A Qualitative Characteristics Model of County Youth Fair Animal Prices

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ABSTRACT

Regression techniques were used to study the responsiveness of final bid prices in a Texas county youth fair auction for five livestock types: steer, barrow, lamb, chicken, and rabbit. A qualitative characteristics model framework is used including buyer characteristics, exhibitor (seller) attributes, and the placement of the animal. Prices received were largely uninfluenced by buyer or seller characteristics; however, non-caucasian exhibitors received a lower price for barrows.

KEYWORDS: livestock auctions

The marketing arena of a county youth fair is an atypical economic environment. A multitude of factors, economic and noneconomic, affect the pricing decisions made in such a setting. As a consequence, the disaggregation of the effects of various phenomena on price determination is complex. Nonetheless, information regarding the pricing policies for animals auctioned in a youth livestock fair can be obtained using a qualitative characteristics framework. The purpose of this study is to investigate the level of influence of personal buyer and exhibitor characteristics on purchase prices to highlight potential areas of concentration in the management of county youth fairs, using a specific case of a Texas county youth fair auction. Specifically, the objective is to analyze the effects of exhibitor attributes and characteristics of the buyer on the prices received and present the qualitative characteristics regression framework used in this analysis. Since data from a single fair is used, the results provide insights only and are not necessarily applicable to other fairs. Discussions with fair administrators and participant groups has indicated an interest in determining the extent of any effects of social characteristics such as age, race, sex, and youth group affiliation on prices received. In addition to this important issue is the framework under which this problem is analyzed as a potential for further study of other auctions (youth fair or otherwise) and related market structures potentially influenced by personal buyer and seller characteristics.

Research has addressed price determination through negotiation between processors and farmer bargaining associations (French, 1987), auction

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environments (Hamm et al., 1985; Johnson, 1957), and cattle prices as a function of livestock attributes (Menkhous and Kearl, 1976), but such studies have not addressed determination of prices in the setting of a youth fair livestock auction. Since its initial inception and early expansion (Waugh, 1928; Theil, 1952; Lancaster, 1966; Houthakker, 1952), qualitative characteristics analysis has largely focused upon hedonic models. Hedonic price research has been conducted on issues of functional form (Lucas, 1975; Blackley et al., 1984) and theoretical and methodological aspects (Ladd and Martin, 1976; Ladd and Suvannant, 1976; Ladd and Zober, 1977; Rosen, 1974). Although the popularity of hedonic price models has increased (Carl et al., 1983; Eastwood et al., 1986; Edmonds, 1983; Milon et al., 1984; Wilson, 1984; Cox et al., 1984; Ethridge and Davis, 1982; Pardew et al, 1986; Jordan, et al., 1985; Unnevehr, 1986; Messonier and Luzar, 1990), a qualitative characteristics framework can be used which focuses upon the characteristics of the buyer and the seller in addition to the attributes of the item being purchased. In a youth fair livestock auction, the characteristics of the exhibitor, of the animal and of the purchaser bidding upon the animal are factors affecting the actual price received.

BACKGROUND INFORMATION

The fair being studied holds an annual show and auction where livestock exhibitors compete in several categories. There are divisions for both breeding livestock and market livestock, but the auction is limited to market animals. The top fifteen places for five market animal categories are sold: steers, barrows, lambs, broilers, and rabbits. Exhibitors must be members of either a 4-H club or a local Future Farmers of America (FFA) to participate. Exhibitors are of school age (elementary through high school) and are residents of one of the two towns within the county (A or B). After all animals have been judged and assigned appropriate placements, the auction is held. Exhibitors cannot sell more than one animal at the auction. Consequently, an exhibitor who wins fifth place steer and tenth place chickens is likely to withdraw the chicken entry because of expected auction prices even considering the market price of the non-auctioned animal. The grand champion animal of each type is auctioned first followed by the reserve champion and so on until the last place animals are auctioned at the end. For a given place, animals are auctioned in the following order: steers, barrows, lambs, chickens, and rabbits. With the exception of steers, the entire fifteen place categories have always been filled; however, in some years there has been insufficient participants in the steer contest to fill all fifteen places. The livestock auction is open to the public; buyers of animals generally come from the county. Individuals, businesses, and groups also participate in the bidding. General observation of the auction indicates that bidding can intensify near the end of the auction. Consequently, the price received for last place animals is often higher than previous places.

DEVELOPMENT OF THE MODEL

Given the differences of the current scenario from many economic frameworks, coupled with the estimation of prices as a function of characteristic attributes, it

seems that a qualitative characteristics price determination framework is an appropriate method for analysis. The traditional qualitative framework which focuses on characteristics of the good being sold (represented by placement variables in this model) can be modified to include attributes of the buyer and the seller. Given the background information provided, several variables can be included in the model. Under a hedonic modeling framework, inclusion of factors measuring the attributes of the product sold is essential. For the youth fair auction, this is largely comprised of the type of animal sold (represented herein by five different models) and by placement (i.e., ordinal ranking) of the animal with prices declining from first through fifteenth place. Heated bidding for grand champion (first place), reserve champion (second place), and last place (usually 15th place) may also deserve special attention as they would be expected to raise prices in excess of what a placement variable may capture. Accounting for these places separately is necessary because, unlike most single place alterations, effects of going from second to first, for example, is different from going from 11th to 10th place. Performance of the general economy, weather, fair advertisements, and other factors can potentially influence the general level of auction prices from year to year.

The exhibitor's age, town of residence, youth group affiliation (4-H or FFA), sex, race, and town of residence relative to the buyer could affect prices. Individual buyers who are white collar professionals may offer prices different from businesses or groups of individuals. Residence of buyers may also affect prices, particularly whether or not the exhibitor is from the same town. Other components such as buyer's relationship to exhibitor, political power of exhibitor's family, goodwill, and philanthropic desires are not directly considered due to inability of collecting the data or measuring and modeling these factors. Buyer and seller characteristics are necessary model variables for satisfying the study objective but directional influences are not hypothesized given a lack of theoretical basis for doing so. A mathematical description (with hypothesized signs for place variables provided parenthetically below the variable) of each of the five models is:

$$P = \beta_o + \beta_1 PL_{(-)} + \beta_2 A + \beta_3 TA + \beta_4 4H + \beta_5 M + \beta_6 R + \beta_7 BP + \beta_8 BG + \beta_9 BB + \beta_{10} BA + \beta_{11} BO + \beta_{12} ST + \beta_{13} Y88 + \beta_{14} Y89 + \beta_{15} Y90 + \beta_{16} GC_{(+)} + \beta_{17} RC_{(+)} + \beta_{18} LP_{(+)} + \epsilon$$

where:

P = Price of animal (final bid)
PL = Placement of animal (1 through 15)
A = Age of exhibitor
TA = Binary variable of value 1 for Town A exhibitors, 0 otherwise
4H = Binary variable of value 1 for 4H exhibitors, 0 otherwise
M = Binary variable of value 1 for male exhibitors, 0 otherwise
R = Binary variable of value 1 for non-caucasian exhibitors, 0 otherwise
BP = Binary variable of value 1 for individual buyers who are white collar professionals, 0 otherwise
BG = Binary variable of value 1 for buyers who are in groups, 0 otherwise
BB = Binary variable of value 1 for individual buyers who are businesses, 0 otherwise
BA = Binary variable of value 1 for buyers who are from Town A, 0 otherwise

BO = Binary variable of value 1 for buyers who are outside of the county, 0 otherwise
ST = Binary variable of value 1 when buyer and exhibitor are residents of the same town, 0 otherwise
Y88 = Binary variable of value 1 for 1988, 0 otherwise
Y89 = Binary variable of value 1 for 1989, 0 otherwise
Y90 = Binary variable of value 1 for 1990, 0 otherwise
GC = Binary variable of value 1 for the grand champion (1st place), 0 otherwise
RC = Binary variable of value 1 for the reserve champion (2nd place), 0 otherwise
LP = Binary variable of value 1 for the last place animal, 0 otherwise

Data were obtained from the fair association for all five animal categories from 1987 through 1990 (Table 1). Data include the prices received for the animal, the age,residence, sex and the race of the exhibitor, the placement of the animal, and the type and residence of the buyer. The average auction price for animals trended downward from the order in which they are auctioned: steers at $2633, barrows at $1586, lambs at $1339, chickens at $1063, and rabbits at $953. Maximum values and standard deviations followed the same trend. Minimum values parallelled this trend but with equal values of $850 being observed for barrows and lambs while chickens and rabbits both displayed a $500 minimum value. The average age of exhibitors selling at the auction was highest for steers and lowest for chickens. The average age for exhibitors selling in the lamb auction was higher than for barrows, but both barrows and lambs had higher seller age than rabbits. Town A exhibitors comprised 76% of the steers sold, 65% of barrows and lambs sold, 60% of chickens, and 50% of rabbits. Since all exhibitors must reside within the county, all other exhibitors were from the only other town in the county (Town B). The 4-H Club comprised 41% of steers auctioned, 55% of barrows, 50% of lambs, 90% of chickens, and 80% of rabbits, dominating the smaller livestock categories. Males sold 88% of steers auctioned while females sold 50% of lambs. Both chicken and rabbit sales were 40% attributed to female exhibitors while barrows were sold by 55% male exhibitors. Non-caucasian exhibitors sold the largest proportion in barrows at 13% with 12% selling steers, 8% chickens, and 5% lambs and rabbits.

Buyers are categorized as individual professional white collar workers, individual blue collar workers, individual businesses, or buyer groups. Buyer groups are defined as more than one individual or entity uniting for the purchase of an animal. Professional white collar buyers were most predominant in the chicken auction at 8% while buyer groups represented 48% of the purchases of chickens auctioned. Buyer groups represented about 40%-43% for the remaining animal categories with the exception of barrows where buyer groups purchased about 32% of the animals sold. Businesses bought 50% of barrow; 45% of rabbit; 43% of lamb; representing the largest purchasing category in these markets. Furthermore, businesses bought 33% of steers and about 32% of chickens. Town A provided the major portion of buyers ranging from 63% for rabbits to 81% for steers. While exhibitors were all from either Town A or B, buyers were not. Buyers from outside of the county purchased 13% of lambs and 5% of steers. Given the larger population of Town A, the greater purchasing by entities from this area and placement by students from Town A was not unexpected. Furthermore, the buyer and seller of livestock auctioned at the fair were from the same town approximately 67% of the time.

Table 1. Descriptive Summary Statistics of the County Fair, by Animal Type.

	Steer	Barrow	Lamb	Chicken	Rabbit
Number of Observations	42	60	60	60	60
Price - Minimum	1400	850	850	500	500
- Maximum	8000	4500	3600	2500	2000
- Mean	2633	1585	1338	1062	953
- Standard Deviation	1455	646	552	367	296
Age - Minimum	9	8	9	8	8
- Maximum	19	19	19	19	18
- Mean	15	14	14	12	13
- Standard Deviation	3	3	3	3	3
TA - percent	76	65	65	60	50
4H - percent	40	55	50	90	80
M - percent	88	73	50	60	60
R - percent	12	13	5	8	5
BP - percent	5	3	3	8	5
BG - percent	43	32	42	48	40
BB - percent	33	50	43	32	45
BA - percent	81	72	72	65	63
BO - percent	5	8	13	10	7
ST - percent	67	67	62	70	63

Legend:
Price = Price of animal (final bid)
Age = Age of exhibitor
TA = Binary variable of value 1 for Town A exhibitors, 0 otherwise
4H = Binary variable of value 1 for 4-H exhibitors, 0 otherwise
M = Binary variable of value 1 for male exhibitors, 0 otherwise
R = Binary variable of value 1 for non-caucasian exhibitors, 0 otherwise
BP = Binary variable of value 1 for individual buyers who are white collar professionals, 0 otherwise
BG = Binary variable of value 1 for buyers who are in groups, 0 otherwise
BB = Binary variable of value 1 for individual buyers who are businesses, 0 otherwise
BA = Binary variable of value 1 for buyers who are from Town A, 0 otherwise
BO = Binary variable of value 1 for buyers who are outside of the county, 0 otherwise
ST = Binary variable of value 1 when buyer and exhibitor are residents of the same town, 0 otherwise

RESULTS AND ANALYSIS

Linear regression was performed on all five models using Ordinary Least Squares (OLS) (Table 2). Overall the models seemed to perform acceptably with F-values ranging from 3.3 for the rabbit model to 11.6 for the lamb model. The models were significant at the 0.0001 or greater significance level. Unless specified, significance is defined for the 0.05 level. Adjusted coefficients of determination (R^2) indicated that from 41% to 83% of the variation in prices was explainable by the factors considered.

The estimate for the grand champion dummy variable was positive and highly significant (0.0005 or greater significance level) for all models considered. The intercept was statistically significant at the 0.05 level for the lamb, chicken, and rabbit auctions. Additionally, the last place dummy variable was significant for both the rabbit model and for the lamb model, where the reserve champion variable was also statistically significant. With the exception of 1990 for the steer and barrow

Table 2. Regression Results (Ordinary Least Square), by Animal Type.

	Steer	Barrow	Lamb	Chicken	Rabbit
F-value	11	8	12	43	3
R^2	0.91	0.79	0.84	0.63	0.59
Adjusted R^2	0.83	0.69	0.77	0.47	0.41
			Beta Values and Standard Errors†		
Intercept	2159.12	876.37	2086.06*	1039.32*	779.12*
	1560.67	633.97	362.54	338.73	298.51
PL	-34.70	6.95	-0.61	-5.47	-5.21
	39.90	16.77	14.39	11.96	10.02
A	40.15	23.33	-27.36	15.43	1.52
	79.99	31.30	18.61	14.61	14.41
TA	-476.59	-60.47	21.20	-3.73	-105.55
	330.08	154.67	126.62	123.54	94.90
4H	292.74	47.45	-39.95	-103.46	-88.25
	465.15	201.14	105.03	141.92	111.19
M	-265.10	44.05	136.44	-28.14	4.24
	448.61	139.97	89.91	87.48	70.48
R	-494.10	-437.94*	-89.92	-155.26	-39.13
	432.48	184.03	301.30	147.48	164.12
BP	97.91	465.13	102.41	74.58	191.57
	601.00	339.66	272.08	202.94	190.78
BG	-328.88	-130.89	-544.63*	-244.34	22.72
	341.38	173.65	142.89	150.13	120.96
BB	-456.25	33.27	-505.40*	-131.06	-9.11
	339.85	163.61	134.20	148.50	119.73
BA	-217.57	25.98	-16.50	178.01	48.69
	350.73	150.97	126.81	127.50	103.66
BO	-609.12	253.70	-286.88	126.03	91.72
	831.50	242.18	221.68	216.54	177.92
ST	271.38	0.69	-151.60	-74.84	199.68*
	343.09	144.69	125.24	115.16	98.88
Y88	504.59	2.15	69.20	-11.91	183.91
	295.05	158.49	109.67	109.45	100.26
Y89	383.91	100.76	-145.24	-92.39	8.13
	465.62	159.00	108.27	110.99	93.27
Y90	1026.73*	415.59*	34.36	45.23	-7.82
	283.08	160.20	114.26	111.56	88.54
GC	4141.84*	1932.30*	1496.38*	763.79*	713.44*
	411.01	266.09	205.50	197.77	156.26
RC	609.13	393.60	679.40*	248.78	243.93
	417.25	275.53	172.82	163.19	147.85
LP	334.79	483.49	564.09*	273.73	464.00*
	435.42	260.12	181.50	174.45	172.02

†See table 1 for legend. Standard Errors are reported below Beta estimates.
*Significant at the $\alpha=0.05$ level.

models, the auction year did not influence many price levels. The buyer group and business classifications of purchasers seemed to pay less for lambs than individuals.

Of all exhibitor attributes analyzed, only race was significant. Non-caucasians exhibiting barrows received less than their caucasian counterparts. The only other significant finding was that a higher amount was paid to exhibitors of the same town as the purchaser for the rabbit auction. Contrary to expected results, the continuous variable for placing was not significant in any of the models. Additionally, the estimate was different than the hypothesized sign for the barrow model. However, the signs associated with the grand champion, reserve champion, and last place dummy variables were all positive as expected. All models display a positive intercept. Other variables which displayed a like directional influence across all five models were race and professional white collar buyers. Consequently, in all cases non-white exhibitors did not receive prices equivalent to their white counterparts. However, caution is given with interpretation to this finding for two reasons. First, the non-caucasian binary variable was statistically significant in only one of the five models (barrows). Secondly, there are few observations for non-white exhibitors ranging from 8 for the barrow market to only 2 for the steer market. Sufficient data for non-white sellers may not have been present to indicate statistical significance for the race indicator variable in models other than the barrow market.

Given the models' overall successful performance coupled with a lack of many significant parameters, the likelihood of degrading multicollinearity comes into question. There is also reason to believe that individual independent variables are highly correlated, especially age and membership in 4-H versus FFA since only high school students can participate in FFA. Since degrading multicollinearity is a data problem rather than a model formulation problem (excepting the dummy variable trap of a perfect identity), empirical investigation based on the original models is needed. Consequent observation of correlation matrices, eigen-values, variance inflation factors, condition indices, and variance decomposition proportions indicated that degrading multicollinearity was a distinct possibility in each model. Ridge regression was used to correct for multicollinearity and experiments conducted to determine the sensitivity of results to alterations in the ridge coefficient by using a ridge trace. Correcting for multicollinearity by larger sampling is not an option because of limited data and exclusion of additional variables is unjustified theoretically and precludes the empirical investigation of influences attributable to omitted variables. Ridge regression is used for these reasons to permit trading of a little bias in parameter estimates for a substantive decrease in variance of parameter estimates and to allow analysis of the implications of multicollinearity to the problem at hand. Qualitative results under ridge regression were similar to those provided by OLS in that few additional variables become significant under asymptotic T-values or changed signs. Notable exceptions to the largely paralleling results to linear regression include the reversal of the directional movement for the placement variable in the barrow model to a negative relationship as expected. Other variables displaying an alteration in sign under ridge regression compared to OLS are given in Table 3. However, none of these variables were ever significant even under consideration of asymptotic T-values. Additional variables did become significant under consideration of the asymptotic T-values as follows: the placement variable (steer, lamb, chicken), the professional buyers variable (barrow, lamb), the buyers group variable (chicken), the Town A buyers variable (chicken), and the last place variable (barrow). Consequently, while ridge regression analysis displayed magnitudinal changes, signs associated with statistically significant parameters were unaltered from OLS results.

Concerns over whether or not the models were homoscedastic given the potential difference in the variance of errors associated with different placements were tested

Table 3. Ridge Regression Results (RR), by Animal Type.

	Steer	Barrow	Lamb	Chicken	Rabbit
	Beta Values and Standard Errors†				
Intercept	2434.93	1675.25	1734.81	1113.29	967.58
PL	-61.89*‡	-9.50¶	-14.22*‡	-8.71*‡	-6.45
	18.77	6.69	5.16	4.16	3.62
A	5.05	-6.29¶	-10.09	5.91	2.94
	26.48	9.39	8.58	6.45	5.38
TA	-50.15	32.36¶	-72.46¶	-10.02	-20.17
	186.38	61.14	49.57	36.47	31.34
4H	-29.75¶	-23.83¶	-72.60	-20.21	-57.05
	136.04	53.80	47.72	63.61	38.70
M	115.13¶	-0.65¶	-6.25¶	-24.51	-12.16¶
	314.58	71.39	50.41	39.19	34.33
R	-290.42	-245.85*	-108.14	-50.23	-76.63
	265.05	102.99	199.69	70.25	76.98
BP	121.50	484.54*‡	421.61*‡	65.90	68.55
	372.55	166.14	134.60	66.63	75.44
BG	69.41¶	-112.01	-98.14*	-98.87*‡	5.10
	147.82	60.55	44.77	33.08	29.81
BB	-125.36	0.74	-125.88*	-44.19	14.33¶
	161.44	55.72	44.55	36.88	29.20
BA	105.40¶	-12.72¶	9.99¶	80.10*‡	-21.43¶
	209.52	64.24	53.27	37.25	32.03
BO	-109.73	87.81	13.35¶	8.84	-13.87¶
	520.32	106.22	61.96	57.58	64.25
ST	187.41	5.67	-76.47	-78.78	32.16¶
	165.05	61.74	48.01	40.17	32.48
Y88	26.08	-37.99‡	35.80	7.35¶	58.70
	179.97	69.70	56.24	43.25	36.80
Y89	139.75	13.85	-80.73	-26.87	-2.14¶
	264.87	67.29	58.09	42.94	-37.31
Y90	413.82*	173.53*	36.23	36.05	-22.83
	182.91	66.49	55.26	43.09	38.00
GC	1826.43*	835.86*	614.65*	399.05*	314.75*
	271.35	117.96	95.39	75.53	65.79
RC	131.95	105.81	249.06*	94.50	96.58
	270.61	138.29	100.07	77.79	66.63
LP	25.67	241.88*‡	261.92*	111.32	182.52*
	267.93	118.30	98.12	76.38	63.21

* - Significant at the $\alpha = 0.05$ level for asymptotic T-values.
† - See Table 1 for legend. Standard errors are reported below Beta estimates.
‡ - Variable is significant (asymptotically) under ridge regression but not ordinary least square.
§ - Variable is significant under ordinary least square but not ridge regression.
¶ - Variable possesses different signs under ridge regression and ordinary least square.

using the Goldfeld-Quandt test and the Park-Glejser test (Kennedy, 1987). The Goldfeld-Quandt test provided indication that at the 0.05 significance level heteroscedasticity existed in the barrow model. Additionally, the Park-Glejser test provided evidence that at the 0.05 level of significance, the steer, lamb, and rabbit models displayed heteroscedasticity. Given these test results, Weighted Least Squares (WLS) was performed on all five models. The weights were calculated from the regressions used to conduct the Park-Glejser test by taking the parameter estimate of the log of the placement variable regressed as an independent variable to the log of the error terms. Transformations were based on these parameter estimates and yielded results not unlike those of standard OLS.

While the magnitudes were altered, the directional relationships remained unaffected under WLS as did the significance of most variables (Table 4). However, parameter estimates for some additional variables did become significant under the performance of weighted linear regression: the intercept, Town A exhibitor, and race variables for the steer model; the last place variable for the barrow model; the professional buyers variable for the lamb model; the last place variable for the chicken model; and no additional significant variables for the rabbit model. The same town variable did become insignificant for the rabbit model under WLS.

Linear regression (OLS) was used to examine the possibilities of autocorrelation when ordered by the placement variable. The Durbin-Watson test for autocorrelation indicated that no model possessed problems of autocorrelation. However, the Durbin-Watson test results fell within the range which is inconclusive. Disturbances terms were therefore considered not to be unduly correlated.

The need for the use of SUR (Seemingly Unrelated Regression) as a result of correlated disturbance terms was examined by regressing each model's error term against all remaining model errors. Only the steer and lamb models demonstrated statistical significant correlation of error terms at the 0.05 level. Application of SUR techniques to these two models did not substantively change the results although the magnitudes of parameter estimates differed. The steer model experienced a change in the sign on the professional buyer indicator variable but it remained insignificant. The lamb model displayed a change in parameter signs for the professional buyer, 1988, and 1990 variables but these remained insignificant with the last place variable retaining positive effects but becoming insignificant. Statistical significance of all other variables remained unaltered for both models.

Determination of whether exhibitor attributes and the buyer characteristics cause significant influences upon the prices received for the livestock auctioned can be accomplished by conducting an F-drop test with a reduced model. This is done by comparing the full model with a reduced model in which the dependent price variable is predicted as a function of the following independent variables: placement, grand champion, reserve champion, and last place. Reduced model regression results by animal type are recorded in Table 5. All of the five models still perform favorably overall as indicated by the F-value and adjusted coefficient of determination (R^2). The intercept and grand champion variables are statistically significant and positive for every model. Additionally, the last place variable was statistically significant and positive for the lamb and rabbit models. The reserve champion variable was positive for each of the five models but was not significant. The placement variable was not significant in any of the models and was negative as expected in all models except the barrow model, paralleling results for the full models. All estimates were signed as expected with this exception.

To test whether any of the variables removed from the full model were significant, an F-test was used. The null hypothesis that all parameter estimates dropped from the model are equivalent to zero is tested against the alternative that at least one of the parameter estimates is nonzero. There was no statistical evidence to support the

Table 4. Weighted Regression Results (Weighted Least Square), by Animal Type.

	Steer	Barrow	Lamb	Chicken	Rabbit
F-value	11.34	3.87	11.48	2.04	2.97
R^2	0.91	0.64	0.84	0.47	0.57
Adjusted R^2	0.83	0.47	0.77	0.24	0.37
	Beta Values and Standard Errors†				
Intercept	2612.78*‡	728.74	2035.66*	948.57*	933.14*
	852.56	685.74	295.08	309.85	269.29
PL	-39.37	5.88	-3.87	-6.81	-6.71
	22.27	17.77	11.44	11.41	8.93
A	7.10	26.75	-10.05	11.59	0.56
	45.73	34.01	14.49	14.23	12.33
TA	-452.88*‡	-22.75	75.98	31.99	-65.62
	174.52	153.69	124.07	113.58	82.65
4H	147.93	71.34	-11.38	-175.33	-87.96
	300.47	216.15	85.57	126.75	97.03
M	-205.71	93.42	53.52	13.86	-20.14
	225.42	137.50	68.94	80.42	63.63
R	-479.39*‡	-393.31*	-136.43	-141.87	-19.12
	200.16	188.70	189.03	125.92	154.46
BP	291.93	110.49	637.81*‡	176.17	180.47
	353.72	437.36	208.71	195.51	159.38
BG	-106.15	-124.59	-663.87*	-152.23	6.82
	198.71	171.92	131.47	139.33	101.77
BB	-208.45	69.39	-662.97*	-60.59	-13.08
	191.28	168.82	130.58	134.53	104.38
BA	-226.11	57.80	-59.21	165.45	-37.28
	177.12	152.10	119.09	116.97	85.35
BO	-272.92	294.38	-360.05	204.51	-67.23
	427.77	232.76	222.32	203.89	147.71
ST	299.40	-74.15	-157.94	-25.91	116.06§
	197.20	139.86	118.17	110.80	83.23
Y88	243.42	26.10	-39.25	17.87	89.70
	147.28	161.43	90.90	103.46	90.76
Y89	436.44	128.59	-86.52	18.84	81.52
	387.63	156.21	87.31	111.17	84.78
Y90	847.09*	487.60*	87.81	100.57	-15.27
	171.34	161.83	100.09	106.70	80.16
GC	4009.92*	2017.67*	1263.69*	841.47*	696.38*
	496.87	432.87	369.48	287.96	222.85
RC	604.09	406.54	637.96*	245.40	264.13
	361.71	384.19	252.66	217.60	179.13
LP	311.18	549.56*‡	288.84*	319.95*‡	427.81*
	230.46	239.33	119.33	142.98	131.74

†See Table 1 for legend. Standard Errors are reported below Beta estimates. *Significant at the $\alpha = 0.05$ level.
‡Variable is significant under weighted least square but not ordinary least square.
§Variable is significant under Ordinary Least Square but not weighted least square.

claim that any of the estimates for the parameters dropped from the model were significantly different from zero for the steer, chicken, and rabbit models. However, there was statistical evidence to support the alternative hypothesis that at least one of the dropped variables was significantly different from zero for the barrow and lamb models (Table 5). Given the full model regression results for the barrow model, it seems likely that some combination of the race and 1990 year variables are important in the determination of barrow prices (Table 2). Likewise, some combination of buyer characteristics (specifically group and business categories) seems to be statistically influential in the determination of lamb prices at the fair. These results indicated that prices received in the county fair youth livestock auctions were relatively without prejudice and unaffected by the various exhibitors' sociological, demographic, and personal characteristics modeled. The results also provided reason to believe that the final bid price on animals was not significantly affected by the various buyer attributes analyzed excepting the lamb market (businesses and groups) and same town variable for the rabbit auction. While the overall pricing policy at the youth fair seemed to be largely unaffected by personal characteristics, a possible area for concern is relevant with regard to non-caucasian exhibitors, especially in the barrow contest. Other exhibitor characteristics including age, town of residence, agricultural organization affiliation, and sex were seemingly unrelated to the prices received, with no discernable pattern observed for these attributes. However, the race variable was consistently negative across all regression models. Prices received for non-caucasian exhibitors were consistently lower than for caucasians. Nonetheless, statistical significance was displayed only in the case of the race variable for the barrow auction.

Table 5. Reduced Model Regression Results, by Animal Type.

	Steer	Barrow	Lamb	Chicken	Rabbit
F-value	35.41	21.67	28.54	12.14	11.64
R^2	0.79	0.61	0.67	0.47	0.46
Adjusted R^2	0.77	0.58	0.65	0.43	0.42
	Beta Values and Standard Errors†				
Intercept	2633.13*	1359.50*	1301.17*	1047.87*	918.97*
	300.97	159.99	125.09	106.38	86.66
PL	-70.43	4.15	-19.11	-9.92	-6.64
	37.19	17.44	13.63	11.60	9.44
GC	3862.30*	2011.35*	1480.44*	887.05	637.68*
	439.63	253.42	198.13	168.50	137.27
RC	632.73	444.70	599.55	246.97	219.32
	420.88	244.87	191.45	162.82	132.64
LP	331.35	440.72	772.96*	275.95	455.68
	389.45	244.87	191.45	162.82	132.64
F-drop value	1.88	2.33*	3.01*	1.32	0.97

†See Table 1 for legend. Standard Errors are reported below Beta estimates.
* Significant at the $\alpha = 0.05$ level.

SUMMARY AND CONCLUSIONS

The atypical economic environment of a county youth fair livestock auction was modeled using a qualitative characteristic framework. Regression models were used to analyze pricing policies of a county youth fair in Texas by examining both exhibitor characteristics (age, town of residence, agricultural organization affiliation, sex, and race) and buyer attributes (white collar professionals, groups, businesses, and blue collar individuals as well as geographical location and whether buyer and exhibitor are residents of the same town). Models were examined for each of the market livestock auctions: steer, barrow, lamb, chicken, and rabbit. Additional variables were included for placement of the animal, grand champion status, reserve champion status, last place status, and a dummy variable was incorporated for the year of the auction. The regression models performed well overall, but displayed problems of degrading multicollinearity and heteroscedasticity. Corrections for these conditions did not drastically alter the results. The use of an F-drop test conducted from comparisons of the full model to a reduced model showed that only in the case of the barrow and lamb auction did some exhibitor and buyer attributes influence prices with statistical significance. Race was the only exhibitor trait with a consistent sign across models. As the negative valued parameters demonstrate, non-caucasian exhibitors consistently received lower prices than their caucasian counterparts and significantly lower in the case of the barrow market auction. However, overall pricing was largely unaffected by buyer or exhibitor attributes.

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