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Cattle Sector Production Practices and Regional Price Differences

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Abstract

Fed cattle from the Southern Plains generally are priced at a premium to Northern and Central Plains cattle. The “North-South price spread” persists because, while production practices in the U.S. cattle sector typically include pasture grazing followed by feeding grain in feedlots, the timing and the duration between each stage may vary. Regional differences include variation with the length and timing of the calving season, the availability and quality of pasture (including the potential for winter wheat grazing), and grain prices. This report describes nuances in regional production practices that underlie the price relationship referred to as “the North-South spread.”

Keywords: Backgrounding, calf-fed, cattle feeding, wheat pasture, and yearling

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The use of commercial and trade names does not imply approval or constitute endorsement by USDA.

Introduction

Typically, Southern Plains cattle sell at a premium to northern cattle. While more commonly referred to as the North-South (N-S) price spread, the spread is defined here as the monthly all-grade prices for Southern Plains’ (Texas, Oklahoma, and New Mexico) steers minus the prices for Nebraska’s steers (for example, USDA, AMS, LM_CT181 and LM_CT183).¹ The N-S spread appears counter-intuitive because higher quality cattle, like those marketed in the Central and Northern Plains, generally sell at a premium to lower quality cattle like those in Southern Plains feedlots. Between 1990 and 2009, monthly Southern Plains fed cattle prices were \$0.28 per hundred-weight (cwt) higher, on average, than northern cattle prices (fig. 1). Typically, the spread is widest in December-January, is inverted in March-April, and narrows during June-August (fig. 2). In addition to seasonal inversions, the N-S spread is sometimes inverted for much longer periods, as it was for much of 1997 and 2003 (fig. 1).

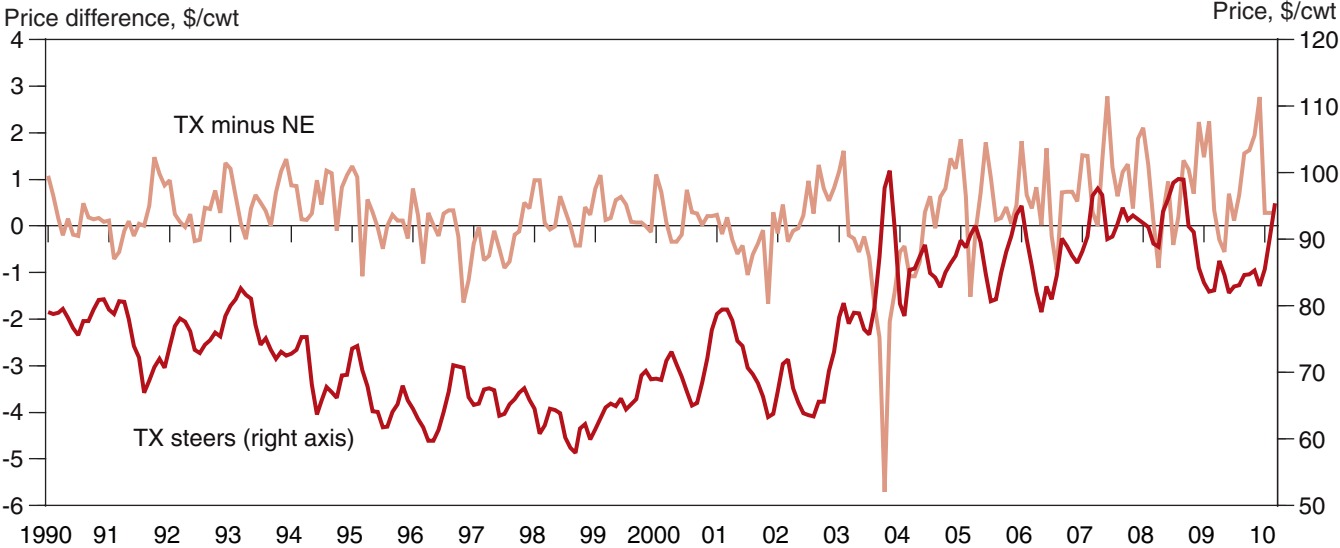
The N-S spread is the result of complex dynamics among a number of differences in cattle sector production systems:

- Timing of production process;
- Quality, age, and size of cattle when marketed;
- Regional marketing conventions; and
- Corn/feed prices in the two regions.

Regional differences in how these factors vary across production systems and how prices are reported can explain much of the N-S spread.

¹In what follows, the use of “NE” for Northern and Central price-related designations and “TX” for Southern Plains designations is maintained as a shorthand reference to USDA’s Agricultural Marketing Service (AMS) designations for the separate price series that typically define the N-S spread.

Figure 1
Southern cattle often sell at a premium to northern cattle

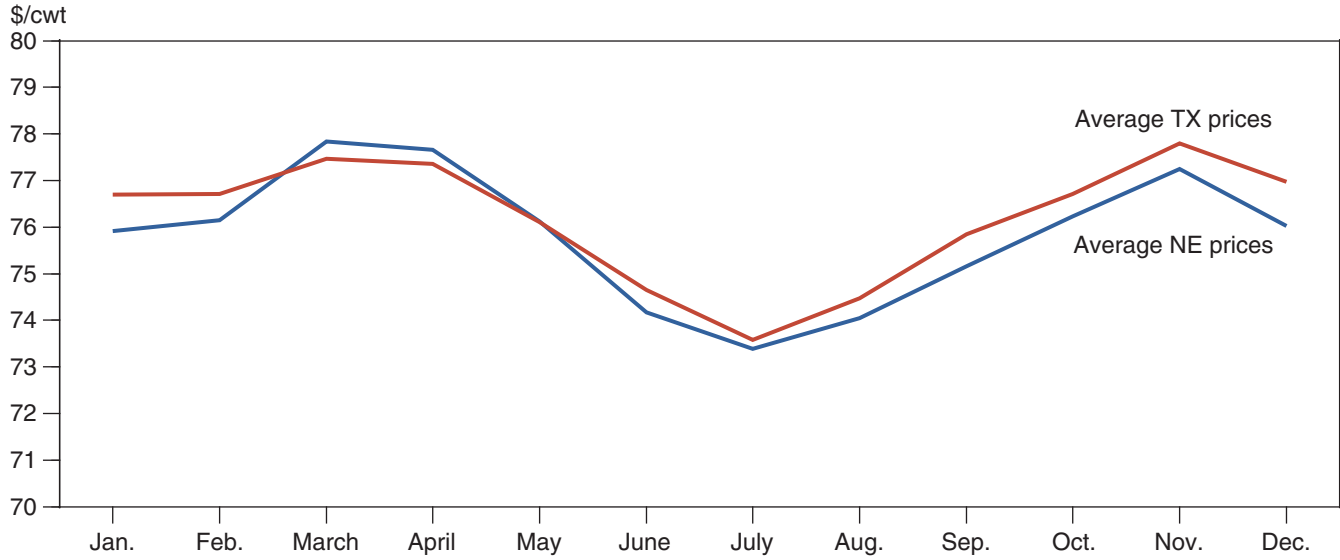


cwt = hundredweight.
 TX = Texas prices representative of Southern Plains cattle.
 NE = Nebraska prices representative of Northern Plains cattle.

Source: USDA, Economic Research Service calculations based on prices reported to USDA, Agricultural Marketing Service’s Mandatory Price Reporting System.

Figure 2

Average monthly prices for fed cattle, 1990-2009



cwt = hundredweight.

TX = Texas prices representative of Southern Plains cattle.

NE = Nebraska prices representative of Northern Plains cattle.

Source: USDA, Economic Research Service calculations based on monthly prices reported to USDA, Agricultural Marketing Service.

Cattle Sector Production Systems

Three general groups of production systems for beef cattle characterize the stages from weaning through slaughter with many variations across these systems (fig. 3). The length of time between weaning and feedlot placement distinguishes each production system:

- Calf-fed;
- Intermediate-term (background lot and short-yearling); and
- Long-yearling.

Fed cattle are those placed in feedlots, where they are fed grain and supplements until they reach optimal slaughter weight and grade. Calves are weaned at about 7-8 months of age and can follow one of several alternative interim programs before being placed in feedlots on full (concentrate) feed rations—rations with a high ratio of grain and protein to roughage—until slaughter. In the most direct system, calves weighing around 600 pounds at weaning can be placed directly on feed (Mark, 2009).

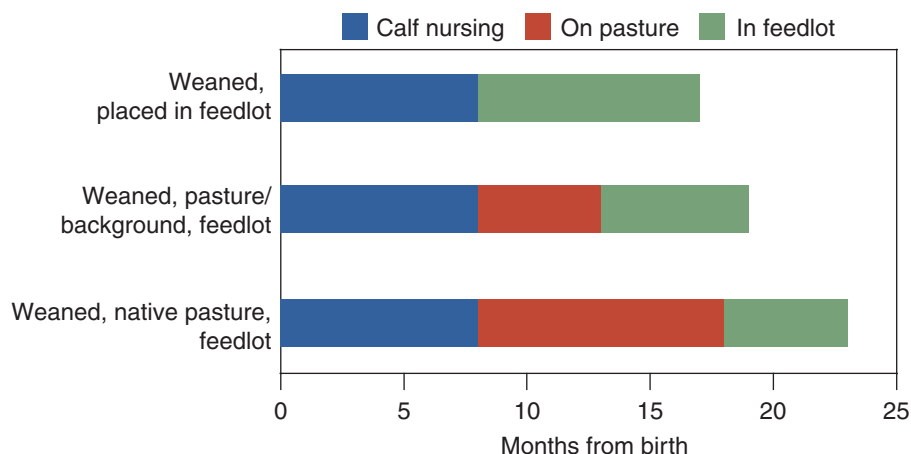
The two primary intermediate-term programs are (1) a backgrounding program² that uses supplemental growing rations and (2) a pasture-based short-yearling program that may include supplemental growing rations. In these intermediate-term programs, backgrounded calves and short-yearlings are placed on feed 4-6 months after weaning and will weigh around 700-800 pounds.

In a long-term program, older yearling cattle typically are backgrounded through the winter following fall weaning, and then on pasture the following summer where they grow to 800-1,000 pounds before being placed in feedlots in late summer or early fall (Mark, 2009). This classification—long-yearlings—suggests an age dichotomy between feeding younger calves (“calf-feds” and short-yearlings) and older calves (“yearling-feds”) and between younger and older calves of the same weight, with discounts often

²Backgrounding prepares young cattle for a feedlot, allowing them to grow and getting them accustomed to confinement facilities and feeds.

Figure 3

Timeline for beef cattle production systems



Source: USDA, Economic Research Service.

associated with calves purchased to be placed on feed over yearlings of the same weights (discussed later).

At any point in time, cattle on feed come from all production systems. Feeding periods can range from less than 90 days to more than 300 days. Generally, the older the cattle are at placement, the shorter the feeding period because they are larger and the feed they consume is used primarily to achieve optimal “finish.” Less efficient cattle—those consuming relatively more feed per pound gained or those gaining at slower rates—can be on feed for longer periods, regardless of age.

Calf-Fed System

Most U.S. calves are born in the spring and are weaned in October-November. Warmer climates in the South offer greater access to adequate cool-season pastures, providing quality pasture for milk production to support calving throughout the year. Calf-fed cattle are generally acclimated to feeding regimes with less concentrated rations for 2-3 weeks before going on full rations. If calves are on a less concentrated, or growing, ration for several months, they are considered part of the backgrounding lot system—a variation of the short-yearling system (discussed later)—because of the calf’s age and weight when placed on feed. Calf-feds typically are smaller, have smaller digestive systems, and are also still growing. Because of these growth characteristics, calves placed on feed at or shortly after weaning will often be on feed longer than the average 5- to 6-month feeding period (typically 8-9 months). Calves placed shortly after weaning in October-November will be marketed as fed cattle from May to early July (Meyer and Steiner, 2007; Mark, 2009), when prices begin seasonal declines, and will weigh less than most cattle in yearling systems.

The number of cattle on feed for more than 120 days typically peaks during the May-July marketing period. This benchmark indicator denotes how efficiently feedlot managers are marketing cattle before they become too fat, or “over-finished,” and as they become market ready. Some latitude is given, however, to interpreting this commonly discussed benchmark because calf-feds are typically on feed for more than 120 days.

Again, because of their smaller size and growth patterns, calf-feds often perform better in feedlots in terms of growth and feed conversion than older calves and yearlings. When corn prices are low, managers may place more calves on feed at weaning because calf-feds gain weight more efficiently on corn-based diets (Griffin et al., 2008). Corn prices in Nebraska are consistently lower than corn prices in the Southern Plains partly because of transportation costs. As a result, managers may feed more calves in the northern region. Due to their smaller carcasses and their tendency to become excessively fat if kept on feed too long (Griffin et al., 2007), calf-feds are often discounted more than yearlings of the same finish. Calf-feds often produce meat that is more tender (Brewer et al., 2003), but they may also yield less meat as a percentage-of-live-weight basis than yearlings, making them slightly more expensive to process (Smith, 2005).

Intermediate-Term Programs

Short-yearlings—backgrounded in dry lots (pens generally devoid of or with limited pasture) or on pasture prior to placement in feedlots—are placed on feed at or near 1 year of age, where they remain for 5-6 months. Prior to entering the feedlot, they will have eaten rations (if backgrounded) or grazed pasture of sufficient quality for them to gain 1-2 pounds per day for 4-6 months. In the wheat-growing areas of the Southern Plains, cattle commonly graze on wheat or other small grain pastures throughout the winter and gain, on average, 2 or more pounds per day. In the Central and Northern Plains, cattle grazing on either native pasture, corn stalks or other stover, or harvested forages must be fed energy/protein supplements to gain adequate weight during the winter.

Long-Yearlings

Of the three production systems discussed in this report, the long-yearling system keeps cattle on pasture for the longest time before placing them in feedlots. Long-yearlings may be slower growing calves that simply did not reach sufficient weight for placement in feedlots, or they may have spent the winter on a low-quality pasture that prevented sufficient growth. Many northern pastures are at their nutritional peak during spring and early summer. Calves on these pastures will ordinarily gain enough weight to enter feedlots from late summer to early fall. Long-yearlings can weigh over 1,000 pounds when placed, but usually weigh closer to 800-900 pounds.

Because they are larger and can use feed more efficiently for “finish” rather than growth, long-yearlings are generally able to reach market-ready condition sooner. Long-yearlings, however, also tend to continue growing and can become overweight at slaughter (Griffin et al., 2007), sometimes resulting in discounts. These cattle may be marketed after being on feed less than 5 months, weighing 1,400 pounds or more. Long-yearlings are capable of rapid weight gain early in the feeding period—compensatory gains at as much as twice the “normal” rate of growth—because of “pent up” growth potential that was not completely fulfilled on growing regimes.

In one Nebraska study, a calf crop was divided into two groups at weaning. The researchers compared calf-fed and long-yearling systems. Calf-feds—at the heavy end of the calf crop—entered feedlots weighing an average of 642 pounds, were on feed an average of 168 days, and were marketed at an average weight of 1,282 pounds (Griffin et al., 2007). Calves at the light end of the calf crop weighed 526 pounds and were placed on pasture from fall to the following September. They entered feedlots as long yearlings weighing an average of 957 pounds and were on feed for only 90 days before being marketed at an average weight of 1,365 pounds.

In another aspect of the same analysis, “[p]rofitability of yearlings versus calf-feds increased \$4-6 [per head] for each \$1/bushel increase in corn price” (Griffin et al., 2008). While there were no differences in marbling scores or yield grades, yearlings gained more weight on less feed in the feedlot than did calf-feds, but required more total time from weaning to slaughter (Griffin et al., 2007).

Southern Plains Cattle Sell at a Premium to Northern Plains Cattle

Northern cattle grade higher, on average, than southern cattle, and higher quality cattle are priced at a premium to lower quality cattle. As such, the observed N-S spread runs counter to the typical premiums paid for quality. For example, in 2009, the N-S spread between Nebraska (northern) prices and Texas (southern) prices averaged \$1.12 per cwt across all grades and qualities. In 2009, 46 percent of negotiated purchases of Nebraska fed cattle were in the 65- to 80-percent Choice range, whereas 92 percent of Texas-Oklahoma-New Mexico cattle were in the lower quality 35- to 65-percent Choice range (USDA, AMS, LM_CT175 and LM_CT173).³ Two factors partially explain why the southern premium might exist despite the average difference in quality: The distance between feedlots and packers and the difference in how shrinkage⁴ is discounted.

Although information has been added to the markets for fed cattle, not all the information being reported to the Mandatory Price Reporting System is reported in ways that are necessarily directly comparable. Reported prices do not reflect differences in marketing practices and channels; nor are differences in transportation arrangements reported. For example, packers may pay transportation costs in some cases, cattle owners may pay transportation costs in other cases, or the costs may be split. The distance between the feedlot and the packer is also a factor.

At times, especially when fed cattle are relatively plentiful, cattle feeders and packers may not agree on prices, so the cattle remain on feed longer and become “over-finished.” These cattle then shift into higher yield grades⁵ (grades 4 and 5) and weigh more. At the extreme, these heavier cattle often sell at discounted prices. On average, northern cattle are generally 100 pounds or more heavier when marketed than southern cattle because southern cattle often come from sources with lighter average placement weights (Southeastern United States and Mexico). In 2009, Nebraska fed cattle averaged 1,398 pounds (live weight across all quality categories) versus 1,286 pounds for Texas-Oklahoma-New Mexico cattle.

Other subtle differences in information are reported to the AMS Mandatory Price Reporting System, where the data are aggregated as cattle are sold. For example, fed cattle are sold out of feedlots in a number of ways. Some cattle are sold on a dressed basis as hanging carcasses, usually with no adjustment for shrinkage. Other cattle are sold as live animals, usually with an adjustment for shrinkage. In the eastern portions of Northern and Central Plains cattle feeding areas, cattle are often sold with a 3-percent shrink discount—packers pay based on actual live weight adjusted down by 3 percent to account for weight lost in transit from the feedlot to the packer. Southern Plains cattle and some cattle from western portions of Northern and Central Plains cattle feeding areas are often sold with a 4-percent shrink discount. If all other factors remain equal, such as live weight, quality, and distance to the packer, northern cattle would sell at a slightly lower price per cwt than southern cattle simply due to varying shrink factors (table 1).

³USDA's Agricultural Marketing Service is the agency responsible for grading meat. Grading for quality considers the tenderness, juiciness, and flavor of meat at eight levels: Prime, Choice, Select, Standard, Commercial, Utility, Cutter, and Canner (in order from highest to lowest quality).

⁴Shrink results from the stress cattle experience during processing, transporting, and marketing.

⁵The yield grade of a beef carcass is determined by a formula that takes into account the amount of external fat over the ribeye muscle; the amount of kidney, pelvic, and heart fat; the area of ribeye muscle; and the carcass weight. Yield grades range from 1 through 5, with 1 having the least fat and 5 being the fattiest. The lower yield grades (1 and 2) generally have higher dressing percentages (more meat per carcass as a ratio of carcass weight to live weight), while the higher yield grades (4 and 5) have lower dressing percentages. Cattle with higher dressing percentages usually receive higher prices.

Table 1

**The hypothetical effect of shrink on prices,
given constant live weight and quality**

	Live weight	Shrunk weight	Price per head	Price per cwt
	-----Pounds-----		-----Dollars-----	
Hypothetical 3-percent shrink (e.g., NE)	1,300	1,261	1,170	92.78351
Hypothetical 4-percent shrink (e.g., TX)	1,300	1,248	1,170	93.75
Difference				0.966495

cwt = hundredweight.

TX = Southern Plains cattle.

NE = Northern Plains cattle.

Source: USDA, Economic Research Service.

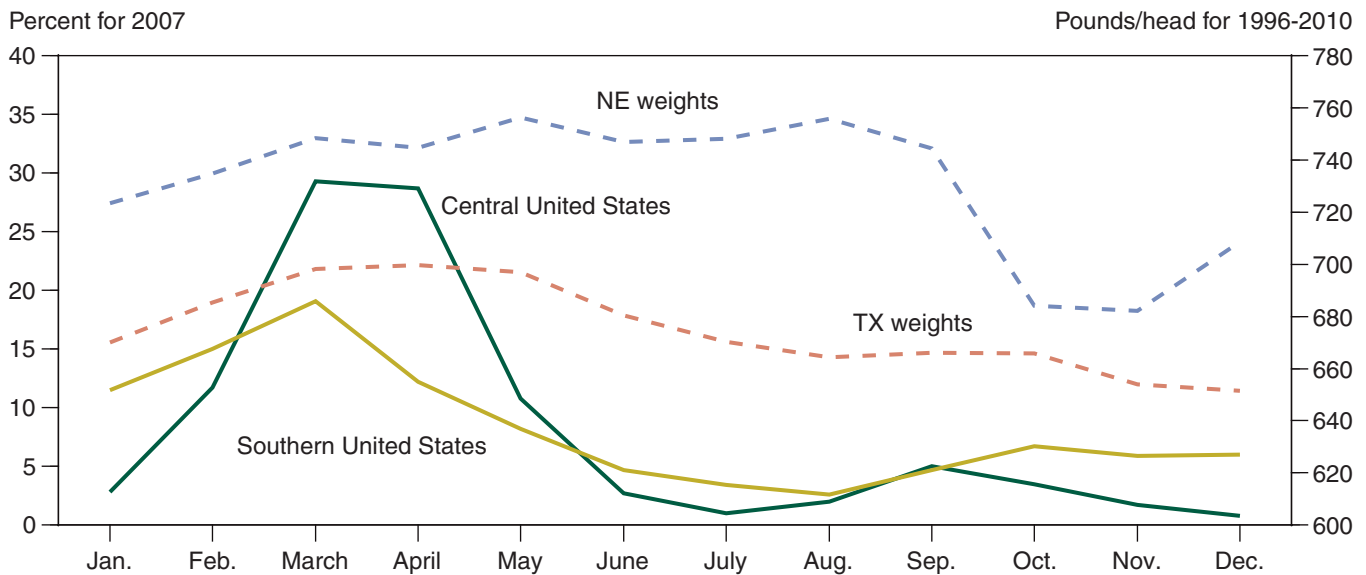
Dynamics of the North-South Price Spread and Cattle Production Systems

The very nature of cattle production systems play a role in the N-S price spread:

1. The relative supply of feeder cattle and fed cattle (by season and region);
2. The age, size, and price of cattle placed in feedlots (by season);
3. The occurrence of dry periods (by region); and
4. The availability of various feedstuffs like corn gluten feed or distillers' grains (by region).

Supplies of fed cattle vary between northern and southern feedlots, altering the price spread. Regional calving patterns, grazing options, and feedlot placement weights underlie regional differences. Nationwide, 54 percent of the yearly calf crop is born during March-May (USDA, APHIS, 2009). The spring calving tendency holds more rigidly in the North—with its harsher winters and shorter summer pasture-grazing seasons—where 69 percent of calves are born during March-May (fig. 4). Some of these spring calves are placed in feedlots in October-November (figs. 5 and 6). Milder winters allow a for lengthier spring calving season in the South and a greater number of calves to be born in the fall. Thus, weaning and placement at weaning in the South can be spread over a longer period. As a result, marketing of southern calf-feds is distributed more throughout the year than in the North.

Figure 4
Monthly calving distribution and average placement weights

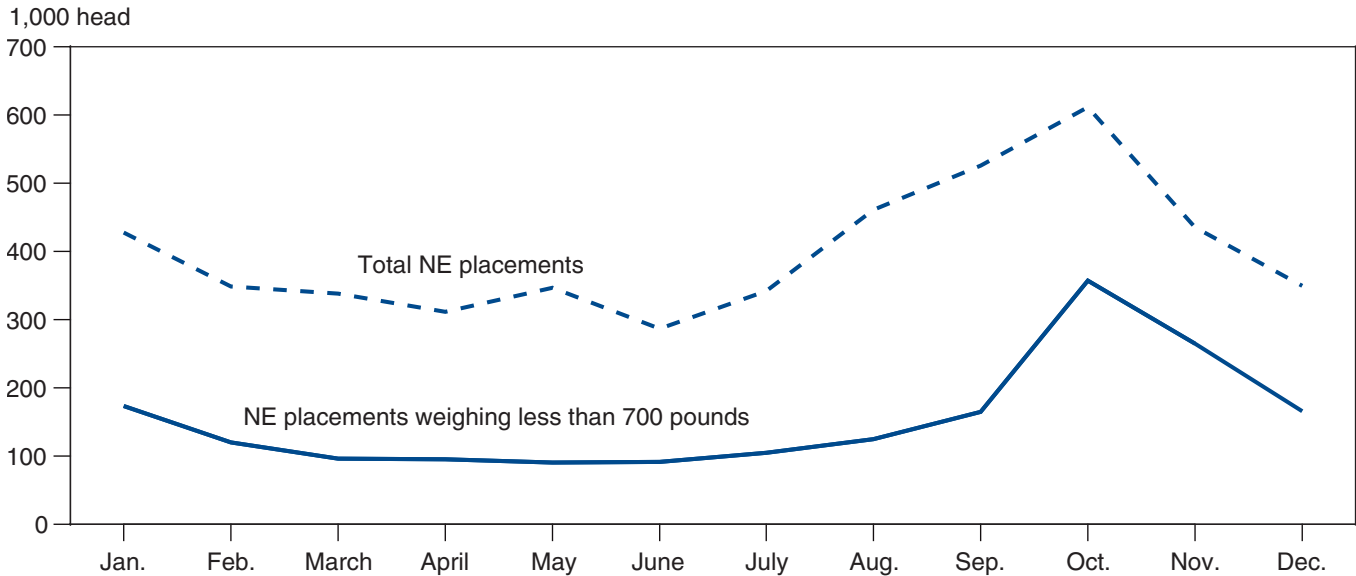


TX = Southern Plains cattle.
 NE = Northern Plains cattle.

Source: USDA, Economic Research Service calculations based on data from USDA, Animal and Plant Health Inspection Service, Veterinary Services, *Beef 2007-08, Part II: Reference of Beef Cow-calf Management Practices in the United States, 2007-08*; National Agricultural Statistics Service, *Cattle On Feed* reports, various issues.

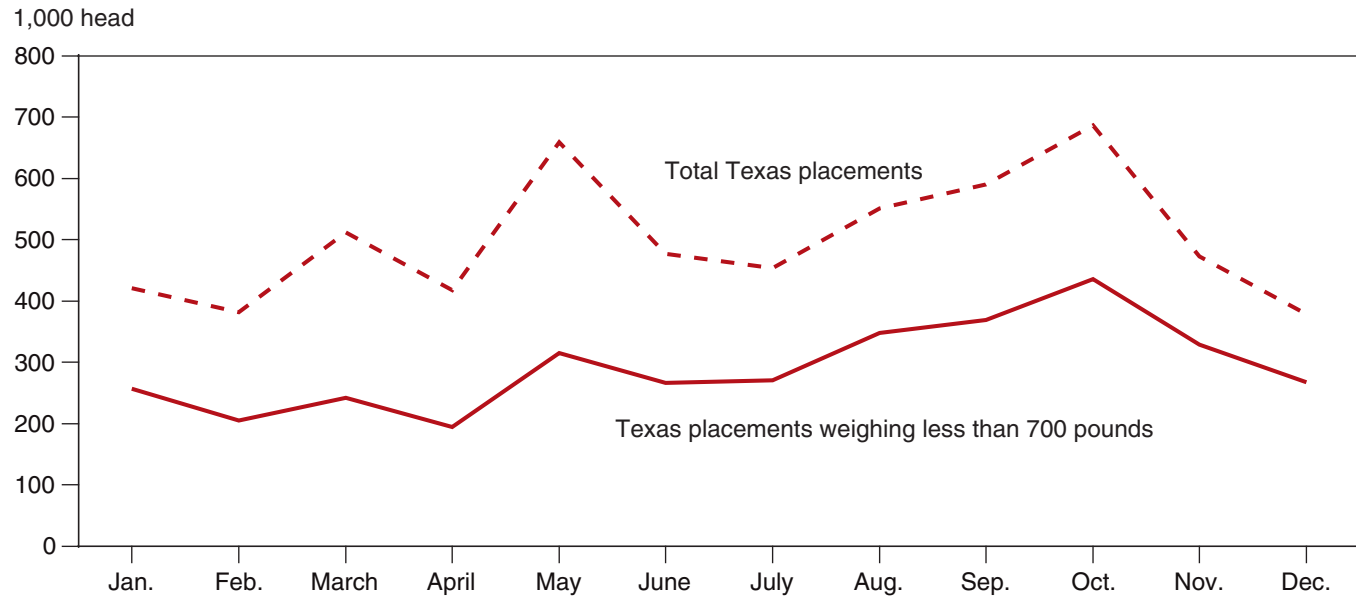
A greater number of grazing options are available for feeder cattle not placed on feed immediately after weaning in the South through the winter months because of milder winter temperatures and the availability of cool-season grasses. More feed options offer southern producers greater flexibility in calving seasons and grazing programs. In the South, cattle can often graze winter wheat pasture, generally from October through mid-March. Feedlot

Figure 5
Total Nebraska placements and those under 700 pounds, averaged over 1996-2010



Source: USDA, Economic Research Service calculations based on data from USDA, National Agricultural Statistics Service, *Cattle On Feed* reports, various issues.

Figure 6
Total Texas placements and those under 700 pounds, averaged over 1996-2010

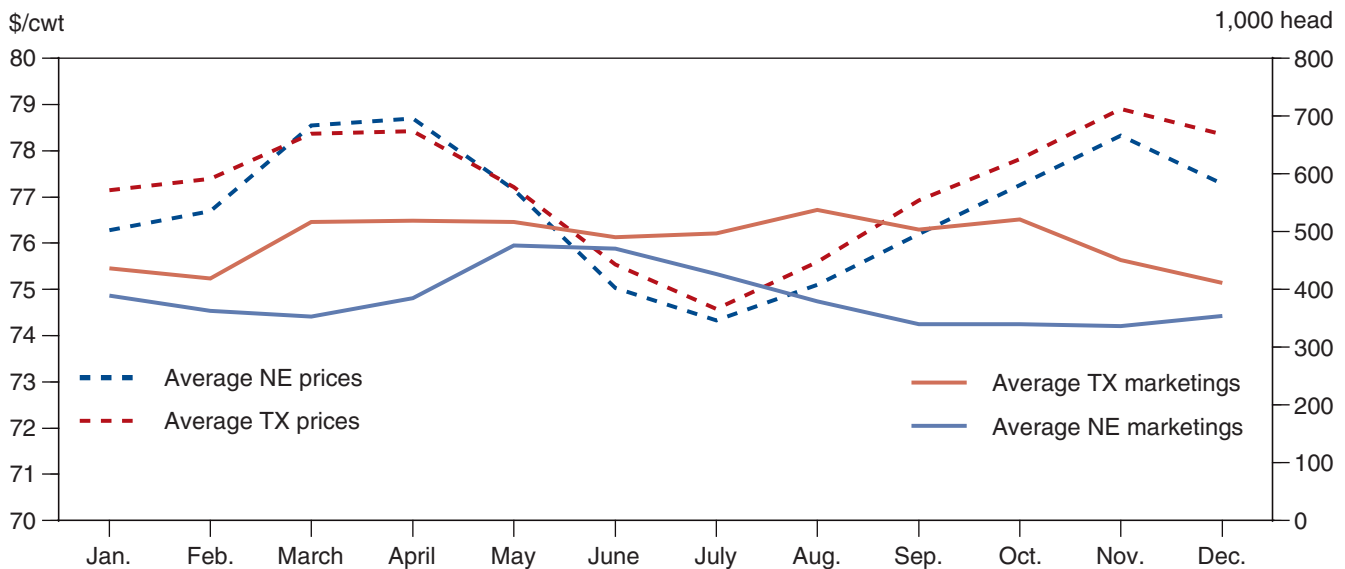


Source: USDA, Economic Research Service calculations based on data from USDA, National Agricultural Statistics Service, *Cattle On Feed* reports, various issues.

placements increase sharply in March when cattle have to be removed from wheat pastures to prevent inroads into grain production (see fig. 6). Another peak occurs in May when wheat pastures not intended for harvest have been “grazed out” and cattle are removed from these or other cool-season pastures (or other backgrounding programs) and placed in feedlots. Northern cattle placement in feedlots increases again in May, mostly from short-yearling backgrounding programs, possibly as a means of filling pen space vacated by earlier marketings of calf-feds.

On average, the peak in northern feeder cattle placement occurs in October (see fig. 5). A relatively large proportion of the cattle entering feedlots in the North from October to November are calf-feds. These cattle generally weigh less than 700 pounds and will be marketed primarily during May-July. In a typical year, however, more 700-pound or heavier cattle (long-yearlings) are placed in the North than in the South. Placement of these long-yearlings peaks in September-October, and marketing of these cattle from feedlots begins in late February (see figs. 5 and 6). Conversely, more cattle weighing less than 700 pounds are typically placed in TX than NE, with peak placement in April-June. These placements may be calf-feds, calves carried through the winter, or calves that have grazed out wheat pastures. Placements in this region and weight category also are likely to include a number of calves imported to the United States from Mexico. Heavier calves in the South placed in February-March likely are removed from wheat pasture early enough to prevent damage to the grain crop. Heavier cattle placed in April-June are generally short-yearlings that have grazed out wheat pasture or another small grain crop. These April-June placements are marketed as fed cattle beginning in late summer. Long-yearlings in both the North and South are placed in September-October and sold from feedlots beginning in late February (figs. 5, 6, and 7).

Figure 7
Monthly prices and marketings for fed cattle from Texas and Nebraska feedlots of 1,000 head or more, 1996-2010 average



cwt = hundredweight.

Source: USDA, Economic Research Service calculations based on data from USDA's Agricultural Marketing Service reports on monthly prices.

As a result of these placements, supplies of market-ready fed cattle increase earlier in northern feedlots in March-May. Fed cattle marketings in the North are elevated in May-October. Fed cattle prices generally reach a seasonal peak in March or April, on average, because fewer market-ready cattle are available during the first quarter (see fig. 7). This peak occurs just after long-yearlings in the North and South have been marketed and calf-fed placements have not yet reached market finish. Prices peak again in November, with reduced supplies of fed cattle resulting from low feeder cattle placements during spring and summer. Seasonally low prices occur in June-August with another, less pronounced seasonal dip in December-January. The June-August low in prices is due to the relatively large supply of fed cattle available during the summer, including calf-feds from the North and South and early finishing yearlings in the South that were removed from wheat pasture and cool-season forage.

Price Spread Inversions Occur Seasonally

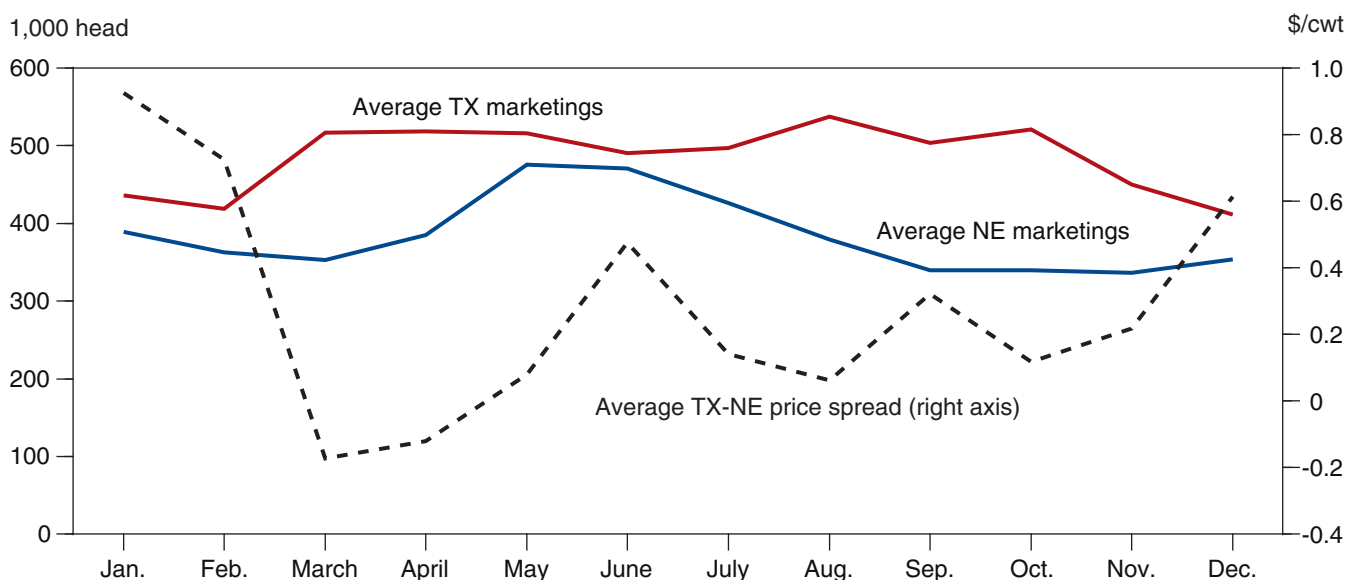
The average monthly price differential between Texas' and Nebraska's (TX-NE) cattle decreases sharply in the early spring, becoming negative in March-April when larger numbers of fall-placed calf-feds and long-yearlings come to market as fed cattle (fig. 8). Relative scarcity for long-yearlings in NE results in an average price premium for NE cattle compared with TX cattle prices during March-April, making the TX-NE spread negative (figs. 7 and 8). During these months, a similar number of calf-feds come from both North and South, but fewer preferred yearlings are coming to market in the North. Packers in the North who want to process more yearlings than are locally available and who wish to maintain slaughter levels have three options:

1. They must bid more for northern yearlings due to their relative scarcity;
2. They must pay more for northern calf-feds; or
3. They must pay transportation costs for southern cattle.

The TX-NE spread is greatest in December-February, when fewer summer-placed cattle are marketed (figs. 7 and 8). The observed reduction in marketings during the first quarter (January-February in TX and January-March in NE) are due to low placement levels from the previous summer. During December-January, Southern Plains feedlots have fewer heavier weight (yearling) cattle relative to northern feedlots, prompting southern packers to bid more for these cattle. This supply adjustment occurs just before the bulk of calf-feds enter the market (May-July).

Figure 8

Marketings from feedlots of 1,000 head or more, December 1995-December 2010 average



cwt = hundredweight.
NE = Nebraska cattle.
TX = Texas cattle.

Source: USDA, Economic Research Service calculations based on data from USDA's Agricultural Marketing Service reports on monthly prices; placement data from USDA, National Agricultural Statistics Service, *Cattle On Feed* reports, various issues.

Other Historical Price-Spread Inversions

Inversions in the price spread between NE and TX cattle do occur outside the seasonal inversion in March-April. For example, in 2003, imports of Canadian feeder and slaughter cattle were halted between May 2003 and July 2005 due to a Canadian case of bovine spongiform encephalopathy (BSE). This event occurred as U.S. cattle inventories were well into cyclical liquidation and were already low. Since many Canadian feeder cattle are typically fed in northern U.S. feedlots,⁶ feeder cattle placements in northern feedlots for 2003 were below normal. At the same time, Mexican cattle imports were increasing, with a large proportion being fed in and marketed from southern feedlots, increased regional supplies. This supply flux resulted in an atypical shift in already reduced supplies of fed cattle available for slaughter from northern feedlots and increased prices relative to southern fed cattle prices. This shift reversed the TX-NE spread (a premium for NE over TX cattle) for all but 2 months (June-July 2004) from March 2003 to August 2004.

The price spread was also inverted for 13 months from October 1996 through October 1997, although the reason is not as clear. Placements of heavier feeder cattle were higher than usual in the Southern Plains compared with Northern and Central Plains placements, which could have given a price edge to northern markets. Also, in fall 1996, feeder cattle imports from Mexico were below those of the previous year, while slaughter steer and heifer imports from Canada were relatively high year to year, which could have reduced the availability of heavier finished cattle in TX and given heavier finished cattle in NE a price advantage. Finally, cattle-on-feed inventories rose as seasonal grain prices declined from record high levels set in summer 1996. Marketings at or below those of the previous year supported fed cattle prices, and cattle placed on feed in late fall 1996 and winter 1996 could be hedged at profits approaching \$100 per head.

⁶CanFax reports that, in 2007, 81 percent of feeder cattle exported to the United States were fed in Nebraska (39 percent), Colorado (21 percent), Iowa (11 percent), and Washington (10 percent), compared with 74 percent fed in those same States in 2006 (CanFax Weekly Summary, *Cattle Market Outlook and Analysis* Vol. 38(9), February 29, 2008).

Conclusions

Production practices in the cattle sector reflect variations in the timing and duration of calving and the use of pasture before placement in feedlots. Some of these differences contribute to regional price differentials. For example, fed cattle prices in the Southern Plains are typically at a premium to Northern and Central Plains fed cattle. A price difference persists, in part, because of discounts associated with the heavier average market weights of northern cattle and despite the premiums associated with the higher average quality of northern cattle compared with marketings in the Southern Plains. Seasonal factors and aberrant market situations produce premium price inversions for southern fed cattle.

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