The Value of Castration: Analyzing Bull Discounts in Feeder Cattle

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Abstract

It is crucial for cattle producers to understand how management practices influence market prices for their livestock. This paper assists cow-calf producers by providing insights into the financial implications of the castration decision prior to marketing feeder cattle. Using data from Oklahoma feeder cattle auctions, this study quantifies the impact of marketing feeder cattle as bulls on prices across weight categories. The results indicate an average bull discount of $11.69 per hundredweight that remains constant as animal weight increases, translating into per-head revenue losses ranging from $35 to $111 depending on animal size.

INTRODUCTION

Calf management decisions made by cow-calf producers, such as vaccinating, weaning, dehorning, and castrating, have been shown to significantly influence sale prices at auction. Feeder calves that are healthy, preconditioned, and ready to enter the next production phase typically command price premiums, especially when these practices reduce risk and labor for buyers. Beyond management, phenotypic attributes such as breed, color, frame size, and muscling also play a critical role in determining value. These combined factors highlight the importance of understanding how both observable traits and management practices shape market outcomes for cow-calf producers.

This research addresses a key economic question for cow-calf producers: How does weight class influence the price discount applied to bulls compared to steers in the feeder cattle market? While it is widely understood that lack of castration can affect market value, the extent to which this effect varies by animal weight remains unclear. This lack of weight-specific data leaves producers without a clear understanding of the financial trade-offs associated with castration timing or omission. The objective of this study is to quantify the price differential between bulls and steers sold as feeders across various weight classes, using hedonic[1] regression[2] analysis of market data collected across Oklahoma auctions. In the study, we consider the slate of attributes that impact price, but with special attention to price differences between steers and bulls. By isolating the impact of castration on market price by weight class while controlling for other attributes, this research provides practical, evidence-based insights that support producers in making more profitable herd management decisions.

BACKGROUND AND LITERATURE REVIEW

Cow-calf producers are faced with making a multitude of decisions that could impact animal health, productivity, and the market prices received for their cattle. Understanding the financial implications of different management decisions can help ranchers make more profitable choices. For example, these

management decisions could include whether to follow a certification program's protocol, which vaccinations to administer or omit, and whether or when to castrate.

Multiple studies have identified price discounts for non-castrated male feeder cattle (e.g., Ward, Ratcliff, and Lalman, 2007; Peel et al., 2023). Research conducted through Texas A&M AgriLife Extension found that cattle prices in South Texas are "significantly higher for steers than for bull calves" and that those differences were higher as animal weight increased. Average per-head price differences for castrated, implanted males were $25 per head for animals weighing 350 to 500 pounds, $30 at 550 pounds, and $154 at 750 pounds (Russell, 2015). These price differences reflect that earlier castration is known to induce less stress and to result in better performance and weight gain as calves move through the beef supply chain (Waters, 2022). Additionally, many buyers may prefer to pay a premium to avoid castrating the animal themselves, especially for larger cattle as this can also pose a human safety risk. While these results are informative, the study did not isolate the value of castration while holding other cattle characteristics and management attributes constant or separately from the value of implants. Williams et al. (2012) estimated individual market values of vaccinating, weaning, preconditioning, and other attributes for feeder cattle at Oklahoma auctions, including a discount of $5.77 per hundredweight for bulls sold as feeder cattle compared to steers with the same attributes otherwise. Other studies have used similar modeling to estimate bull discounts ranging from $1.81 to $7.39 per hundredweight (e.g., Schulz et al., 2010; Massey et al., 2011; Peel et al., 2023).

While several studies have examined price impacts of castration in feeder cattle, those studies either assess price differences between steers and bulls by weight without accounting for differences in other characteristics or estimate a bull discount per hundredweight without examining whether that discount differs by feeder cattle weight. As a result, producers lack research-based guidance on how the timing and implementation of castration may influence sale price relative to animal weight. This study seeks to fill that gap by quantifying the feeder cattle market discount associated with intact males compared to steers across feeder cattle weight categories while also considering the market values of other cattle attributes.

CONCEPTUAL FRAMEWORK

In competitive cattle markets, market prices reflect the qualities of the animal and the risks buyers expect to face. Bulls typically bring lower prices as feeder cattle than steers because buyers expect more work, more risk, and lower performance from intact males. Castrating a calf before sale reduces these concerns for buyers as those cattle are more likely to be less aggressive, less risky to handle, and more likely to perform better in feedlots. When buyers see a bull come through the sale barn, they factor in the extra time, labor, and health risks they may face and lower their bids accordingly. In this way, the market discount for bulls reflects how buyers value castration and the reduced risk that comes with it.

The size of the animal can also change how buyers view that discount. Castrating a larger animal typically means more stress for the calf, higher chances of health problems, and greater safety concerns for the handler. Thus, the bigger the animal, the more buyers may discount the price if it has not yet been castrated. This raises the question of whether and how that bull discount differs for different weight categories when price is measured in dollars per hundredweight and how the bull discount is reflected when price is measured in dollars per head. This study uses a hedonic pricing model to estimate the contribution of individual characteristics to overall sale price. As part of that model, we estimate the bull discount by weight class and determine whether discounts differ across weights. By focusing on the price difference between bulls and steers across weight classes, producers have a clearer picture of how castration timing and animal size affect their price received at market.

DATA

The study utilizes feeder cattle auction data collected in Oklahoma feeder cattle markets. Data were collected between Fall 2021 and Fall 2024 at seven sale barns across Oklahoma for cattle weighing between 300 and 950 pounds. A total of 4,948 lots were recorded, with 4,129 steer lots and 819 lots containing bulls. For this study, data on heifer lots was omitted. Table 1 reports the number of steer and bull lots by weight category and indicates that the percentage of bull lots declines as the average feeder cattle weight increases.

Figure 1 shows the ratio of lots containing bulls to total lots by location. One location recorded fewer than 5% of male lots containing bulls, while two locations

reported over 30% of male lots contained bulls. The other four locations had bull lots ranging from 10% to 17% of total male lots.

In addition to castration status, the dataset includes physical attributes and management practices for each lot. Physical traits recorded include color, frame, fleshiness, muscling, and average weight of cattle in the lot. Management practices include whether lots were vaccinated, weaned, certified, and dehorned at the time of sale. Other variables recorded include lot size, sale location, season, and year. These variables allow for control of both animal- and market-level factors that may influence sale price, improving the accuracy of the estimated price discount associated with bulls relative to steers.

METHODOLOGY

To control for changes in market conditions across marketing periods, a reference price is used to calculate a price basis, i.e., price differential for each lot in the dataset based on the sale date. This price differential, $P_{DIFF(i,t)}$ is calculated as:

$$P_{DIFF(i,t)} = P_{LOT(i,t)} - P_{750lb(t)}$$

where $P_{LOT(i,t)}$ is the price received in dollars per hundredweight by individual lot i on sale date t, and $P_{750lb(t)}$ is the associated weekly average price in dollars per hundredweight for 700- to 750- pound steers sold at OKC National Stockyards for the week that includes sale date t.

This adjustment accounts for general market variability and allows for more meaningful comparisons across years, seasons, and locations. While the price basis standardizes price comparisons across the dataset, we also include year, season, and location variables as controls in our econometric model to further account for temporal and regional effects. All effects are still interpreted as changes in price per hundredweight.

Price differences between bulls and steers across weight categories are first examined using analysis of variance (ANOVA) tests to compare average price basis values between bulls and steers within each weight class. These tests help determine whether observed differences in average prices between castrated and intact males are statistically significant within specific weight ranges, without yet accounting for other characteristics.

We then estimated a hedonic pricing model using Stata data analysis software to account for additional animal characteristics and management practices not captured in the ANOVAs. The hedonic model isolates the contribution of individual traits to sale price across a range of physical attributes and management practice attributes and, by design, interprets the value of an attribute's contribution in dollars per hundredweight. The model also includes controls for lot size, sale location, year, and season to address broader market influences. The general hedonic model is:

$$P_{DIFF} = f(LotSize, AverageWeight, Sex, Vaccination, Certification, Weaning, Color, Horns, Muscling, Fleshiness, Frame, Season, Location, SellerAnnounced, Health, BrahmanInfluence, Year)$$

The primary variables of interest in this analysis are castration status—specifically, whether the lot sold was sold as bulls or steers—and weight category. In addition to examining the overall price effect of not castrating, the model includes interaction terms between weight category and bull status. These interaction terms allow us to determine whether the price discount associated with bulls changes depending on animal weight. By estimating the value of each trait while holding others constant, the model provides a clearer understanding of how the timing and implementation of castration affect market prices across different weight classes.

RESULTS

ANOVA results are reported in Table 2 and indicate that the difference in average price basis between bulls and steers is statistically significant at the 95% confidence level across all weight categories. Additionally, the size of the discount associated with bulls increases as weight class increases. It is important to note that calves sold as bulls often lack other value-added management practices as well, which can influence price independently and may contribute to the overall discount observed. The ANOVA analysis conducted here does not control for those differences or other differences in feeder cattle attributes, aside from castration.

Table 3 reports the hedonic model's estimated parameters that capture the value of premiums and discounts for lot characteristics, physical traits, and management practices included in the model, highlighting their individual contributions to sale price. Direction and magnitude of impacts are similar to previous studies.

Both average weight and lot size are modeled as quadratic relationships with respect to sale price. This is similar to studies done by Peel et al. (2023), Williams et al. (2012), and Brorsen et al. (2001). Figure 2 illustrates the feeder cattle price slide estimated here; recall that our sample includes feeder cattle weighing between 300 and 950 pounds. Figure 3 illustrates the price premium associated with larger lot sizes in this sample—in this case, the lot size premium peaks at 90 head and, while still substantial, begins to decrease at that point. The quadratic form captures how price effects taper as average weight and lot size increase, reflecting typical market behavior.

Other results from the hedonic model in Table 3 are similar to previous studies. All values represent the value in dollars per hundredweight of that attribute or characteristic. The results indicate statistically significant premiums for fully vaccinated cattle ($3.22) and weaning ($7.08) but discounts for horned cattle (-$9.06) and discounts for lots other than black cattle, ranging from -$6.31 to -$30.82, depending on breed or hide color. Relative to cattle with medium muscling, light muscled cattle are discounted heavily at -$22.08 and medium-thick and thick cattle receive modest premiums of $6.08 and $7.48, respectively. Medium-large frame cattle are discounted -$4.98 relative to large frame cattle, and cattle sold in the spring bring $14.47 more per hundredweight on average than those marketed in the fall. The location variables indicate both location premiums and discounts relative to the reference barn. Announcing the seller yields a premium of $2.64, unhealthy cattle (lame, visible eye issues, cough, etc.) are discounted heavily (-$68.77). Note that these are typically calves that have been pulled out of a bigger lot of cattle at the buyer's request and are auctioned again individually. Cattle with no Brahman influence receive higher prices at an average rate of $14.24. Year variables are relative to 2021 and indicate a slight decrease for 2022 at -$3.52 and increases for both 2023 and 2024 as expected, at $15.62 and $24.45, respectively.

Recall that the impact of intact males on price is captured in two ways in the model, including an overall discount per hundredweight for lots including bulls as well as interaction terms between that discount and different weight classes to determine if that value is different as weight changes. The overall discount for bull lots is significant, with the model estimating a discount of $11.69 per hundredweight for bulls relative to steers. However, the interaction terms between bull status and weight class that measure differences from the overall bull discount are not statistically significant for any weight class (500-pound base), indicating that the bull discount of $11.69 per hundredweight holds across weight classes. However, that does not mean that the lost value from marketing feeder cattle as bulls is the same across weight classes since the total value lost per head from not castrating still increases as animal weight increases. The estimated total value lost per head can be calculated as the bull discount multiplied by the boundaries of the individual weight classes. As shown in Table 4, the estimated loss in value for bulls in the 300-pound weight class ranges from $35.07 to $46.64, while bulls in the 800-pound plus weight class are estimated to lose between $93.52 and $111.05 per head.

Table 5 presents the net return on investment from castrating feeder calves, calculated by combining the per-head revenue losses from Table 4 with the average castration cost of $5.28 per head (Sahs, 2022). Net returns represent the avoided revenue loss from castration minus the cost of the procedure and increase with animal weight. For example, 300- to 399-pound calves have a net return of $29.79 to $41.36 per head, while 800- to 950-pound calves show net returns of $88.24 to $105.77 per head. Return on investment (ROI) is then calculated as ROI = (Net Return/Cost) x 100. These estimates demonstrate that castration is economically beneficial across all weight classes, with the financial advantage growing as calves get heavier, providing producers with a concrete measure to evaluate the cost-effectiveness of castration.

It is important to note that the cost of castration is assumed to be constant at $5.28 per head across all weight classes, based on the best available estimate from previous research (Sahs, 2022). In practice, castration costs may increase with animal weight as the procedure becomes more physically demanding and time-intensive for larger calves. However, because the economic benefit of castration also increases with weight, the ROI expressed as a percentage of cost may increase more slowly than represented here or may remain relatively stable across weight classes, even if actual costs are somewhat higher for heavier animals.

CONCLUSION

The findings of this study reinforce the willingness of the market to pay premiums (or discounts) for specific management practices in cow-calf operations. Specifically, the results underscore why extension specialists encourage producers to adopt practices such as vaccination, certification, dehorning, and castration. These practices not only improve calf health

on the cow-calf operation, but they also enhance marketability by reducing the risk of potential health costs, lower performance, and death loss faced by buyers—factors that are directly reflected in sale prices.

While the ANOVA results confirmed a statistically significant average price discount for bulls relative to steers across all weight categories, those results do not account for any other differences in cattle attributes or management characteristics. However, the hedonic model estimates that bulls receive an average discount of $11.69 per hundredweight after any differences in other attribute and management differences are considered. Although the discount per hundredweight is estimated to be constant across weight classes, the value lost per head increases substantially as animals get heavier. These findings illustrate that delaying castration can result in significant revenue losses, especially for producers marketing larger calves.

Although the bull discount is constant on a per hundredweight basis, the resulting revenue loss per head increases as animal weight increases. This suggests that delayed castration or no castration may be less costly for lighter-weight calves but becomes increasingly expensive for producers marketing heavier feeder cattle. These results support extension recommendations that emphasize early castration as a risk management practice, both from a health and performance perspective and from an economic returns perspective. Future research using this same hedonic approach and dataset could extend the analysis to include heifers, allowing for direct comparisons of price differentials among heifers, steers, and bulls by weight class.

FOOTNOTES

1 "Hedonic" refers to the hedonic hypothesis that goods are valued for their utility-bearing attributes or characteristics (Rosen, 1974).

2 Hedonic regressions deconstruct an item's price into the item's attributes and characteristics and examine how each characteristic or attribute contributes to the item's overall value (Sopranzetti, 2015).

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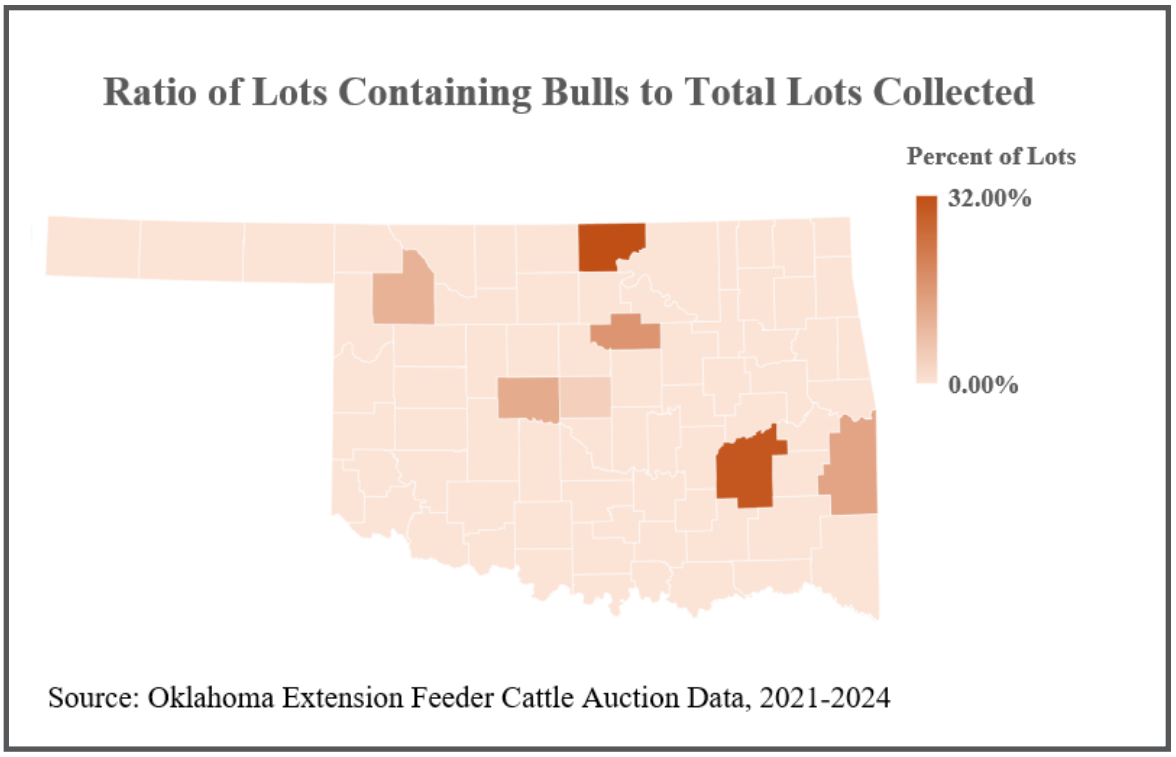

Figure 1. Ratio of lots containing bulls to total lots collected by location, selected Oklahoma Auctions, 2021-2024

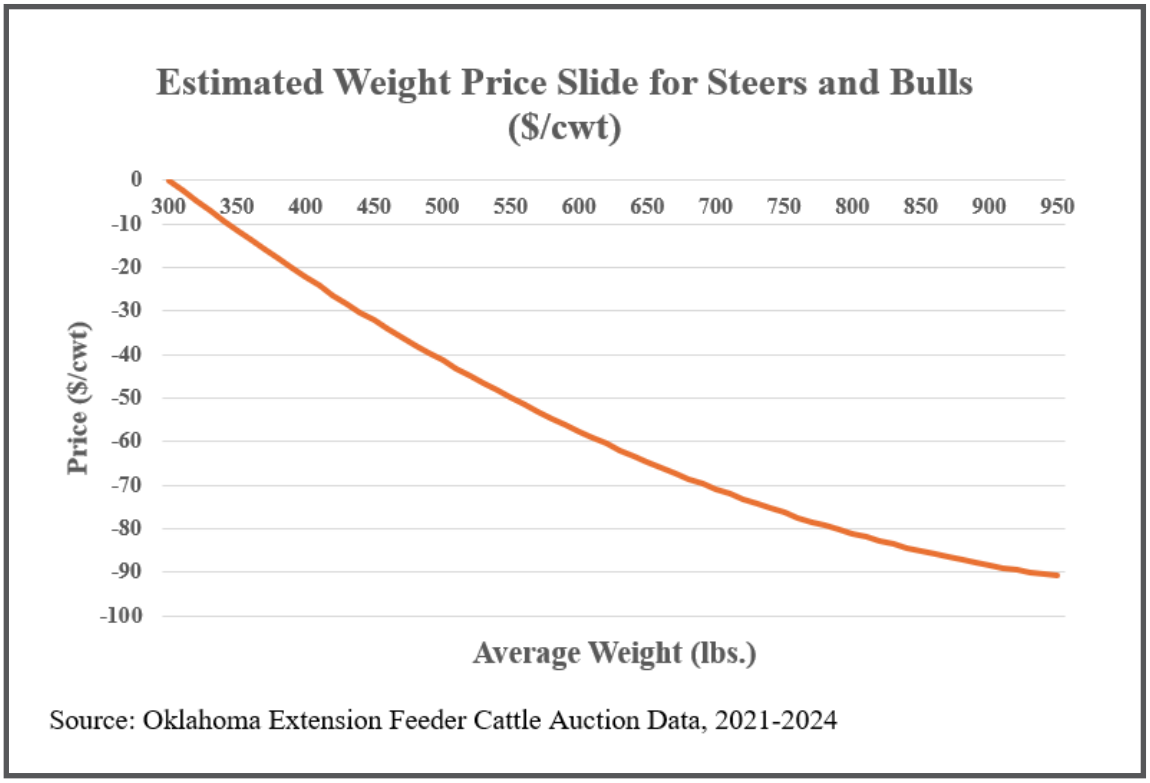

Figure 2. Estimated weight price slide for steers and bulls ($/cwt), selected Oklahoma auctions, 2021-2024

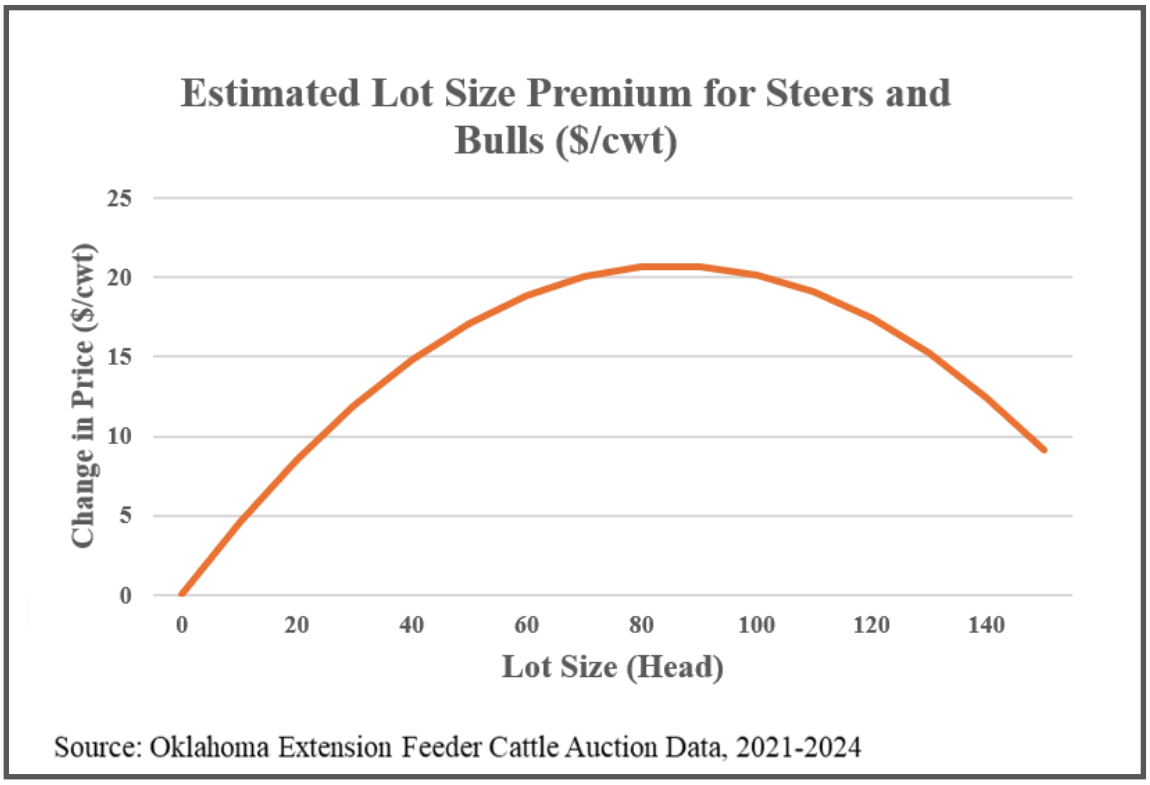

Figure 3. Estimated lot size premium for steers and bulls ($/cwt), selected Oklahoma auctions, 2021-2024

Table 1. Number of Male Feeder Cattle Lots by Castration Status and Weight Category

	Weight Category (lbs.)					
Castration Status	**300-399**	**400-499**	**500-599**	**600-699**	**700-799**	**800-950**
Bulls & Mix	122	228	223	164	52	30
Steers	413	832	1120	909	553	302
% Bull Lots	23%	22%	17%	15%	9%	9%
Total Lots	535	1060	1343	1073	605	332

Source: Oklahoma Extension Feeder Cattle Auction Data, 2021-2024

Table 2. ANOVA Comparison of Price Basis Between Steer and Bull Lots

	Steers	Bulls & Mix	
Weight Category	**Average Price Basis ($/cwt)**	**Average Price Basis ($/cwt)**	**Difference in Basis ($/cwt)**
300-399lbs	$37.55	$20.02	17.53*
400-499lbs	$26.90	$7.17	19.73*
500-599lbs	$12.22	-$13.22	25.44*
600-699lbs	-$3.17	-$27.48	24.31*
700-799lbs	-$10.34	-$37.01	26.67*
800-950lbs	-$16.04	-$54.42	38.38*

*Statistically significant at the 95% confidence level.

Source: Oklahoma Extension Feeder Cattle Auction Data, 2021-2024

Table 3. Hedonic Parameter Estimates for Lot Characteristics, Traits, and Practices ($/cwt)			
Variable	**Premium Estimate**	**Discount Estimate**	**p-value**
Head	$0.48*		0.00
Head squared		-$0.00*	0.00
Average Weight		-$0.33*	0.00
Average Weight squared	$0.00*		0.00
Bulls		-$11.69*	0.00
Bulls*Weight Category (base: Bulls*500wt)			
Bulls*300wt		-$1.24	0.65
Bulls*400wt	$2.78		0.20
Bulls*600wt		-$0.99	0.68
Bulls*700wt		-$2.22	0.54
Bulls*800wt		-$5.82	0.21
Vaccination (base: No Vac)			
Limited Vaccination	$2.56		0.14
Vaccinated	$3.22*		0.00
Certification (base: No Cert)			
Integrity Beef	$1.71		0.43
MacVac		-$1.20	0.53
OQBN	$1.32		0.36
Other Cert	$7.27		0.07
Weaned	$7.08*		0.00
Horns		-$9.06*	0.00
Hide Color (base: Black)			
Black Mixed		-$1.07	0.24
Dairy/Longhorn		-$30.82*	0.00
Hereford		-$19.13*	0.00
Mixed High Quality		-$6.31*	0.00
Mixed Low Quality		-$28.89*	0.00
Red		-$7.12*	0.00
Red Mixed		-$5.57*	0.00
White/Gray		-$9.85*	0.00
Other		-$12.30*	0.00
Muscling (base: Medium)			
Light		-$22.08*	0.00
Medium-Thick	$6.08*		0.00
Thick	$7.48*		0.00
Fleshiness (base: Average)			
Thin		-$8.93*	0.00
Fleshy		-$3.82	0.17
Spring (base: Fall)	$14.47*		0.00
No Brahman Influence	$14.24*		0.00
Frame (base: Large)			
Medium		-$4.98*	0.44
Medium-Large	$1.08		0.00

Table 3. Hedonic Parameter Estimates for Lot Characteristics, Traits, and Practices ($/cwt) (Continued)			
Variable	**Premium Estimate**	**Discount Estimate**	**p-value**
Location			
Barn 2	$8.63*		0.00
Barn 3		-$14.75*	0.00
Barn 4		-$1.71	0.19
Barn 5		-$7.09*	0.00
Barn 6		-$5.14*	0.01
Barn 7		-$0.01	0.99
Seller Announced	$2.64*		0.01
Unhealthy		-$68.77*	0.00
Year (base: 2021)			
2022		-$3.52*	0.00
2023	$15.62*		0.00
2024	$24.45*		0.00

*Statistically significant at the 95% confidence level.

Source: Oklahoma Extension Feeder Cattle Auction Data, 2021-2024

Table 4. Estimated Value Lost for Lots Containing Bulls, Relative to Steers ($/head)	
Weight Class	**Value Lost per Head**
300-399 lbs.	$35.07 - 46.64
400-499 lbs.	$46.76 - 58.33
500-599 lbs.	$58.45 - 70.02
600-699 lbs.	$70.14 - 81.71
700-799 lbs.	$81.83 - 93.40
800-950 lbs.	$93.52 - 111.05

Source: Oklahoma Extension Feeder Cattle Auction Data, 2021-2024

Table 5. Net Return on Investment for Castrating (per Head)			
Weight Class	**Cost of Castration* ($/head)**	**Net Return on Investment ($/head)**	**Net Return on Investment (%)**
300-399 lbs.	$5.28	$29.79 - 41.36	564 - 783%
400-499 lbs.	$5.28	$41.48 - 53.05	786 - 1,005%
500-599 lbs.	$5.28	$53.17 - 64.74	1,007 - 1,226%
600-699 lbs.	$5.28	$64.86 - 76.43	1,228 - 1,448%
700-799 lbs.	$5.28	$76.55 - 88.12	1,450 - 1,669%
800-950 lbs.	$5.28	$88.24 - 105.77	1,671 - 2,003%

Sources: Oklahoma Extension Feeder Cattle Auction Data, 2021-2024

*Sahs, 2022