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The Impact of Captive Supplies on Cash Fed Cattle Markets

Rodney Jones, Ted Schroeder, James Mintert, Frank Brazle[1]

Introduction

The beef slaughtering and processing sector underwent a large structural change in the 1980's. The market share of the four largest firms (CR4) engaged in beef slaughtering increased from 35.7 in 1980 to 69.7 in 1988. At the same time, the CR4 for the boxed beef market increased from 52.9 to 79.3 (Ward, 1990c). Available market share statistics depict the increasing concentration in beef packing at the national level, but concentration is often higher at the regional level (Quail et al.). The high concentration in meat packing and in fed cattle procurement indicates non-competitive conduct is possible (Schroeter). Since the major packers have recently introduced a new method of procuring fed cattle supplies, fed cattle procurement warrants further investigation for the possibility of non-competitive behavior.

Direct trade between cattle feeders and packers has been the dominant method of marketing fed cattle in the Central Plains of the U.S. for over 20 years. Although direct cash market sales to packers a few days prior to slaughter are still the primary method of marketing fed cattle in the Plains states, packers began to pursue alternative means of procuring fed cattle supplies in the late 1980's and early 1990's. Several major packers began to vertically integrate into the cattle feeding sector by forward contracting future supplies of fed cattle, feeding packer-owned cattle to slaughter weight and by establishing exclusive purchase agreements between select feedyards and the individual packer. If cattle procured via forward contracts and exclusive purchase agreements are combined under the heading of captive supplies, 19 percent of the total slaughter requirements for the 15 largest slaughtering firms came from captive supplies in 1988. More importantly, during parts of 1988, as much as 32 percent of the four largest firms' slaughter requirements came from captive cattle supplies (Ward, 1990b).

The actual impact on cash fed cattle prices of an increase in the percentage of fed cattle procured by packers under captive supply arrangements, whether in the form of forward contracts, exclusive purchase agreements, or feeding of packer-owned cattle, has been debated by agricultural economists and industry participants. Purcell suggested that an increase in captive supplies could increase concentration on the buying side of the market and thereby reduce competitive bidding in the cash market. However, Purcell also noted using captive supplies could increase cash cattle prices if, through the use of captive supplies, packers are able to operate at or near capacity and thereby lower their average costs significantly. A 1989 survey of cattle feeders indicated they believed forward contracting benefitted packers by aiding in cattle procurement and providing additional control in timing deliveries. Furthermore, forward contracting may also give packers a cash market pricing advantage since they may bid less aggressively

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in the cash market if they have cattle forward contracted, thereby inducing a temporary price decline (Ward and Bliss).. Cattle feeders responding to the survey also agreed that increased forward contracting results in greater cash price volatility and lower average cash prices.

Previous research suggests that increases in packer concentration may have a negative impact on livestock prices. Ward (1984) found that a decline in competition among buyers in the lamb market had a negative impact on slaughter lamb prices. In the beef market, Quail et al. concluded that an increase in packer concentration was negatively related to fed cattle prices. Using data collected in 1979, Ward (1982) discovered that price differences among packers existed, but the differentials could not be explained by market share alone. However, when the study was repeated using data collected in 1989, Ward (1990c) concluded that packers with a larger market share did appear to pay lower prices. In the only study that has directly examined the impact of captive fed cattle supplies on transaction prices for fed cattle, Ward (1990a) concluded that captive supplies had no significant impact on prices paid for individual pens of fed cattle.

Factors other than buyer concentration can have a significant impact on prices paid for cattle. Previous research indicates that feeder cattle prices are influenced by a wide variety of physical traits such as weight, sex, number of head, breed and grade (Schroeder et al., Faminow and Gum). Fed cattle prices also vary as traits of individual lots of cattle vary. Jones et al., concluded that the percentage of cattle expected to grade choice, finish uniformity, weight, dressing percent, breed, number of brands, buyer, seller, day of the week the cattle are sold, number of bids received and nearby live cattle futures price all had a significant impact on fed cattle prices.

The objective of the research reported in this paper is to determine the impact of captive fed cattle supplies on cash fed cattle prices in southwest Kansas during a six month period in 1990. Models that explain transaction prices of individual pens of cattle as a function of cattle quality characteristics, pen traits, buyers, feedyards, market factors and the estimated level of captive supplies are estimated to determine the impact of changes in captive supplies on cash fed cattle prices. Additionally, results are also used to test whether cash market price variability increases as captive supplies increase. Compared to previous research that has attempted to explain the variation in fed cattle transaction prices, this study offers two distinct advantages. First, the data collection period is much longer than that used in previously published research. Second, the transaction prices are modeled as a function of a more detailed set of factors likely to influence the transaction prices for each pen, thereby minimizing the possibility of model misspecification.

Methods

Price of each pen of cattle is modeled as a function of a wide variety of factors likely to influence the demand for individual pens of cattle. Use of a price dependent demand function implies that, in the short run, the quantity supplied of fed cattle is perfectly inelastic. Given that cattle are a non-storable commodity and that most cattle are purchased within a 100 mile radius of the packing plant, quantity supplied of cattle within a relatively small geographic region can be viewed as predetermined. Consequently, the

price (P) dependent demand for a particular pen of cattle in the western Kansas marketing region is modeled in the following manner:

P =f(Market Conditions, Quality and Pen Factors, Buyer and Buyer Competition Factors).

A list and a brief description of the specific variables used in the models are included in table 1. The variables used in the analysis are divided into groups including quality factors, individual pen factors, feedyard factors, buyer factors, aggregate market forces, a measure of short term concentration change (captive supply), and other factors that may impact price. The categories were established to facilitate testing whether groups of similar variables, as a whole, impacted transaction prices.

In the transaction price model the price of a particular pen of cattle (i) at a particular time (t) is a function of all of the variables defined in table 1. The empirical equation is:

$$
\begin{aligned}
(1)\quad PRICE_{it} = {} & \alpha_0 + \beta_1 WEIGHT_i + \beta_2 CHINT_{it} + \beta_3 SEINT_{it} + \\
& \beta_4 FINISHR_i + \beta_5 ANGU_i + \beta_6 HERE_i + \beta_7 CHAR_i + \\
& \beta_8 SIMM_i + \beta_9 LIMO_i + \beta_{10} EXMX_i + \beta_{11} HRAN_i + \\
& \beta_{12} HOLS_i + \beta_{13} ENEX_i + \beta_{14} BRAH_i + \beta_{15} MIXE_i + \\
& \beta_{16} JUNK_i + \beta_{17} HEADR_i + \beta_{18} BRANDR_i + \beta_{19} STEER_i \\
& + \beta_{20} HEIFR_i + \beta_{21} BULL_i + \beta_{22} HEFF_i + \beta_{23} YARD_i \\
& + \beta_{24} HP_i + \beta_{25} IBP_i + \beta_{26} NAT_i + \beta_{27} MON_i + \\
& \beta_{28} MNUM_i + \beta_{29} WINDOW_i + \beta_{30} TUEDAY_i + \beta_{31} WEDDAY_i \\
& + \beta_{32} THUDAY_i + \beta_{33} FRIDAY_i + \beta_{34} FUTURE_t + \\
& \beta_{35} CAPSUP_{t+1} + \mu_{it} \ .
\end{aligned}
$$

Where:

β_k = the estimated marginal implicit price for the kth variable.
α_0 = the intercept term.
μ_{it} = the disturbance term.

Table 1. Definitions of Variables.

Variable	Description
I) Dependent Variable:	
Transaction Price (PRICE)[a]	Cattle price, 4% pencil shrink, FOB the feedyard ($/cwt).
II) Quality Factors:	
Weight (WEIGHT)	Actual average pay-weight of the cattle when delivered
Choice * Cprice (CHINT)	Estimated percentage of the cattle in the pen grading choice (nearest 10%) times the choice 700-850 pound USDA boxed beef carcass equivalent price ($/cwt), prior day price if cattle sold before 1 pm and current day if sold at 1 pm or later.

Table 1 (continued) Definitions of Variables.

Variable		Description
Select * Sprice (SEINT)		Estimated percentage of cattle in the pen grading select (nearest 10 %) times the select 700-850 pound USDA boxed beef carcass equivalent price ($/cwt), prior day price if cattle sold before 1 pm and current day if sold at 1 pm or later.
Finish Uniformity (FINISHR)		Binary variable equal to 1 if the finish of the cattle is not uniform and equal to zero otherwise.
Angus	(ANGU)	Binary variable equal to 1 if at least 20% of the cattle in the pen were of the respective breed and equal to zero otherwise.
Hereford	(HERE)	
Charolais X	(CHAR)	
Simmental X	(SIMM)	
Limousine X	(LIMO)	
Exotic Mix	(EXMX)	
Herf-Angus	(HRAN)	
Holstein X	(HOLS)	
Eng Exotic Mix	(ENEX)	
Brahman X	(BRAH)	
Mixed	(MIXE)	
JUNK[b]	(JUNK)	
III) <u>Pen Traits</u>:		
Head (HEADR)		Number of head in the pen.
Brands (BRANDR)		Number of brands on the cattle.
Steer	(STEER)	Binary variable equal to 1 if the pen contained cattle of the respective category and equal to 0 otherwise.
Heifer	(HEIFR)	
Bull	(BULL)	
Heiferette	(HEFF)	
IV) <u>Feedyard</u>: YARD = (A,B,...J)[c]		1 if yard i, zero otherwise i = A,B,....J.
V) <u>Buyer</u>:		
Excel	(XL)	Binary variable equal to 1 if the cattle were purchased by the respective packer and equal to 0 otherwise.
HyPlains	(HP)	
IBP	(IBP)	
National	(NAT)	
Monfort	(MON)	

Table 1. (continued) Definitions of Variables.

Variable		Description
VI) Market Forces:		
Futures price (FUTURE)		The nearby contract live cattle futures price, previous trading day's close if the cattle were sold before 1 pm and today's close if sold at 1 pm or later.
VII) Other Factors:		
Bid Number (MNUM)		Number of bids made on the pen of cattle during the week the cattle were sold.
Distance (MILE)		Approximate road miles from feedyard to the packer that purchased the cattle.
Delivery lag (WINDOW)		Number of days between selling date and delivery date.
Tuesday	(TUEDAY)	Binary variable equal to 1 if the pen was sold on the respective day and equal to 0 otherwise.
Wednesday	(WEDDAY)	
Thursday	(THUDAY)	
Friday	(FRIDAY)	
VIII) Captive Supplies		
Captive Supply (CAPSUP)		The percent of Kansas slaughter procured under captive supply arrangements for the week following the week of the sale transaction.

[a]Variables in parentheses are the abbreviations of the variables that are included in the models.

[b]Cattle in pens classified as junk were generally of nonassignable breeds and of varied and below average quality.

[c]Although a total of 13 feedyards were included in the study, 4 small yards were grouped together in one of the yard variables because of low volume.

In the transaction price model captive supplies are used as a proxy variable for changes in buyer concentration. Capturing the impact changes in captive supplies have on buyer concentration required that captive supplies be measured in relation to slaughter volume in the geographic marketing region studied. Consequently, captive supply is defined as the percent of Kansas steer and heifer slaughter delivered from Kansas feedyards under captive supply arrangements in week t+1. The formulation of this model makes it possible to test whether varying levels of packer-buyer concentration over time affect the bids and transactions prices on individual pens of cattle.

The captive supply variable leads the cash price transaction by 1 week because the average number of days between purchase and delivery during the study was approximately 5 working days. The delivery lag implies packers were generally buying cattle one week for slaughter in the following week. Since individual packers know in advance the number of cattle that will be delivered to their firm under captive supply arrangements, it is logical that captive supplies in week t+1 could impact the cash market price in week t.

The interaction terms (percent choice * choice price and percent select * select price) are included in the model to capture the percentage of the cattle in the pen expected to grade either choice or select as well as the varying price spread between choice and select wholesale beef. This is important because buyers may change their bids based on the percentage of choice cattle in the pen and on the premium the packers can receive for choice grade beef relative to select grade beef in the wholesale market.

Data

Data were collected on 1407 pens of fed cattle from 13 feedyards in the southwestern Kansas marketing region. The data collection period began during the third week of May 1990 and ended the fourth week of November 1990 for a total of 27 weeks. Data were collected from all 13 of the yards for the 3-month summer period. However, the size of the study was reduced to 8 feedyards for the fall data collection period because of time and budget constraints. The feedyards included in the study ranged in size from under 10,000 head one-time capacity to over 40,000 head one-time capacity.

Feedyard personnel recorded the asking price, date, time, buyer, and bid price for each bid received and also indicated the final transaction price on each pen of cattle marketed. The actual delivery date and delivery weight for each pen of cattle sold were also recorded which made it possible to calculate the number of days between purchase and delivery. Summary statistics for the data collected by the marketing personnel are presented in table 2.

Each pen of cattle identified as ready for sale (i.e., on the showlist) at each feedlot was evaluated[2] to estimate the major quality factors likely to affect the demand for a pen of cattle. Cattle were evaluated weekly as the managers developed new showlists. Breed, sex, uniformity of finish, average number of brands per head, and percent of the cattle in the pen expected to grade choice were evaluated for each pen.

Most pens contained mixtures of english and exotic crossbred cattle. Very few pens consisted entirely of any one particular breed. About 1.5% of the pens contained some Brahman or Brahman crossbred animals and less than 1% of the pens were classified as junk. Steers were represented in 60% of the pens of cattle, 42% had heifers, 2% contained heiferettes, and 2% contained bulls or late cut bulls (some pens contained both steers and heifers). The percentage of cattle in the pen expected to quality grade choice ranged from 40% to 80% with an average of 54%. About 53% of the cattle in the study had no brands, 46% had 1 brand, and less than 1% had 2 brands per head. The

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[2]The cattle evaluator was trained to evaluate fed cattle characteristics in a systematic manner by the Department of Animal Sciences and Industry, Kansas State University.

percentage of cattle in each pen expected to yield grade 4 or above ranged from 0% to 5%, with most pens containing 2% or 3% yield grade 4 cattle.

Table 2. Average Transaction Price, Weight, Bids, Number of Head, Delivery Lag and Transaction and Buyer Information Summary.

Variable	Average	Minimum	Maximum
PRICE ($/cwt)	77.15	71.00	82.00
WEIGHT (lbs)	1142	902	1416
BIDS[a]	1.53	1	7
TOTAL BIDS[b]	1.75	1	9
HEAD	119.85	23	792
DELIVERY LAG (days)	4.85	0	17
NUMBER OF PENS			1407
PENS SOLD ON MONDAY			26%
PENS SOLD ON TUESDAY			44%
PENS SOLD ON WEDNESDAY			19%
PENS SOLD ON THURSDAY			7%
PENS SOLD ON FRIDAY			4%
PURCHASED BY IBP			15%
PURCHASED BY EXCEL			25%
PURCHASED BY NATIONAL			25%
PURCHASED BY MONFORT			25%
PURCHASED BY HYPLAINS			10%

[a]Bids received on the pen during the week they were sold.
[b]Total bids received on the pen during the time they were on the showlist.

The aggregate price level for fed cattle changed markedly during the course of the study. The changing aggregate price level for fed cattle was measured by recording the daily closing price of the nearby live cattle futures contract. Additionally, the boxed beef carcass equivalent cutout values for choice and select beef were collected each day on the 700 to 850 lb. carcasses to monitor the changing wholesale values for beef carcasses.

Kansas fed cattle slaughter numbers were collected for each week of the study as reported by the U.S. Department of Agriculture's Agricultural Marketing Service (AMS). Aggregate captive supply data were also collected from the AMS office in Dodge City, Kansas for the entire period of the study. The estimate of captive supplies reported by AMS was an estimate of the number of cattle delivered under contracts or formula price agreements for the week, based upon a phone survey of feedyards in the Kansas marketing region. Weekly Kansas feedlot sales information was also collected from the Dodge City AMS office.

Summary statistics for the futures prices, wholesale prices and Kansas marketing region data are presented in table 3. Weekly Kansas slaughter ranged from 101,200 head to 135,000 head with an average of 123,140 head. Kansas fed cattle sales averaged 66,175 head per week, ranging from 40,300 head to 104,600 head. This indicates that a large number of cattle slaughtered in Kansas during the period were purchased from surrounding states and also suggests that few, if any, cattle in the southwest Kansas area were exported for slaughter in other states. The weekly number of fed cattle

procured by packers under captive supply arrangements from Kansas feedlots ranged from 2,000 head to 20,200 head with an average of 8,530 head per week. As a percent of Kansas federally inspected slaughter, captive fed cattle supplies ranged from 1.78% to 15.38%, averaging 6.83%. Captive fed cattle supplies as a percent of Kansas feedlot sales averaged 12.98% with a range of 3.81% to 22.08%.

Table 3. Summary Statistics for Futures Prices, Wholesale Prices and Kansas Marketing Region Data.

Variable	Average	Minimum	Maximum
Near Term Futures Price ($/cwt)	76.14	72.77	80.17
Choice 700-850 lb. Price ($/cwt)[a]	121.55	115.76	130.61
Select 700-850 lb. Price ($/cwt)[b]	114.80	111.60	119.75
Kansas Slaughter (Head per Week)	123,140	101,200	135,000
Kansas Sales (Head per Week)	66,175	40,300	104,600
Captive Supplies (Head per Week)	8,530	2,000	20,200
Captive Supplies as % of Slaughter	6.83%	1.78%	15.38%
Captive Supplies as % of Sales	12.98%	3.81%	22.08%

[a]USDA boxed beef cutout carcass price for choice 700-850 pound carcasses.
[b]USDA boxed beef cutout carcass price for select 700-850 pound carcasses.

Model Results

Parameter estimates for the factors affecting transaction prices for individual pens of cattle are provided in table 4. Because several of the categorical variables were binary, it was necessary to specify a base for those variables to avoid perfect collinearity among certain regressors. Specifically, for the buyer variable the base was Excel, for the feedyard variable the base was feedyard A, and for the day of the week the base was Monday. The model explained over 83% of the variability in cash transactions prices. The equation F-statistic was significant at the .01 level indicating

that, as a group, the variables included in the models were significant factors in explaining the price differentials across pens of fed cattle.

The presence of heteroscedasticity with respect to the captive supply variable was suspected since industry participants have indicated that cash price variability might increase as captive supplies increased. To test whether cash fed cattle prices became more variable as captive supplies increased, the squared disturbance terms from the transaction price model were regressed on the captive supply variable. A significant positive slope coefficient from this test would indicate that, as captive supplies increased, the cash market price became more variable. Contrary to expectations, test results indicated that as captive supplies increased, cash price variability decreased significantly. Since the presence of heteroscedasticity with respect to the captive supply variable was detected, weighted least squares was used to correct for heteroscedasticity in the final empirical estimation of the transaction price model.

Table 4. Parameter Estimates of Factors Affecting Transaction Prices for Fed Cattle in western Kansas from May through November, 1990.[a]

Dependent Variable = Transaction Price ($/cwt)			
Independent Variable	Estimate	t-statistic	F-statistic
Quality Factors			
WEIGHT	-0.0015	-4.294**	
CHINT	0.0053	48.931**	
SEINT	0.0056	49.554**	
FINISHR	-0.490	-3.444**	
ANGU	0.132	1.094	
HERE	-0.171	-0.719	
CHAR	-0.133	-1.141	
SIMM	-0.085	-0.657	
LIMO	0.148	0.942	
EXMX	0.139	1.382	
HRAN	-0.019	-0.186	
HOLS	0.173	0.753	
ENEX	0.029	0.261	
BRAH	-0.064	-0.417	
MIXE	0.016	0.135	
JUNK	-2.241	-6.946**	
Quality Factors			175.887**
Pen Traits			
HEADR	0.000	0.242	
BRANDR	-0.033	-0.812	
SEX (Base = Steers and Heifers)			
STEER	0.761	5.293**	
HEIFR	0.680	4.792**	
BULL	-0.099	-0.586	
HEFF	-1.102	-8.042**	
Pen Traits			22.288**

Table 4. (continued)

Parameter Estimates of Factors Affecting Transaction Prices for Fed Cattle in western Kansas from May through November, 1990.

Dependent Variable = Transaction Price ($/cwt)			
Independent Variable	Estimate	t-statistic	F-statistic
Feedyard (Base=Yard A)			
B	-0.175	-2.378**	
C	-0.359	-4.870**	
D	-0.663	-8.846**	
E	-0.277	-3.052**	
F	-0.578	-3.869**	
G	-0.893	-9.064**	
H	-0.579	-3.510**	
I	-0.797	-7.477**	
J	-0.571	-4.900**	
Feedyard			19.796**
Buyer (Base=XL)			
HP	-0.557	-6.505**	
IBP	-0.298	-4.195**	
NAT	-0.045	-0.703	
MON	-0.086	-1.405	
Buyer			12.895**
Other Factors			
MNUM	0.187	6.634**	
MILE	0.000	0.191	
WINDOW	0.030	2.862**	
Day of Week (Base=Monday)			
TUEDAY	-0.145	-2.745**	
WEDDAY	-0.333	-5.130**	
THUDAY	-0.126	-1.341	
FRIDAY	-0.800	-7.310**	
Other Factors			14.886**
Market Forces			
FUTURE	0.404	26.241**	
Captive Supplies			
CAPSUP	-0.096	-8.676**	
Adjusted R-Squared	0.833		
RMSE	0.353		
Equation			160.021**
Number of Pens	1,407		
Head of Cattle	166,338		

[a]Single and double asterisks indicate parameter estimate is statistically different from zero at the .10 and .05 levels of significance, respectively.

As a group, the quality variables in the model had a significant impact on transaction prices. Moreover, several of the quality variables individually impacted transaction prices. As the average weight of the cattle in the pen increased, the transaction price decreased by $0.0015/cwt for each additional pound. Cattle that were not uniform in finish received average discounts of $0.49/cwt relative to pens of cattle which were uniform. The only breed variable that had a significant impact on transaction prices was the junk category, which, not surprisingly, was associated with a $2.24/cwt discount.

Cash transaction prices varied as the percent of cattle in each pen expected to grade choice increased and as the spread between estimated choice and select carcass values changed. Evaluated at the means, the parameter estimates for percent choice times choice price and percent select times select price indicate that a 10% increase in the number of cattle in the pen expected to grade choice resulted in a $0.06/cwt increase in the transaction price.

As a group, pen traits also had a significant impact on cash transaction prices. Pens that contained steers without heifers and pens that contained heifers without steers received premiums over mixed pens of both steers and heifers. Pens of steers received $0.76/cwt premiums and pens of heifers received premiums of $0.68/cwt, on average, compared to mixed pens of steers and heifers. Pens containing bulls or late cut bulls were not significantly discounted, however pens containing heiferettes received a significant discount of $1.10/cwt compared to pens without heiferettes. Neither number of head in the pen nor number of brands per head had any significant impact on cash transaction prices.

Compared to the randomly selected base feedyard, cattle marketed from all of the other feedyards in the study received significant discounts ranging from $0.17/cwt to $0.89/cwt. Feedyard size did not appear to be correlated with these parameter estimates and it is not clear whether sales management, sales experience, or some other factor not included in the model is responsible for this result. As a group, the feedyard variables had a significant impact on fed cattle transaction prices.

Relative to Excel, two of the buyers paid significantly lower prices for cattle on the average. Specifically, HyPlains paid an average of $0.56/cwt less for cattle than did Excel and IBP paid an average of $0.30/cwt less than Excel. The coefficients for the other two buyers, National and Monfort, were both negative, but were not statistically significant at the .10 level. The F-statistic for the buyer group of variables is significant at the .05 level, suggesting that which buyer purchases the cattle is a significant factor in price determination. This result contrasts with Ward (1982) in which no significant price differentials were found in southwestern Kansas among packer buyers. However, this is consistent with a later study by Ward (1990c) in which price differences were found among packer buyers. Finally, although the buyer variables were significant, it is possible that the price differences associated with the various packers are the result of the transaction price model failing to capture all of the quality variation that existed among pens of cattle included in the study.

Several other factors were important in cash fed cattle price determination. The number of bids received on an individual pen during the week it was sold had a positive effect on transaction price. Sellers received a premium of about $0.19/cwt for each additional bid they obtained on a pen of cattle indicating that as more buyer interest was demonstrated in a particular pen, transaction price increased. The number of days between purchase and delivery also had a positive effect on transaction prices, suggesting that packers were willing to pay more for cattle if they could delay delivery to coordinate cattle flows through the packing plant. Consistent with recent work by Ward (1990c), the day of the week cattle were sold had an impact on price. Relative to those sold on Monday, cattle sold on Tuesday received a $0.15/cwt discount, cattle sold on Wednesday received a $0.33/cwt discount, and those sold on Friday brought $0.80/cwt less. Finally, changes in the nearby live cattle futures price were positively correlated with the cash transaction prices for fed cattle in southwest Kansas. A $1.00/cwt increase in the near term futures price was associated with a $0.40/cwt increase in transaction prices for fed cattle in southwestern Kansas.

The coefficient on the captive supply variable indicates that captive supplies, expressed as a percent of Kansas slaughter, were negatively and significantly related to cash transaction price. For every percentage increase in the share of slaughter procured by packers in southwest Kansas under captive supply arrangements, the cash fed cattle price declined by $0.096/cwt. Since it was not clear which method of defining captive supplies was appropriate, the model was also estimated using a captive supply variable defined as the percent of Kansas sales delivered to packers from Kansas feedyards under captive supply arrangements in week t+1. There was more variability in this captive supply variable definition than in the previous definition of captive supply.

Results using the alternative captive supply definition differ little from the original model except for the parameter estimate on the captive supply variable. Since Kansas fed cattle marketings averaged roughly 50% of Kansas slaughter during the study period, the Kansas fed marketing captive supply parameter was expected to be about half as large as the Kansas slaughter captive supply parameter. However, the Kansas fed marketing captive supply parameter was smaller than expected. For every percentage increase in the share of Kansas sales delivered to packers in southwest Kansas under captive supply arrangements, the cash fed cattle price declined by $0.015/cwt. Although the size of this coefficient is smaller than the parameter estimate for the captive supply coefficient found in the previous model ($.096/cwt), the estimate is still statistically significant at the .01 level.

CONCLUSIONS

This study investigated factors that affected cash fed cattle transaction prices in southwestern Kansas from late May through late November 1990. Compared to previous research that has attempted to explain the variation in fed cattle transaction prices, this study offers two advantages. First, the data collection period is longer than that used in previously published research. Second, the transaction prices are modeled as a function of more factors likely to influence the transaction prices for each pen, thereby minimizing the possibility of model misspecification.

This research provides information concerning the impact on cash fed cattle prices of a wide variety of factors that are important in fed cattle price determination. Quality factors that significantly influenced cash price included average weight, finish uniformity, and the percent of cattle in the pen expected to quality grade choice. The presence of heiferettes in a pen resulted in a discount in transaction price, however the presence of bulls or late cut bulls did not result in a significant price discount. Packer buying activity was most aggressive early in the week, as cattle sold on Mondays received significant premiums relative to every day but Thursday. Which feedyard sold the cattle as well as which packer ultimately purchased the cattle both had significant impacts on the final transaction price. As the number of bids received on a pen during the week sold increased, transaction price increased. Packers were willing to pay more for cattle as the number of days between purchase and delivery of the cattle increased, suggesting that packers value the scheduling flexibility associated with increasing delivery lags.

Several factors that did not appear to influence cash fed cattle prices are also noteworthy. Number of head in the pen did not have a significant impact on prices paid for fed cattle in southwestern Kansas during the time frame of the study, nor did the number of brands per animal in the pen. Another interesting result was that the number of miles from the feedlot to the ultimate purchaser did not have a significant influence on price, possibly because the feedlots involved in the study were all a relatively short distance from the packers that ultimately purchased the cattle. Over all, these results are consistent with a recent study by Ward (1990c).

The primary objective of this study was to investigate the impact of variation in captive supplies on cash transaction prices for fed cattle. Results indicate that, from May through November of 1990, the cash fed cattle market in southwestern Kansas was influenced by the number of cattle that packers in the region procured under captive supply arrangements. Both captive supplies as a percent of Kansas slaughter and captive supplies as a percent of Kansas sales were negatively and significantly related to cash transaction prices. Although the magnitude of the captive supply coefficients varied depending on the exact captive supply definition used, both models indicated that the estimated impact of an increase in captive supplies was negative and statistically significant. This suggests that the fears among some industry leaders and industry analysts that increases in captive supplies could result in lower cash fed cattle prices may be a viable concern. However, results do not confirm that price variability increases as captive supplies increase. Cash fed cattle price variability decreased as the percentage of slaughter in the region procured under captive supply arrangements increased.

The benefits of captive supplies to the packers and producers need to be carefully weighed against the cost to the industry of lower average cash market transactions prices. Of course, with no knowledge regarding the prices paid for cattle purchased under captive supply agreements, we are uncertain as to how much lower (if any) the overall average prices received were for cattle slaughtered in any given week, especially those having considerable captive supplies.

The results of this analysis could have implications for policy makers considering regulation of the industry regarding captive supplies. Specifically, the results can be used as one estimate of the costs associated with increasing captive supplies. Hopefully this study will serve as a guide and provide motivation for further research concerning this important issue. In particular, similar studies need to be conducted in different marketing regions and covering different time periods to either confirm or reject the results of this particular study under different conditions. In addition, research needs to be conducted on a more firm specific level, identifying the impacts of increases in captive supplies on an individual firm basis, rather than relying solely on aggregate captive supply data. Finally, we currently have little knowledge regarding the feeding and slaughter of packer-owned cattle. Significant cattle feeding by packers could further concentrate the market at times. Future research would benefit from consideration of this aspect of the industry.

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