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Breed Influence on Feeder Calf Prices

Circular 634

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ABSTRACT

Cow-calf producers select for genetic traits that create profitability in their output—feeder calves—but are constrained by environmental factors; this is readily apparent in the southwestern United States. The use of exotic-origin or *Bos indicus* cattle in this region allows producers to utilize otherwise unproductive rangeland, as many *Bos taurus* cattle cannot thrive in semiarid conditions. This paper examines price differentials between feeder calves of exotic origin and those of European origin. Specifically, a hedonic price model is used to analyze sales data from feeder calf teleauctions in the Southwest over a six-year period.

INTRODUCTION

Livestock producers' ability to make sound financial and economic decisions is often constrained by the qualities of the product they are selling. Agricultural producers are price takers; they are dependent on market response to the product put forth. This study considers the impact of breed influence on prices received for calves produced in the Southwest. Feeder calf prices depend to a large extent on the prevailing market conditions and on the physical characteristics of the animal for sale (Buccola, 1980). Many sales yards do not provide information about an animal other than its weight and breed or breed type. Bidders must physically examine the animal to infer other characteristics, such as its carcass quality or predicted mature weight. The animal's physical characteristics are important indicators of the calf's future performance in the feedlot, and are often the only information a bidder has about the animal's genetic and environmental background.

Cow-calf producers select for genetic traits that hopefully will create profitability for their production unit. Cattle that excel in the feedlot are not always productive under harsh rangeland conditions that are often seen in the Southwest. Since survivability traits are not always desirable in the feedlot, ranchers face a trade-off between selecting for cattle that have been adapted to semiarid rangelands over generations and selecting for cattle that will perform well in the feedlot and produce high-quality carcasses. Each producer attempts to select an optimal combination of survival traits and feedlot-desired traits to maximize profit potential. Feedlot buyers, of course, only value traits that are profitable for them. Thus, a calf has a variety of traits, some highly valued by feedlot buyers and some not valued by feedlot buyers. Due to this, premiums and discounts for specific characteristics have appeared in the feeder calf market.

An animal's breed type, i.e., *Bos taurus* or *Bos indicus*, is usually an important factor in a feeder calf's price, since there is significant variability between the characteristics of these breed types. For example, *Bos taurus* breeds typically reach finish weight faster and yield a quality grade higher than their *Bos indicus* cousins—called *exotic* breeds. Profit levels vary among breeds in the feedlot due to the level of "finish" required to make the animal ready for slaughter (Amer et al., 1994). Breeds vary in feed efficiency and growth rate; thus, breed decisions can affect feedlot profitability. The U.S. feedlot industry primarily utilizes *Bos taurus* breeds such as Angus, Simmental, Hereford, and Charolais—referred to as *European* breeds.

However, cow-calf producers in southern areas of the U.S. often select *indicus* breeds or composite breeds with *indicus* influence because they possess traits that allow them to thrive in difficult rangeland conditions. These heat-tolerant animals have been developed in arid or semi-arid, hot-climate environments that may otherwise be considered unproductive. However, *indicus* breeds are not known for yielding the highly palatable cuts of meat that the U.S. feedlot industry seeks to produce. Exotic breeds can have less intermuscular marbling and leaner carcasses—this may yield a tougher, less flavorful cut of meat (Bidner et al., 2002).

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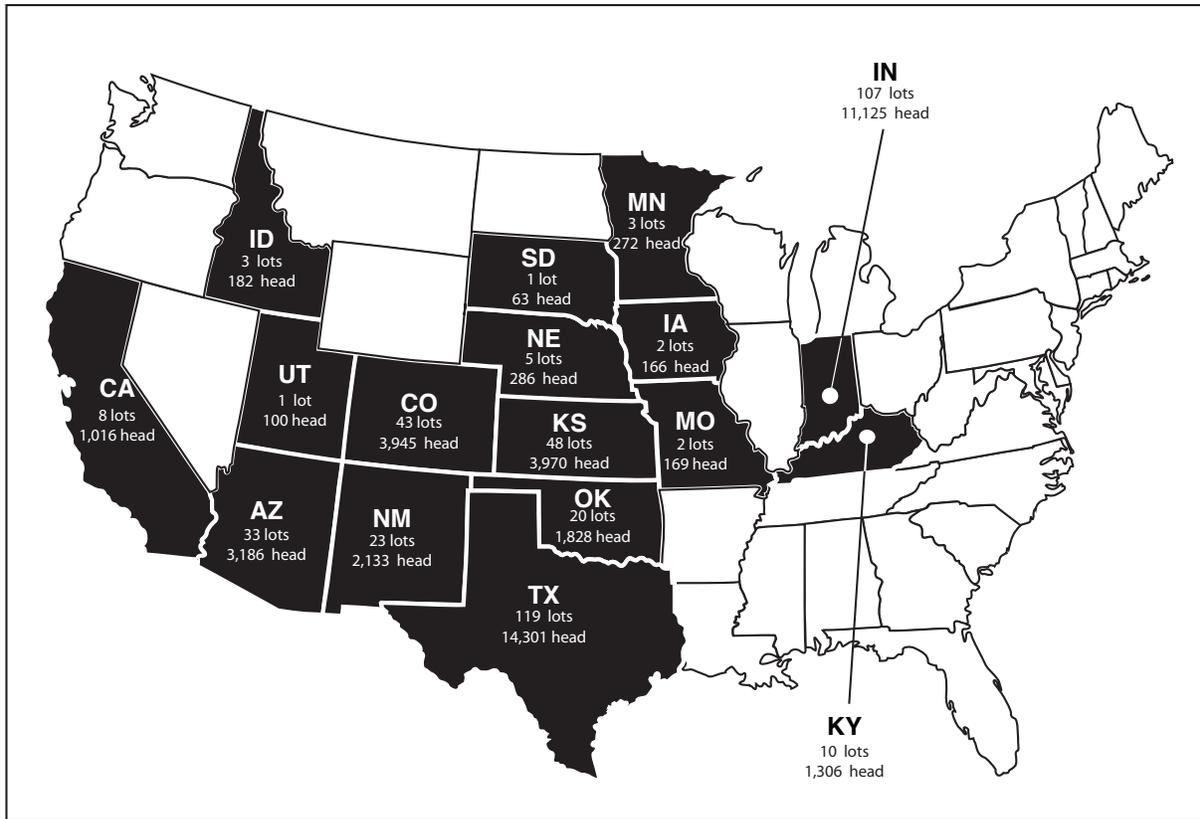
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Figure 1. Feeder calf shipments from sales at Superior Livestock teleauctions, by destination state, 2000–2006.

Table 1. Feeder Cattle Weight, Lot Size, and Price Received ($/cwt) by Dam's Breed

	N		Weight		# Hd in Lot		Price	
	Total Lots	Total Hd	Mean	SE	Mean	SE	Mean	SE
Angus	130	14,375	495.0	9.1	110.5	6.3	105.8	1.06
Beefmaster	14	1,696	530.3	29.0	121.1	27.4	85.3	2.33
Braford	13	1,039	535.7	27.0	79.9	6.1	94.7	2.95
Brahman	37	4,823	491.8	18.8	130.3	15.1	96.15	2.43
Brangus	47	2,724	495.8	16.4	57.9	3.6	97.5	1.65
European – unspecified	65	8,888	576.6	16.7	136.7	10.8	95.3	1.29
Exotic – unspecified	36	4,444	493.0	21.0	123.4	19.7	100.6	2.48
Gelbvieh	6	342	521.6	32.8	57.0	5.4	95.3	1.74
Hereford	73	4,984	596.5	15.7	68.2	3.2	94.3	1.51
Limousin	7	733	446.4	20.4	104.7	17.2	101.4	3.37

Table 2. Expected Signs for Explanatory Variable Coefficients

Variable	Measurement	Expected Sign
Physical characteristics		
Lot size	Index of the number of head in the lot for sale; lot size equals animals in lot divided by 100	Positive
Calf weight	Hundredweight	Negative
Sex	Dummy variable that equals 1 if the lot is comprised of heifers	Negative
Breed type	Dummy variable that equals 1 if the lot is comprised of Exotic Influence animals	Negative
Environmental characteristics		
Origin	Dummy variable that equals 1 if the lot is comprised of animals from Arizona	Unknown
Vaccination program*	Dummy variable that equals 1 if the animals in the lot were vaccinated under a program with specified regulations	Positive
Marketing characteristics		
Destination[k]	Dummy variable that equals 1 if the lot sold to k state, k = California, Colorado, Iowa, Idaho, Indiana, Kansas, Kentucky, Minnesota, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, or Utah (Arizona base)	Unknown
Source verified	Dummy variable that equals 1 if the lot is source verified	Positive
Year	Year in which the lot sold	Unknown
Corn price	Annual average on-farm price	Positive

*In all four specified vaccination programs calves are vaccinated with Clostridial 7-way, IBR, PI3, BVD, BRSV viral vaccine, and *Pasteurella haemolytica* and/or *multocida* at preweaning, weaning, or postweaning. In the unspecified program, calves were vaccinated at the discretion of the breeder.

DATA

Sales data were collected on 428 lots of feeder cattle (representing 44,048 head of cattle) sold between January 2000 and December 2006 at Superior Livestock teleauctions held in Arizona. Cattle were raised in Arizona, New Mexico, and Texas[2] and sold to 16 states, with the majority of animals going to Texas and Indiana (Figure 1). The breeds of both the animal's sire and dam were recorded, and ten breeds were represented (Table 1). If either the animal's sire or dam was an exotic breed, the calf was categorized as an *Exotic Influence* breed type; if the animal's sire and dam were both of European origin, the calf was categorized as a *European* breed type.

MODEL AND METHODOLOGY

Table 2 presents the characteristics examined in the model and their expected influence on calf price.

Physical characteristics. An animal's physical characteristics are often indicators of its genetic makeup. Since only some genetic traits are expressed superficially (e.g., carcass traits are not apparent upon visual inspection of the live animal), information about the animal's breed may imply additional information to the bidder

about non-visible traits. Variables included as physical characteristics are physical factors traditionally assumed to influence feeder calf price (e.g., lot size, average calf weight, and gender) as well as a binary variable for the animal's breed type (either European or Exotic Influence). Lot size is expected to be positively correlated with price—feedlots prefer larger lots of calves from one source to limit shipping stress and reduce the spread of disease. Conversely, calf weight is expected to be negatively correlated with price—feedlots are willing to pay less per pound for a heavier calf. As other research has found that heifers are discounted relative to steers (Schroeder et al., 1988; Dhuyvetter & Schroeder, 2000), a negative relationship between a heifer calf and price is expected. If common industry perceptions that Exotic Influence cattle sell at a discount compared to European cattle are correct, a negative relationship will be observed between an Exotic Influence calf and price.

Environmental characteristics. In addition to genetic characteristics, environmental factors play a role in feeder cattle pricing. A calf's environment includes its physical environment as well as the care and management it is given. Breeders make management decisions involving the care of their animals; in recent years the use of vac-

[2]One lot originated from West Texas; this observation was added to the New Mexico observations.

Table 3. Results from Regression Analysis of Superior Livestock Teleauction Sales, 2000–2006

Variable	Parameter Estimate	t-value	p-value
Intercept	142.9992	39.36	< 0.0001
Physical characteristics			
Lot size	1.2915	2.34	0.0196
Calf weight	-7.3248	-15.62	< 0.0001
Heifer	-9.1698	-12.13	< 0.0001
Breed type: Exotic Influence	-3.2277	-4.11	< 0.0001
Environmental characteristics			
New Mexico origin	-0.4974	-0.14	0.8883
Vaccination program	1.7876	2.20	0.0287
Marketing characteristics			
Destination:			
California	-0.7236	-0.23	0.8181
Colorado	-2.8697	-1.49	0.1379
Iowa	-5.7656	-0.78	0.4362
Idaho	8.9837	2.13	0.0334
Indiana	-3.8341	-2.20	0.0287
Kansas	1.8082	0.90	0.3664
Kentucky	-6.3607	-2.34	0.0196
Minnesota	5.7783	1.21	0.2260
Missouri	-2.1432	-0.13	0.8976
Nebraska	-7.1106	-3.27	0.0012
New Mexico	2.1480	0.94	0.3475
Oklahoma	0.3629	0.13	0.8970
South Dakota	7.3762	0.06	0.9541
Texas	-0.0772	-0.04	0.9643
Utah	4.5510	0.02	0.9858
Source verified	1.5777	1.38	0.1692
Year			
2001	-2.9262	-1.22	0.2218
2002	-9.8363	-3.95	< 0.0001
2003	-9.4048	-3.75	0.0002
2004	-3.3281	-1.35	0.1772
2005	2.6620	1.02	0.3069
2006	4.3890	1.70	0.0893

cination programs and source-verified tracing systems has become more prevalent (Lawrence & Yeboah, 2002; Macartney et al., 2003b; King & Seeger, 2004). There seems to be little doubt that the animal's pre-weaning environment can influence the animal's value to a feedlot. This category includes factors that can be affected by the cow-calf producer (e.g., the animal's origin and whether the producer has used a specified vaccination program).

Marketing characteristics. Feeder cattle are now being sold via several methods; many animals are marketed by teleauction rather than by traditional auction. Teleauctions are auctions held without the bidders, sellers, and

cattle physically meeting; they often include live video footage of the animals offered for sale. Feeder calves in teleauctions are usually sold from the ranch with stipulations regarding acceptable shrink percentages and weight variations. Like the Superior Livestock teleauction, most teleauctions provide information to bidders on the general characteristics of the calves for sale, including the lot size, location, weight ranges, breed(s), vaccination programs, and source verification status (Turner et al., 1993). Comparing feeder calf prices at teleauctions to feeder calf prices at traditional auctions has been the focus of several studies (Bailey & Peterson, 1991; Macartney et al., 2003a). For the purposes of this model, the marketing category includes micro characteristics (e.g., the animal's destination and source verification status) as well as macro factors (e.g., year effects as well as annual variations in feeder calf price due to the cattle price cycle).

RESULTS AND DISCUSSION

Table 3 presents results of a regression analysis of data gathered at Superior Livestock teleauctions between 2000 and 2006.

Effect of physical characteristics. Most feedlots acknowledge that larger, same-source groups of cattle entering the feedlot are more cost efficient. When a feedlot is forced to mix calves of different origins within one pen, stress occurs. When these calves have different vaccination histories, the calves are more likely to become sick. Purchasing a lot of calves at a sales yard from the same source as calves already in the feedlot pen can help minimize these health risks. Animal stress and sickness decrease, which means single-source calves gain faster after purchase than mixed-source calves, saving the feedlot money. In addition, transportation is more efficiently coordinated when one lot of same-source calves can fill a truck. These efficiencies were reflected in our data: a 1% increase in the lot's size increases the price of the lot by $1.29 per hundredweight.

As a calf's weight[3] increased, the purchase price in dollars per hundredweight decreased, all else equal. While the total value[4] of the animal to the feedlot continues to increase, a feedlot is not willing to pay as much per hundredweight for a heavier animal as it is for a lighter-weight animal. Increasing a calf's weight by 1 pound decreased the calf's price by $0.06 per hundredweight.

As suggested by previous research, heifers were discounted compared to steers (Buccola, 1980; Turner et al., 1992). This may be due to the risk of undetected pregnancy associated with heifers or the fact that open heifers expend energy during estrous cycles that would otherwise be converted to growth or finish in the feedlot. Open heifers returned $66.35 more than pregnant heifers in one feedlot study (Jim et al., 1991). In addition to less efficient growth, heifers also have smaller carcass weights, which may result in smaller cuts of meat that are discounted at the retail level. Heifers were discounted $9 per hundredweight compared to steers.

Breed type had a significant impact on the sales price. Cattle of an Exotic Influence breed type sold at a discount compared to European breed type cattle. While breed type was not the primary focus of their research, Shroeder et al. (1988) also found that Exotic breeds were discounted relative to Herefords in their model examining feeder calf price differentials. One explanation for this discount may be the lower carcass quality associated with *Bos indicus* cattle, primarily involving issues of palatability; while Exotic Influence cattle have lean carcasses, problems with meat tenderness may be present (O'Connor et al., 1997). Consumers are willing to pay more for highly marbled steaks (Killinger et al., 2004), and most consumers prefer steaks that are more tender and are willing to pay more for these steaks (Lusk et al., 2001).

To satisfy consumer preferences at the retail level, packers seek out these traits in the carcasses they purchase. Carcasses of Exotic Influence cattle may be sold at a discount compared to carcasses of European origin cattle if they are not as tender. This discount will most likely translate up the production chain and affect feeder calf prices, as feedlots attempt to fatten cattle that meet packer desires and discount calves from breeds that research has identified to have tenderness issues. This potential cost to cow-calf producers must be weighed carefully against the additional benefits heat-tolerant cattle present in semi-arid range conditions. If Exotic Influence cattle are discounted heavily enough, it becomes no longer economically feasible to raise them, despite their suitability to the desert environment.

Effect of environmental characteristics. All cattle were from either Arizona or New Mexico; both states are known for raising cattle on semi-arid range with similar production practices, so the lack of variation in this variable is not unexpected. Most cattle in the Southwest are "turned out," relatively unsupervised, for most of the year. These cattle travel long distances between their forage source and water supplies and are expected to survive without constant human management.

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[3]The lot's average weight is reported in hundredweight (e.g., 4.5 corresponds to a 450-pound average weight).
[4]Total value equals the animal's hundredweight times the price per hundredweight.
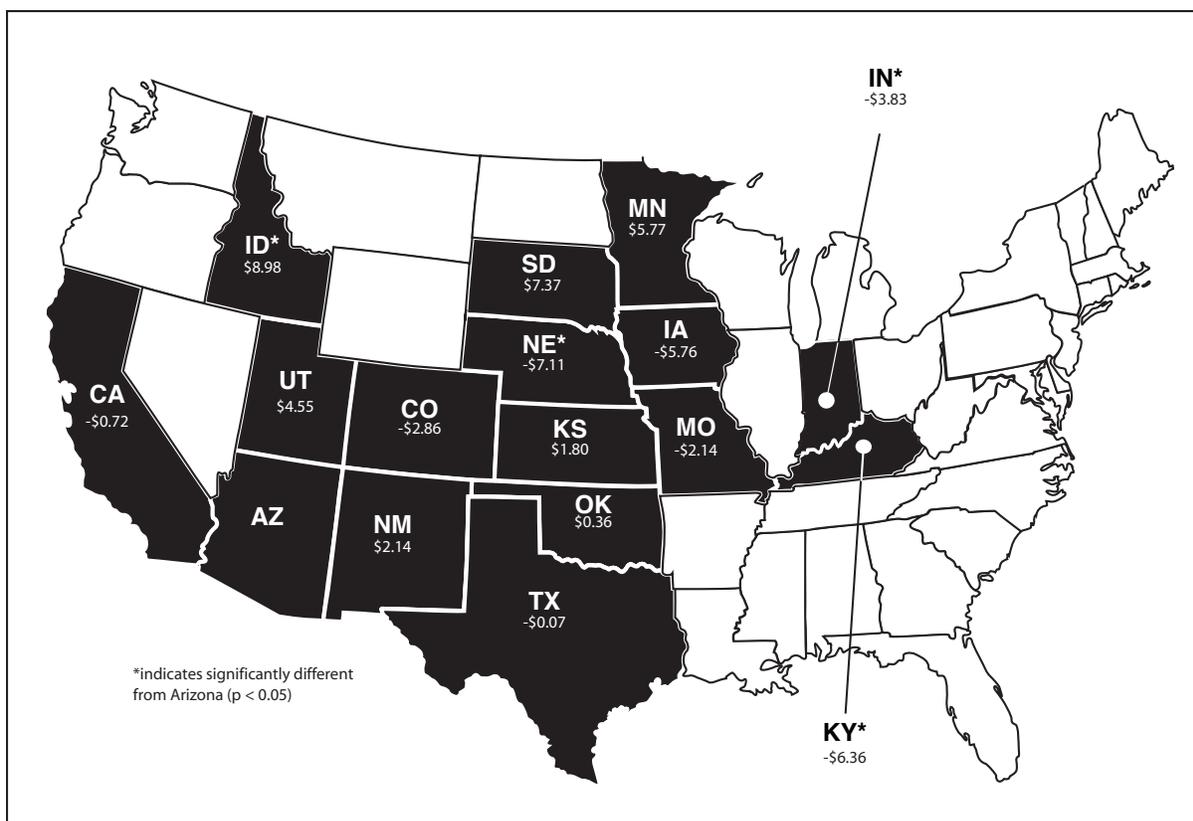
Figure 2. Marginal effect (\$/cwt) of the buyer's destination state for feeder cattle sold through Superior Livestock teleauctions, 2000–2006.

Effect of marketing characteristics. Animals destined for Indiana, Kentucky, and Nebraska were sold at a significant discount compared to animals destined for Arizona, while animals destined for New Mexico and Kansas were sold at a significant premium. This may indicate the basis needed to cover transportation costs; the majority of feeder calves were shipped outside the state of Arizona and incurred additional expenses in reaching the feedlot (Figure 2). This transportation cost can vary, and currently it is estimated at \$3.50 per loaded mile. Thus it would be expected that the farther the buyer must ship the calves the higher the transportation cost, which in some cases affected the price the buyer was willing to pay for the calves. Compared to buyers from Arizona, buyers from states that produce many of their own feeder calves also discounted these calves, possibly because they have a large feeder calf source of their own. With the issue of beef traceability a growing concern, it is unsurprising that source-verified calves sold at a significant premium of \$3.97/cwt. Corn prices (as measured by a national annual on-farm average [U.S. Department of Labor]) were insignificant in explaining the variation in feeder calf prices.

CONCLUSIONS

Cow-calf breeders in the Southwest face discounts for Exotic Influence feeder calves compared to traditional European feeder calves. Breed was an important factor affecting feeder calf prices at Superior Livestock teleauctions held over a seven-year period. It appears that buyers at this sale recognize that breed type significantly affects feedlot performance and base their pricing decisions accordingly.

In these circumstances, cow-calf producers saw a \$3.38/cwt discount for their Exotic Influence calves. For a 500-pound animal, this translates into a \$16.90 discount. Earlier research has indicated that weaning weights, pregnancy rates, and weaning percentages are comparable among the Exotic Influence breeds Barzona, Beefmaster, and Brangus, suggesting that these breeds are similarly adapted to semiarid environments (Winder

et al., 2000). Thus, rather than facing a specific decision about which exotic or Exotic Influence breed to use in the herd, cow-calf producers may wish to decide whether or not to utilize exotic breed types at all, given the discounts they may face.

Since Brangus-sired cows in semiarid conditions produce more calf weight per year than Hereford-sired cows and wean 3.7% more calves per year (Winder et al., 1992), the question becomes, "Does the increase in animal productivity stemming from the use of Exotic Influence breeds outweigh the discounts seen for the resulting calves Southwest cow-calf producers sell?" As animal productivity is also a function of other factors, such as stocking rate (Winder et al., 2000), further research may be necessary to examine under what conditions utilizing Exotic Influence breeds is economically feasible.

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