices remained much lower, -0.07 in 1958 and -0.08 in 1982 (Wohlgenant 1989).

[5] In assessing the current search for the cause of the decline in beef consumption, Chavas states, "Also, traditional economic theory does not provide much insight into the effects on consumers of factors other than prices and incomes. As a result, little empirical evidence on such effects has been found by economists. However, it seems hard to believe that, among other factors, the recommendations of the American Medical Association concerning meat consumption have not had at least some influence on consumer behavior." (Chavas 1989)

[6] Economies of size are generally attributed to a larger firm's ability to divide tasks among specialized workers, to use the most advanced technology, and to spread fixed production costs across a larger volume of output. Diseconomies of size, an increase in average costs as the volume of output increases, may eventually occur if the firm's size exceeds technological constraints or if the firm becomes too large to manage effectively.

[7] Most savings in cattle feeding were realized by feedlots of 20,000-head capacity, with only modest additional cost savings accruing to feedlots of larger capacity. Most of the reduction in total feeding costs was gained by spreading the cost of fixed investments—feed mills, pens, and other equipment—across a much larger number of cattle in the larger feedlots (Dietrich and others 1985).

[8] Most cost savings are realized in plants with capacity of about 700,000 head per year, with only modest additional savings gained by larger plants with capacity of up to one million head per year. These cost savings would add about $1.50 per hundredweight to the price of fed cattle if passed along to cattle feeders (Ward 1988 and Purcell 1990).

[9] These cost reductions occurred while total beef production remained nearly constant, expanding only 7 percent during the decade.

[10] See endnotes 7 and 8.

[11] Historically, beef packing plants slaughtered cattle and shipped beef carcasses to meat retailers for further processing. To reduce transportation and labor costs, packers began to process the carcasses further and ship smaller cuts directly. The cuts were shipped under refrigeration in boxes, hence the term boxed beef. Boxed beef still requires additional cutting, trimming, and packaging at the retail market. The new marketing scheme would increase further the amount of processing done before beef is shipped to retail centers.

References

American Heart Association. 1985. "The American Heart Association Diet, An Eating Plan for Healthy Americans." Dallas, Texas.

Chavas, Jean-Paul. 1989. "On the Structure of Demand for Meat," in Reuben C. Buse, ed., *The Economics of Meat Demand*, Department of Agricultural Economics, University of Wisconsin, Madison, Wisc.

Dietrich, R. A., P. J. Thomas, and D. E. Farris. 1985. "The Texas Cattle Feeding Industry—Operations, Management, and Costs," Experiment Station Bulletin B-1495, The Texas Agricultural Experiment Station, College Station, Texas.

Farris, D. E., J. B. Ward, R. A. Dietrich, and D. W. Holloway. 1990. "Reducing the Cost of Marketing Beef Through Central Retail Packaging." Poster paper presented at the joint American and Canadian Agricultural Economics Associations meeting, Vancouver, British Columbia.

Huang, Kuo S., and Richard C. Haidacher. 1989. "An Assessment of Price and Income Effects on Changes in Meat Consumption, in Reuben C. Buse, ed., *The Economics of Meat Demand*, Department of Agricultural Economics, University of Wisconsin, Madison, Wisc.

Johnson, D. Gale, John M. Connor, Timothy Josling, Andrew Schmitz, and G. Edward Schuh. 1989. *Competitive Issues in the Beef Sector: Can Beef Compete in the 1990s?* Humphrey Institute Report No. 1, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, Minneapolis, Minn.

Johnson, Stanley A. 1989. "Discussion: Structural Change in Meat Demand: The End of the 'Chicken Little' Era," in Reuben C. Buse, ed., *The Economics of Meat Demand*, Department of Agricultural Economics, University of Wisconsin, Madison, Wisc.

National Cattlemen's Association. 1990. "The War on Fat." Report of the value-based marketing task force. Denver, Colo.

Purcell, Wayne, ed. 1990. *Structural Change in Livestock: Causes, Implications, Alternatives*, Research Institute on Livestock Pricing.

Thurman, Walter N. 1989. "Have Meat Price and Income Elasticities Changed? Their Connection with Changes in Marketing Channels," in Reuben C. Buse, ed., *The Economics of Meat Demand*, Department of Agricultural Economics, University of Wisconsin, Madison, Wisc.

U.S. Congress, Office of Technology Assessment. 1986. "Technology, Public Policy, and the Changing Structure of American Agriculture," OTA-F-285, U.S. Government Printing Office, Washington D.C.

Ward, Clement E. 1988. *Meatpacking Competition and Pricing*, Research Institute on Livestock Pricing, Blacksburg, Va.

Wohlgenant, Michael K. 1989. "Effects of Changing Composition of Beef Consumption on the Elasticities for Beef and Poultry." in Reuben C. Buse, ed., *The Economics of Meat Demand*, Department of Agricultural Economics, University of Wisconsin, Madison, Wisc.

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