Price Impacts of Brahman Influence in Southern Texas

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Abstract

Brahman influence is a key characteristic of cattle in the southern US. Several crossbreeds have been developed to utilize the hybrid vigor of the Brahman breed. However, tendency to produce lower-grade beef, Brahman influenced calves are typically discounted relative to British or European calves. Studies typically treat Brahman influence as a binary variable, which is appropriate in other regions, but may not accurately capture the effects of Brahman influence on cattle prices along the Gulf Coast of the U.S. Using a standard hedonic price model and controlling for the typical genetic and managerial factors, we examine price effects using five levels of Brahman influence: 0% Brahman, approximately 25%, 50% or a first-generation cross, approximately 75%, and 100% Brahman. Data were collected on 1,879 calves in 5 auction facilities across south Texas during 2014-2015. Results indicate that Brahman influence doesn't have a statistically-significant negative impact on price, except in the case of 100% Brahman calves.

Key words: livestock marketing, Brahman cattle breed, hedonic models

Introduction

The determinants of feeder cattle prices have been studied extensively in the agricultural economics literature (Coatney et al. 1996, Faminow and Gum 1986, Schroeder et al. 1988, Schulz et al. 2015, and Zimmerman et al. 2012). The value of various management systems is a popular subject in recent studies, but the effects of breed type and other physical characteristics as well as market characteristics and seasonality are also standard explanatory variables. This paper examines the effect of Brahman influence on price in south Texas using a novel set of variables. South Texas is a particularly interesting region for studying the effect of Brahman influence on price because the Brahman breed itself and two popular crossbreeds were developed in this region to take advantage of the breed's heat and insect tolerance, as well as improved maternal ability and longevity.

Most studies that account for the effect of Brahman influence on price do so with binary variables for breed type, with only one or two variables accounting for Brahman and Brahman crossbreeds. An exception to this is Coatney et al. (1996). The authors used 4 binary variables to account for Brahman influence: English-Exotic crosses, 1/10 to 3/8 Brahman influence, 3/8 to 7/8 Brahman influence, and 7/8 to straight Brahman. Other breed types such as South Mexico Zebu, Brown Swiss, Corriente, and Longhorn were lumped in with the last category. Since this paper focuses on Brahman influence, the breed type variable we use accounts only for Brahman influence.

Hedonic Pricing Model and Data

The market value of a calf at sale is dependent on the supply of and demand for calves in a given region. Physical characteristics (C) such as weight, breed type, frame, and muscle score

and market characteristics (M) such as transportation costs, seasonality, and futures market prices are the primary determinants of transactions prices in beef cattle markets. We adopt a model similar to Zimmerman et al. (2012) and Schultz et al. (2015). The model can be written:

(1) $$Price_{it} = \sum_k V_{ikt}\, C_{ikt} + \sum_h R_{ht}\, M_{ht}$$

where i is an individual calf, k is a specific physical characteristic, h is a specific market characteristic, and t is the auction date. The value of a specific physical characteristic for an individual calf on a specific sale date is given by V and the effect of a specific market characteristic on price is given by R. The model specified above enables us to isolate the effect of a range of physical and market characteristics on price.

The empirical model used in this paper is similar to other hedonic pricing models used in previous studies of calf prices as well as a more detailed breakdown of Brahman influence. The price of an individual calf $i$is a function of physical characteristics and market forces on auction date t. The model can be written as:

(2)

$$Price_{it} = f(Coat_{it}, Sex_{it}, Frame_{it}, Fill_{it}, Condition_{it}, Muscle_{it}, Brahman_{it}, Horns_{it}, Weight_{it}, Location_{it}, Futures_t)$$

The effects of all variables are measured by binary variables for a specific trait with the exception of the futures price and weight. The auction site locations are not specified due to previous agreements with the auction owners. The data are summarized in tables 1 and 2.

Data for this study were collected from April 2014 through September 2015 in 5 auction facilities across southern Texas. On average, this area is home to roughly 20% of the beef cows in the state of Texas. County Extension Agents were the primary data collectors and data collection training was provided by Extension Specialists. In the auction facilities in the study, calves are sold individually rather than in lots of several head.

We expect that calves with horns, spotted or irregular coat patterns, and bulls will be discounted relative to the other calves in the study. These characteristics all either impose costs on feedlot operators or are associated with poorer meat quality. Since roughly half of the calves from south Texas are fed and slaughtered in the region, we expect that calves with less Brahman influence will not receive discounts, though those with higher Brahman influence will. This is because the benefit of Brahman influence (i.e. improved feed efficiency due to superior heat and insect tolerance) will largely outweigh the costs (i.e. poorer-grade beef) for calves with 25% and 50% Brahman influence that are fed in the region. Calves with 75% and 100% Brahman influence will still likely receive a discount.

Results

Results of the regression of price on a variety of physical and market characteristics (Table 3) indicate that Brahman influence, coat color and pattern, sex, and horns were the primary physical characteristics that influenced price at the margin. While the frame, fill, condition, and muscle score are important factors for determining calf prices, they were not important in differentiating prices between calves in this study.

Four coat colors or patterns had statistically significant premiums or discounts relative to solid black calves. Solid red and brown coat colors were discounted -$0.042 and -$0.057 relative to solid black calves. Calves with spotted or irregular coats were discounted -$0.238. This is likely due to the sale of large numbers of steers used for rodeo purposes in the region. Calves with black coats and white faces were the only group to receive a premium ($0.073) over solid black calves.

The sex of the calf had a statistically significant impact on price. Bulls and heifers received statistically significant discounts of -$0.041 and -$0.116 per pound relative to steers,

respectively. Frame, fill, condition, and muscle score did not have a statistically significant impact on price, except that calves with shrunk rumens were discounted -$0.219 per pound. Horned calves received a discount of $-0.062, which is similar to other studies.

Contrary to most studies, we found statistically significant premiums over non-Brahman calves for 3 of the 4 Brahman influence levels. The premiums for 25%, 50%, and 75% Brahman influence were $0.038, $0.071, and $0.056 per pound, respectively. A likely explanation for the $0.071 premium for 50% Brahman calves is that F1 cross heifers are very popular breeding females and, during the period of the study, substantial herd rebuilding occurred in the region. The premiums for Brahman influence are an indicator that, in south Texas, the benefits of heat and insect tolerance more than compensate for the cost associated with lower grade beef from Brahman-influenced calves.

Purebred Brahman calves received a substantial discount relative to 0% or non-Brahman calves. The discount, -$0.132 per pound was statistically significant at the 1% level. This requires more explanation since 100% Brahman females are worth substantially more than other breed types in the region (Russell et al. 2015). Table 4 shows the breakdown of Brahman influence by sex. Heifers make up only 28.3% of the total number of calves in the 100% Brahman influence category. Thus, the discount for 100% Brahman influence is primarily due to the steer and bull calves that were presumably unfit to enter the breeding herd. Further, this discount is independent of the high value placed on females, which are primarily traded in a separate market.

Conclusion

This paper used a hedonic pricing model to examine the determinants of feeder calf prices in south Texas. In particular, we focused on the premiums and discounts associated with

Brahman influence. In most studies conducted nationwide or in the Great Plains region, Brahman influence is associated with a statistically and economically significant discount. This is largely due to the lower grade of beef produced by this breed type. However, in south Texas, the Brahman breed provides enhanced efficiency to commercial cowherds and feeding operations through its superior heat and insect tolerance. This is evidenced by the creation of two breeds in the region, Santa Gertrudis and Beefmaster.

The economic question is whether or not the benefit of enhanced efficiency is sufficient to outweigh the cost to the producer of the reduced beef quality. A premium (discount) for a given level of Brahman influence indicates that the benefit is greater than (less than) the cost. We examined 5 levels of Brahman influence (0%, 25%, 50%, 75%, and 100%) and found that calves with 25%, 50%, and 75% Brahman influence receive a premium over calves with no Brahman influence (0%). Since other studies find that Brahman influence results in discounts on feeder calf prices, the premiums we calculated are likely a function of specific circumstances in the Gulf Coast region. There was a statistically and economically significant discount for purebred Brahman influence that is due to the influence of steers and bulls unfit to enter the breeding herd and is independent of the value of 100% Brahman breeding females.

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Table 1. Descriptive Statistics

		Frequency	Percent
Coat Color and Pattern	Black	455	24.2%
	Red	264	14.1%
	Dun	216	11.5%
	White	194	10.3%
	Red with White Face	185	9.9%
	Black with White Face	143	7.6%
	Red Brindle	124	6.6%
	Smokey	104	5.5%
	Brown	80	4.3%
	Gray	71	3.8%
	Spotted/Irregular	42	2.2%
Sex	Steer	471	25.0%
	Bull	633	33.6%
	Heifer	778	41.3%
Frame	Large	544	29.1%
	Medium	1,228	65.7%
	Small	96	5.1%
Fill	Full	509	27.2%
	Average	1,320	70.6%
	Shrunk	40	2.1%

Table 1 (cont'd). Descriptive Statistics

		Frequency	Percent
Condition	Fleshy	193	10.3%
	Average	1,473	78.6%
	Thin	208	11.1%
Muscle Score	1	69	3.7%
	2	948	50.7%
	3	852	45.6%
Brahman Influence	0%	382	20.7%
	25%	711	38.5%
	50%	502	27.2%
	75%	208	11.3%
	100%	46	2.5%
Horns	Polled or Dehorned	1,214	64.6%
	Horned	664	35.4%
Location	Auction 1 (default)	1,035	54.9%
	Auction 2	152	8.1%
	Auction 3	157	8.3%
	Auction 4	357	18.9%
	Auction 5	185	9.8%

Table 2. Descriptive Statistics

	Unit	Obs	Mean	St Dev
Price	$ Per Pound	1875	2.168	0.349
Weight	Pounds	1879	516	108
Nearby Futures	$ Per Pound	1879	2.138	0.148

Table 3.

		Coefficient	Standard Error
Color	Red	-0.042**	0.019
	White	0.000	0.022
	Dun	0.022	0.021
	Gray	-0.053	0.041
	Brown	-0.057*	0.031
	Smokey	-0.010	0.028
	Red Brindle	0.036	0.026
	Black with White Face	0.073***	0.023
	Red with White Face	0.019	0.022
	Spotted/Irregular	-0.238***	0.041
Sex	Bull	-0.041**	0.017
	Heifer	-0.116***	0.015
Frame	Medium	0.000	0.015
	Small	0.024	0.031
Fill	Average	0.015	0.015
	Shrunk	-0.219***	0.044
Condition	Average	0.003	0.022
	Thin	-0.035	0.030
Muscle Score	2	0.026	0.032
	3	-0.013	0.034
Brahman Influence	25%	0.038**	0.016
	50%	0.071***	0.019
	75%	0.056**	0.025
	100%	-0.132***	0.049
Horns		-0.062***	0.013
Weight		-0.003***	0.000
Weight^2		7.84E-07*	4.35E-07
Location	Auction 2	-0.058**	0.027
	Auction 3	-0.051**	0.024
	Auction 4	0.123***	0.020
	Auction 5	0.101***	0.024
Nearby Futures		0.822***	0.050
Constant		1.513***	0.165

*,**, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4. Breakdown of Brahman Influence by Sex

	Steers	Bulls	Heifers
0%	22.3%	27.7%	50.0%
25%	24.1%	31.5%	44.4%
50%	22.6%	41.7%	35.7%
75%	30.9%	40.1%	29.0%
100%	58.7%	13.0%	28.3%