Determining the Variation in Certified Preconditioning Premiums for Heifers and Steers

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A preconditioning program calls for specific management practices to be implemented on calves in order to boost their immune system and health (Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007; Dhuyvetter, 2004). In doing so, preconditioning practices diminish the stress calves traditionally succumb to during shipping and enhance the calves' performance during the remaining production process (Avent, Ward, and Lalman, 2004; Dhuyvetter, 2004). Research has shown that preconditioned calves perform better in the feedlot, need fewer vaccinations causing lower medication expenses, have a decreased morbidity and mortality rate, have a reduced cost of gain, have higher average daily gains and feed conversion, and have a higher carcass quality (Gardner et al., 1999; Cravey, 1996; Avent, Ward, and Lalman, 2004; Bulut and Lawrence, 2007; King et al., 2006; Lalman and Smith; Ward, Ratcliff, and Lalman). Nonetheless, preconditioning does not mean that there is a 0% chance of calves getting sick, or if calves are not preconditioned they are not guaranteed to get sick even though it is highly likely (Lalman and Smith).

Because of the advantages that preconditioning provides, a premium for preconditioned calves is justified (Dhuyetter, 2004). Moreover, calves that have been preconditioned are worth more to cattle buyers, who consequently pass the added value on to the cow-calf producers (Avent, Ward, and Lalman, 2004; Ward and Lalman, 2003). Stimulating signals and incentives have promoted the adoption of standard management practices, such as those entailed with preconditioning (Lalman and Smith). For instance, research by King et al. (2006) shows that preconditioned calves that were given a respiratory tract virus vaccination brought a higher price than calves who were not give the same vaccination. Furthermore, preconditioning programs can earn profits for producers but not because of the added premium value alone. Multiple factors add to the increased income from preconditioning, such as marketing heavier calves, marketing when the seasonal price is increasing, selling steers instead of bulls, selling dehorned calves rather than horned calves, and marketing larger, more uniform, and healthier lots of calves (Ward and Lalman, 2003).

In order for preconditioning to be important to producers, it must also be profitable to feedlots. Previous research suggests that feedlots will desire preconditioning because of the added health benefits, decreased death loss, and better carcass value that is a result of the program. The data from the research of Dhuyvetter, Bryant, and Blasi, Pas (2005) show that feedlots will see an added value of $40 to $60 per head from preconditioned calves, which means they could pay a premium between $34 and $53.57 for preconditioned calves they purchase. However, a survey from cattle feeders showed that they would only be willing to pay a premium of $25.50 for preconditioned calves, which is not the full value of preconditioning. This number may reflect the risk involved and a larger quantity of cattle that cattle feeders handle (Dhuyvetter, Bryant, and Blasi, Pas, 2005).

A common way cattle change ownership is through livestock auction barns. Bulut and Lawrence (2007) are quoted as saying, “While auctions are very efficient at bringing buyers and sellers together for price discovery and also for transferring a large volume of cattle from ranchers to feeders, signaling the value of cattle at auction is often a challenge.” When buying cattle at livestock auction barns, the physical appearance of the cattle has limitations, as imperceptible characteristics related to former management decisions and preconditioning exist. Thus, sellers have incentives to not reveal disadvantageous information or to exaggerate the condition of their cattle. Moreover, sellers have less fear of not upholding their reputation when they only sell cattle a few times a year and when they do not have face to face contact with the buyer. Consequently, buyers purchase cattle based on the common quality in the market and fail to provide premiums to sellers who have made an investment in enhancing the health and condition of their cattle (Bulut and Lawrence, 2007).

Sellers can now become part of a third-party certification program to verify to buyers that their information is reliable and that calves are preconditioned according to a certain protocol. Third-party certification offers the possibility of reducing asymmetric information in the market, but in order for it to be successful buyers must believe that the information is factual and believe in the reliability of the certification program (Bulut and Lawrence, 2007). As preconditioning programs gain a higher reputation, premiums for preconditioned calves will likely increase and move toward the full value of preconditioning (Dhuyvetter, 2004). Nyamusika et al. (1994) and Chymis et al. (2006) claim that a third party certification program provided at low-cost could increase the efficiency in the cattle market by allowing the high-quality calves to be separated from the low-quality calves. Moreover, appropriate economic signals such as premiums and discounts must exist in order to guarantee that management plans that are advantageous to the beef industry and its consumers are utilized (Dhuyvetter, 2004). By acknowledging the existence and degree of seasonal price patterns producers can develop better marketing and production decisions (Peel and Meyer, 2002).

Suppliers who are third-party certified can also foresee economic and other incentives. For instance, suppliers will then be able to enter niche markets and will be able to secure their position in the food system. Producers who operate on a larger scale will be better able to implement any changes necessary to become third-party certified. However, producers that are smaller than “large” may find it difficult to finance changes in their operation, which could have negative results. Nonetheless, third-party certifiers can aid suppliers in improving their product quality and cutting costs. Suppliers will then have the benefit of accessing more markets, executing traceability methods, and guaranteeing payment from buyers (Hatanaka, Bain, and Busch, 2005). Hatanaka, Bain, and Busch (2005) are quoted as saying, “However, as growing numbers of major retailers request certification, TPC (third party certification) may become less about gaining a competitive edge and more about simply remaining in the marketplace.” This information provided by Hatanaka, Bain, and Busch (2005) is not only helpful to the use of third party certification by livestock markets but also provides insight on the current state of the rest of the food system.

Results from Bulut and Lawrence (2007) show that certified preconditioned calves that have been weaned for thirty days received a premium of $6.15/cwt, whereas uncertified preconditioned calves who had been weaned for thirty days received a premium of $3.40/cwt. The results of King et al. (2006) show that certified preconditioned calves who have been weaned for thirty-four days received a premium in the range of $0.99/cwt to $3.47/cwt. and that the certified preconditioned calves who had been weaned for forty-five days received a premium in the range of $2.47/cwt to $7.91/cwt. Additionally, King et al. (2006) found that both the Vac-34 and Vac-45 protocols for certified preconditioning programs increased the market value of calves sold in all eleven years of their study. Furthermore, the Virginia Quality Assured certified preconditioning program discovered premiums ranging between $1.85 and $4.25 depending on the calves’ sex and weight (Dhuyvetter, 2004), while calves certified in the Oklahoma Quality Beef Network have shown to receive a premium ranging from $2.32/cwt to $13.04/cwt (Ward, Ratcliff, and Lalman). The cost of participating in a third party certification program, which averages $1/cwt, is less than the difference of the premiums for certification and non-certification. By choosing to not certify calves through third party certification programs, sellers would on average be worse off (Bulut and Lawrence, 2007). King et al. (2006) and Ward, Ratcliff, and Lalman found that premiums for certified preconditioned calves increased over time as well as the quantity of calves in certification programs. Moreover, preconditioning programs are expected to be more highly valued when calf prices are high because producers have more enticement to decrease death loss (Bailey and Stenquist, 1996). However, Lalman and Smith argue that when the cattle market improved in 1987 and cattle prices were high producers were less interested in special precondition programs, and they say that special sales had to be discounted (Lalman and Smith).

A joint effort between the Oklahoma Cattlemen's Association and Oklahoma Cooperative Extension Service led to the development of the Oklahoma Quality Beef Network (OQBN) in 2001 in order to provide a third-party certification for producers (Ward and Lalman, 2003). Research has shown that Oklahoma cattle who are OQBN certified have received premiums compared to non-certified cattle and have obtained similar price adjustments according to their characteristics as described previously. Specifically, the characteristics described show that certified preconditioned cattle receive a premium, heifers are discounted, and prices per cwt decrease as weight increases. For instance, a heifer of a certain weight receives a price according to her weight, is then given a premium for being certified, and is then discounted for being a heifer.

However, previous studies have often "conjoined" this information without the assurance of the combined effects. The focus and purpose of this research is to see what the certification premium is explicitly for heifers, what the certification premium is explicitly for steers, and how the certification premiums for heifers and steers changes across weight categories. There is no existing knowledge of this kind to date. Moreover, noteworthy information that may provide insight was found in the article “Factors Affecting the Selling Price of Feeder Cattle Sold at Arkansas Livestock Auctions in 2005.” The authors of this literature, Barham and Troxel (2007), found an interaction between calf gender and body weight category on selling price. As steers and bulls calves increased in weight, the difference between the selling price of these animals increased. Additionally, heifers were discounted less when compared to steers for lightweight groups but were discounted more as weight categories increased (Barham and Troxel, 2007).

The ultimate reason behind this research is to obtain the knowledge to estimate a realistic price buyers are willing to pay when purchasing certified preconditioned heifers and steers in Oklahoma, while permitting producers to receive some of the financial benefit for adding value added characteristics to their cattle (Lalman and Smith). Furthermore, extension educators can use this information to show producers how to add value to their cattle through the management practices they choose. Thus, producers will be able to choose management practices that will increase their returns. Extension educators can also use this information to give producers tools to utilize based on the producers’ management practices and expected margins (Halfman, Lehmkuhler, and Cox, 2009; Barham and Troxel, 2007).

Theory:

Ladd and Martin (1976) provide the basic hedonic pricing model That has been used by the majority of the previous studies to explain the price of a product as a function of the characteristics (quality attributes) of the product. Thus, physical characteristics and management characteristics can be used to explain price differences in a cross-section of transactions. The model can be expanded to account for differences in time, place and form. In the current model, the dependent variable is specified as the difference (basis) between the price of a given lot of cattle and a reference market for the particular week of the sale. This accounts for changes in underlying market conditions over several sales dates. A random effects component is included in the model in the various sale locations.

Data:

A detailed description of the data used for this paper can be found in Williams (2011). Data was gathered from sixteen feeder cattle auctions at seven different locations during the fall of 2010 in Oklahoma. The data was collected between October 27, 2010 and December 13, 2010. There were 2,973 lots recorded that represent 25,839 head of cattle. There were 833 lots and 7,332 head sold that were OQBN cattle. Of those lots 1,545 were steers and 1,304 were heifers (Williams, 2011). A list of the characteristics that were recorded and a summary of the data for steers and heifers is shown in Table 1. The general characteristics of the data sets are similar for both steers and heifers indicating the data sets are comparable. The dependent variable for each lot is the sale price of the lot minus the price of 750 pound, Medium and Large steers at Oklahoma City for the same week.

Methods and Model

This work extends the research of Williams by applying his model separately to steers and heifers to allow for more detailed understanding of the value of OQBN certification by gender. Accordingly, Williams' model is adapted by dropping the gender variable and models were estimated separately for steers and heifers. The resulting model is:

$$Basis_{it} = \alpha + \beta_1 LnHead_{it} + \beta_2 AvgWt_{it} + \beta_3 AvgWt_{it}^2 + \sum_{j=1}^{2} \beta_{4j} Vac_{ijt} + \sum_{j=1}^{2} \beta_{5j} Wean_{ijt}$$

$$+ \sum_{j=1}^{2} \beta_{6j} Cert_{ijt} + \sum_{j=1}^{9} \beta_{8j} Hide\ Color_{ijt} + \sum_{j=1}^{2} \beta_{9j} Brahman_{ijt} + \sum_{j=1}^{2} \beta_{10j} Horns_{ijt}$$

$$+ \sum_{j=1}^{4} \beta_{11j} Frame_{ijt} + \sum_{j=1}^{3} \beta_{12j} Muscle_{ijt} + \sum_{j=1}^{3} \beta_{13j} Condition_{ijt} + \sum_{j=1}^{3} \beta_{14j} Fill_{ijt}$$

$$+ \sum_{j=1}^{2} \beta_{15j} Health_{ijt} + \sum_{j=1}^{2} \beta_{16j} Uniform_{ijt} + \sum_{j=1}^{2} \beta_{15j} AgeSource_{ijt}$$

$$+ \sum_{j=1}^{2} \beta_{16j} Reputation_{ijt} + \sum_{j=1}^{7} \beta_{17j} Location_{ijt} + \beta_{18} OQBN\ Sale_{it}$$

$$+ \beta_{19} AvgWt * Cert_{it} + \beta_{20} AvgWt^2 * Cert_{it} + e_{it}$$

where i = 1,.., N denotes each sale lot transaction, and t = 1,…,T_i denotes the day on which the sale took place.   The dependent variable is specified as the difference (basis) bewteen the lot price and the price of 750 The model is estimated using the MIXED procedure in SAS 9.2. The model was corrected for heteroskedasticity specifying exponential local effects using the repeated and local statement.

Results

Regression estimates for the steer and heifer models are presented in Table 2. Most general sale and management characteristics, including lot size, animal weight, vaccination and weaning are significant. The notable exception is that the certification variable and the certification-weight interaction terms are not significant in either the steer or heifer equation. Among the animal characteristics, many are not significant with the exception of those lots which represent major deviations from average market animals and tend to be discounted. Thus, lots that were thin, light muscled (#3), non-uniform, unhealthy, or had horns tended to have statistically significant discounts. Among breed and animal color characteristics, results were generally consistent between steers and heifers. Compared to black-hided animals, several color/breed differences resulted in discounts for both steers and heifers. One notable exception is that Brahman influence was less and not statistically significant for heifers compared to a sizable discount for steers.

Other differences were noted between steers and heifers. In particular, the impact of weight is different for steers and heifers. The quadratic specification indicates that prices drop more quickly for steers as weight increases compared to heifers. Interestingly, the management characteristics have different values for steers and heifers in that that the coefficient on vaccination is roughly twice the magnitude for heifers than for steers but the coefficient on weaning is roughly twice the magnitude for steers as for heifers. As noted previously, the certification coefficients are not significant but the implication of all the OQBN related variables (weaning, vaccination and certification) is that the value of OQBN is greater for steers at lighter weights and greater for heifers at heavier weights.

Discussion

The results of the estimated steer and heifer models display differences that appear to confirm that separate models are appropriate. Separate models allow differences in steers and heifers to be applied to all model characteristics rather than using s single intercept shifting dummy variable to capture differences in steers and heifers. The differences in price impacts by weight for steers and heifers in these models is particularly suggestive of the need to estimate separate steer and heifer models.

The models estimated here suggest that there are indeed differences in the value of OQBN programs for steers and heifers with possible differences for each gender by weight as well. However, the lack of significance of the certification variables indicates that additional investigation is needed. Williams found that while the certification variable was significant in contrast to this study, a similar lack of significance for the interaction terms between certification and weight were not in either study. Additional research is needed to determine the proper certification premium and the possible relationship between certification and weight for both steers and heifers.

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Table 1. Summary Statistics for Steers and Heifers.

Lot Characteristic		Steers		Heifers	
		Mean	Std. Dev.	Mean	Std. Dev
Head		7.599	12.779	7.873	14.67
Weight (cwt.)		5.35	1.184	5.17	1.138
Price ($/cwt.)		119.60	18.195	107.33	12.51
	Class*	Frequency	Percent	Frequency	Percent
Vaccinations					
	Vaccinated	694	44.92	523	40.30
	Not Vaccinated	851	55.08	781	59.70
Weaning					
	Weaned	987	63.88	776	59.51
	Not Weaned	558	36.12	528	40.49
Certification					
	Not Certified	1065	68.94	957	73.4
	OQBN certified	480	31.06	347	26.6
Color					
	Black	950	61.61	781	60.17
	Red	124	8.04	97	7.47
	Hereford	24	1.56	24	1.85
	White/Gray	132	8.56	125	9.63
	Dairy/Longhorn	27	1.75	12	0.92
	Black Mixed	12	0.78	12	0.92
	Red Mixed	135	8.75	138	10.63
	Mixed	41	2.66	20	1.54
	Other	97	6.29	89	6.86
Brahman					
	No Brahman	1417	91.89	1236	94.80
	Brahman Influence	125	8.11	68	5.20
Flesh					
	Thin	43	2.79	24	1.85
	Average	1057	68.55	893	68.80
	Fleshy	442	28.66	381	29.35
Muscling					
	Thick, all # 1	226	14.66	143	11.02
	Mixed, #1 and #2	454	29.44	298	22.96
	Medium, all #2	826	53.57	843	64.95
	Mixed, #2 and #3	8	0.52	4	0.31
	Light, all #3	28	1.32	10	0.77
Uniformity					
	Uniform	1532	99.35	1301	99.77
	Not Uniform	10	0.65	3	0.23

Table 1 continued. Summary Statistics for Steers and Heifers

Lot Characteristic		Steers		Heifers	
	Class	Frequency	Percent	Frequency	Percent
Condition					
	Gaunt	11	0.71	11	0.85
	Average	1272	82.49	1078	83.05
	Full	259	16.8	209	16.10
Frame					
	Large	236	15.3	168	12.94
	Medium/Large	454	29.44	292	22.50
	Medium	852	55.25	838	64.56
Horns					
	Horns	98	6.36	70	5.40
	No Horns	1444	93.64	1234	94.36
Health					
	Healthy	1529	99.16	1294	99.20
	Not Healthy	13	0.84	10	0.80
Age & Source					
	Verified	93	6.03	59	4.5
	Not Verified	1449	93.97	1245	95.48
Reputation					
	Not Announced	1028	66.67	902	69.17
	Seller Announced	514	33.33	402	30.83

* Summaries for class variables are reported as frequency and percent of occurrence.

Table 2. Regression Estimates for Steers and Heifers: Dependent Variable = Basis.

Variable	Steers				Heifers		
	Coefficient	Std. Error	T-stat		Coefficient	Std. Error	T-stat
Intercept	82.2109*	6.3914	12.86		32.0825*	4.6873	6.84
Log of lot size (Head)	3.3954*	0.2965	11.45		2.6871*	0.2560	10.49
AvgWt	-22.4887*	2.2062	-10.19		-12.5419*	1.6785	-7.47
Avg.Wt-squared	1.3314*	0.1888	7.05		0.7716*	0.1494	5.17
Vaccinated	0.9480	0.8831	1.07		2.0812*	0.7303	2.85
Weaned	2.6083*	0.7891	3.31		1.2910**	0.6219	2.08
Certification	18.6726	12.0275	1.55		10.0549	9.2070	1.09
Certification x AvgWt	-5.5013	4.1127	1.34		-3.4177	3.2944	-1.04
Certification x AvgWt-sq	0.3935	0.3461	1.14		0.2825	0.2888	0.98
Color- Red	-3.3436*	0.9080	-3.68		-3.4508*	0.8109	-4.26
Color-Hereford	-7.9831*	1.8652	-4.28		-5.8672*	1.5338	-3.83
Color-White/Grey	-1.8952***	1.0824	-1.75		-2.6061*	0.8843	-2.95
Color-Dairy/Longhorn	-28.3353*	3.3972	-8.34		-27.5244*	2.6143	-10.53
Color-Other	-11.4838*	2.7261	-4.21		-15.6557*	2.0193	-7.75
Color-Black Mixed	-2.4330*	0.7864	-3.09		-0.3983	0.6665	-0.60
Color-Red Mixed	2.1606	1.3764	-1.57		-3.2179**	1.4889	-2.16
Color-Mixed	-4.3697*	0.9566	-4.57		-4.5503*	0.8189	-5.56
Brahman Influence	-4.4356*	0.8513	-5.21		-1.1603	0.8910	-1.30
Flesh-Thin	-10.8047*	1.8496	-5.84		-5.1168*	1.7329	-2.95
Flesh-Fleshy	0.4420	0.5768	0.77		0.7848	0.4978	1.58
Frame-Large	-0.4338	0.8454	-0.51		1.2597	0.7728	1.63
Frame-Med/Large	0.0997	0.6843	0.15		0.1328	0.5719	0.23
Not Uniform	-14.6651*	3.2924	-4.45		-20.3231*	3.5036	-5.80
Unhealthy	-30.3606*	2.3569	-12.88		-34.0852*	2.5688	-13.27
Horns	-2.7370*	0.9519	-2.88		-3.3726*	0.8646	-3.90
Muscling - #1	0.6414	0.7764	0.83		1.1907	0.7942	1.50
Muscling - #1 & #2	-0.0865	0.6559	-0.13		0.0855	0.5622	0.15
Muscling - #2 & #3	-12.4354*	4.3517	-2.86		-5.3359	4.3332	-1.23
Muscling - #3	-23.6194*	3.4221	-6.32		-14.7284*	3.2020	-4.60
Condition – Gaunt	-4.9697***	2.8600	-1.74		1.5698	2.0691	0.75
Condition – Full	-0.7634	0.6906	-1.11		-0.1419	0.5927	-0.24
Age & Source Verified	0.5520	1.0138	0.54		2.0485**	1.0060	2.04
Seller Announced	-0.2170	0.6130	-0.35		0.8112	0.5142	1.58

Table 2 continued. Regression Estimates for Steers and Heifers: Dependent Variable = Basis.

Variable	Steers			Heifers		
	Coefficient	Std. Error	T-stat	Coefficient	Std. Error	T-stat
OQBN Sale	-0.7619	0.7709	-0.99	-0.6427	-.6207	-1.04
Barn 1	-2.5412***	1.3195	-1.93	-2.6473**	1.1123	-2.38
Barn 2	-7.3185*	1.5603	-4.69	-9.1341*	1.4992	-6.09
Barn 3	-8.9652*	1.3693	-6.55	-9.2033*	1.1502	-8.00
Barn 4	0.8665	1.1659	0.74	1.5285	1.0299	1.48
Barn 5	-2.7714**	1.102	-2.52	-3.0087*	0.9606	-3.13
Barn 6	0.6801	1.1676	0.58	-1.4788	0.9512	-1.55

Class variables use the following bases: Not Vaccinated; Not Weaned; Not OQBN Certified; Color-Black; No Brahman Influence; Flesh-Average; Frame-Medium; Uniform; No Horns; Muscling-#2; Condition-Average; Not Age & Source Verified; No Seller announced; Regular Sale; Barn 7. Number of Observations: Steers, 1542; Heifers, 1298. Significance: *,0.01; **,0.005; ***, 0.10.