THE IMPACTS OF CAPTIVE SUPPLIES ON THE FED CATTLE INDUSTRY

Ted Schroeder, Rodney Jones, James Mintert, and Andrew Barkley

October 1991

A report on research conducted
under contract with the Research
Institute on Livestock Pricing,
Ted C. Schroeder, Kansas State University,
Research Director

Research Bulletin 7-91
Research Institute on Livestock Pricing
Agricultural Economics
Virginia Tech
Blacksburg, VA 24061

THE IMPACTS OF CAPTIVE SUPPLIES ON THE FED CATTLE INDUSTRY

By:

Ted Schroeder,
Rodney Jones,
James Mintert,
and
Andrew Barkley*

Department of Agricultural Economics
Kansas State University
Manhattan, KS 66506-4011
(913)-532-6702

Report Submitted to the Research Institute on Livestock Pricing
Wayne Purcell, Director
Department of Agricultural Economics
Virginia Tech
Blacksburg, VA 24061-0401

* The authors are associate professor, graduate research associate, associate professor, and assistant professor, Department of Agricultural Economics, Kansas State University. We acknowledge the financial assistance of the Research Institute on Livestock Pricing and the Kansas State Agricultural Experiment Station. We also appreciate the considerable assistance provided by Frank Brazle, the feedyard and marketing managers, and other personnel cooperating in the data collection. Finally, the meticulous data entry of Joanne Blair and Brenda Moore are gratefully appreciated. An earlier portion of this paper was an invited presentation at the Western Agricultural Economics Association Meetings Portland, Oregon July 7-10, 1991.

THE IMPACTS OF CAPTIVE SUPPLIES ON THE FED CATTLE INDUSTRY

Introduction

During the 1980s, the beef slaughtering industry became increasingly concentrated. In 1980 the four largest packers slaughtered 36% of fed cattle nationally and marketed 53% of boxed beef. By 1989 the four largest firms slaughtered approximately 69% of the fed cattle and marketed more than 80% of the boxed beef (Purcell 1990a; Lambert 1990). Concentration is even higher in some regional markets. This increase in packer concentration was more than twice as rapid as any historical increase in the U.S. food and beverage industries (Connor).

Several factors contributed to the increased concentration. Purcell (1990b) cited a considerable reduction in beef demand as a major catalyst for the consolidation and high levels of concentration. Ward (1988) focused on the incentive of packers to lower costs by capturing economies of size. Connor discussed the introduction of boxed beef as a significant determinant of increased concentration. These factors, together with a nonrestrictive merger policy by the Antitrust Division of the U.S. Justice Department, apparently contributed to rapid beef packer consolidation.

Changes in fed cattle procurement have occurred together with increased concentration in beef slaughtering. One of the most important developments in cattle procurement during the 1980s was vertical integration of beef packers into the cattle feeding sector. Packers have become progressively more involved in controlling the supplies of procured cattle in advance of slaughter (Purcell 1990b). The impact of vertical integration on prices received by cattle feeders, although much debated in the industry, remains unclear. The objectives of this study are to quantify the short-run impacts of the level of captive supplies on cash fed cattle prices, price variability, and packer bidding activity.

Captive Supplies

The term captive cattle supplies refers to cattle procured by the packer in advance of slaughter. Captive supplies take one of three forms: 1) packer-owned cattle, 2) cattle procured on forward contracts, and 3) cattle procured under formula price (or marketing) agreements. Packer-owned cattle accounted for approximately 5% of the 15 largest steer and heifer packers' slaughter in 1990 according to a survey by the U.S. Department of Agriculture (USDA). The USDA reports that 20% of cattle slaughtered by the four largest firms in 1990 were cattle purchased under forward contracts and marketing agreements. The largest beef packer, Iowa Beef Processors (IBP) has exclusive formula purchasing agreements with two of the largest cattle feeding companies, Cactus Feeders and National Farms. The Cactus arrangement alone represents up to 800,000 head (Cactus' 1987 marketings), roughly 10% of IBP's total annual slaughter (Cornett).

Little research has focused on packer motives to acquire captive supplies. One incentive for purchasing cattle in advance of slaughter may be attempts by beef packers to increase the ability to control slaughter schedules (Ward and Bliss).

Changes in the level of captive supplies may influence the level of competition among beef packers in cash markets. At the extreme, if all rival firms had 100% of slaughter in captive supplies, then cash markets would no longer exist. From a more practical perspective, when a packer has a large fraction of slaughter needs in the form of captive supplies, it may bid less aggressively for cattle in the cash market. Cattle feeders, industry leaders, and researchers have expressed concern that captive supplies could reduce cash prices and/or increase price variability for fed cattle in the short-run (Lambert 1989; Ward and Bliss; Center for Rural Affairs).

Motivations For the Use of Captive Supplies

One of the objectives of this study was to acquire information from participating feedyard managers about motivations for packers and cattle owners to contract cattle on forward markets. During the data collection process, the data collector had extensive and repeated contact with the participating feedyard managers. Informal personal surveys administered by the investigator provided empirical evidence on the use and implications of forward contracts in Southwestern Kansas fed cattle markets.

All participating feedyard managers believed that the major motivation of packers to contract was to guarantee a stable source of cattle. This result is in accordance with the survey results of Ward and Bliss that cattle feeders "strongly agree" that "packers use contracts to secure a given quantity of cattle for slaughter." Two feedyard managers felt that contracting was also based on profit motive, but this view was not widespread among the participants.

Cattle owner motivations to contract cattle include risk aversion, reduced transactions costs, and profit motives. Most feedyard managers believe that the major motivation for cattle owners to contract cattle was to avoid price risk in cash markets. Managers also revealed that contracting often occurs as a result of a lending institution's desire to secure a sale price or basis for the cattle. If the cattle are purchased under loan, the suppliers of credit may require that the cattle on feed be contracted as a prerequisite to a loan.

The use of forward contracts may occur to reduce transactions costs associated with cattle sales. Several feedyard managers mentioned the "ease of selling" and "assurance of a known buyer" as major causes of contracting among cattle owners. Transaction costs include the time and effort involved in preparing a showlist and soliciting and acquiring bids from buyers. For many cattle owners, transaction costs may also reflect increased confidence associated with certain sale. The intangible element of security may also be valuable to many cattle owners. Higher prices and profits were mentioned as incentives to contract by only two feedlot managers. Although some managers felt that profits were a causal factor, this was a minority opinion relative to the nearly unanimous motivating factors of risk aversion and reduced selling costs. The available evidence on packer motivations to contract cattle and feedlot incentives to sell cattle on contract have been incorporated into a theoretical model of the causes and consequences of the use of captive supplies in cattle markets (Barkley and Schroeder).

Previous Research

Ward (1988) summarized 13 studies published from 1965 through 1988 that, on balance, suggested that increased market concentration or reduction in the number of buyers can reduce local livestock prices. Studies by Menkhaus et al. and Quail et al. concluded that fed cattle prices were 1.2% to 2.5% lower in the most concentrated procurement regions. Schroeter and Azzam concluded that 55% of the farm-to-retail price margin for beef could be attributed to market power in the meat industry. Marion et al., concluded that regional market concentration and price were generally negatively related, although during the 1981-86 period the results were ambiguous. Ward (1990b) concluded that prices paid by packers were significantly different in several regional markets and found a tendency for the largest packers to pay lower prices than smaller competitors.

Research investigating the impacts of captive supplies on fed cattle prices is related to studies of packer competition. A survey of cattle feeders by Ward and Bliss indicated that producers generally agree that contracting gives packers a pricing advantage in the cash market. Ward (1990a) reported that captive supply shipments up to three days prior to the sale date had no significant impact on transaction prices, however.

Hayenga and O'Brien used weekly contract cattle shipments as a percentage of monthly slaughter from Colorado, Kansas, Nebraska, and Texas during October 1988 through 1989 to investigate the impacts of captive supplies on weekly average prices in the four states as reported by the Agricultural Marketing Service (AMS). They concluded that forward contracting in Kansas had a positive influence on prices whereas contracting in Texas had a negative impact. Forward contract activity in Colorado and Nebraska had no perceptible influence on prices in any of the four regional markets.

Elam regressed monthly average AMS fed cattle prices on wholesale beef prices, a marketing cost index, cattle slaughter, and contract cattle shipments during October 1988 through June 1990. He concluded that a 1,000 head increase in forward contract shipments reduced the national average cash price by $0.003/cwt to $0.009/cwt. He also found that a 1,000 head increase in contract cattle shipments within each state reduced cash price $0.04/cwt in Kansas, $0.05/cwt in Colorado, $0.03/cwt in Nebraska, and $0.01/cwt in Texas, although only the Kansas and Colorado price impacts were statistically significant.

The various studies, using different techniques and data sets, have shown mixed results. Ward found no influence, Hayenga and O'Brien had mixed results, and Elam found negative impacts of captive supplies on cash fed cattle prices. Given the inconclusive results of these studies, cattle feeders, price analysts, policy makers, and market regulators need additional information.

This study addresses the relationship between captive cattle supplies and cash prices by extending the work of Hayenga and O'Brien, and the work of Elam in several important ways. Foremost, both of the previous studies used aggregate prices reported by the AMS as dependent variables. In contrast, this study utilizes individual pen transaction price and associated data, providing a more completely specified price model. During any particular week, and especially on any particular day, changes in cattle quality need to be held constant to find

the actual relationship between captive supplies and price. Previous studies did not hold cattle quality characteristics constant when estimating the influence of captive supplies.

Also, previous studies have not matched captive supply shipments with the delivery dates of cattle being sold. Elam regressed monthly prices against concurrent month captive supplies. Hayenga and O'Brien regressed weekly prices on concurrent week's captive supplies. Finally, Ward measured captive supplies as captive shipments during the three days prior to the sale date. These are all imperfect measures of captive supplies. Here, captive supply deliveries as a percent of slaughter are matched with the delivery date of the pen of cattle being sold rather than the sale date. Matching captive supplies with the delivery date is reasonable because packers know the captive supply shipments that they will be receiving over the next two weeks (or more) as they bid on cattle.

Although similar to the analysis conducted by Ward (1990a), this study uses a more complete measure of captive supplies and a more comprehensive data set covering a longer time period. Ward used contract shipments from 152 feedlots as the measure of captive supplies. Here, regional USDA contract and formula shipments data are used as the measure of weekly captive supply. This is a more complete measure of regional captive supplies than a sample comprised only of those feedlots in the study. Ward collected data from four different states during June 1989. Here, data covering a longer time period (May to November 1990) from a single market region (Southwestern Kansas) are used. A longer time period allows for more variation in the level of captive supplies. Moreover, data were collected on a broader set of factors likely to impact fed cattle prices, thereby minimizing the likelihood of model mis-specification. The logistics of collecting consistent data on quality characteristics by pen necessitated the study of a smaller geographic region.

Model

Most fed cattle are purchased within 100 miles of the slaughter facility (Ward 1979). The relatively small geographic market, containing only a few feedyards, combined with price discounts associated with "under-" or "over-finished" cattle, imply that the short-run supply of fed cattle in a particular region is relatively inelastic. Thus, the price of an individual pen of cattle can be expressed as a function of the demand for cattle characteristics and the number of cattle supplied in a regional market. The demand for fed cattle by packers is derived from the demand for beef products by consumers. The derived demand for fed cattle in cash markets can be specified as a function of quality characteristics, market conditions, and the level of captive supplies as:

$$(1)\quad \text{Price} = f(\text{Quality Factors, Market Conditions, Captive Supplies}).$$

Specific variables included in equation (1) and their expected signs are reported in Table 1.

Table 1. Definitions of Variables.

Variable	Expected Sign	Description
TRANSACTION PRICE		Selling price of cattle fob the feedlot with 4% pencil shrink ($/cwt).
Quality Factors		
WEIGHT	(?)	Average delivered pay-weight of cattle (lbs./head).
CHOICE * CPRICE	(+)	Estimated % of cattle grading Choice times the Choice 700 to 850 pound USDA boxed beef carcass equivalent price ($/cwt). Prior day's price if sold before 1 p.m., current day's price otherwise.
SELECT * SPRICE	(+)	Estimated % of cattle not grading Choice times the select 700 to 850 pound USDA boxed beef carcass equivalent price ($/cwt). Prior day's price if sold before 1 p.m., current day's price otherwise.
DRESSING	(+)	Estimated average dressing percentage.
YLDGR4	(-)	Estimated percentage of yield grade 4 cattle.
FINISH UNIF	(-)	1 if the finish of the cattle is not uniform and zero otherwise.
BRANDS	(-)	Number of brands on the cattle.
HEAD	(+)	Total number of cattle purchased by packer-buyer from the same feedyard on the same day (head).
DISTANCE	(-)	Distance from feedlot to packing plant (miles).
SEX:		
STEERS AND HEIFERS (Default)		
STEERS	(+)	Binary variables equal to 1 if the pen contained cattle of that sex, equal 0 otherwise.
HEIFERS	(?)	
BULLS	(-)	
HEIFERETTES	(-)	
BREED:		
ANGUS	(?)	
CHAROLAIS	(?)	
SIMMENTAL	(?)	
LIMOUSIN	(?)	Binary variables equal to 1 if at least 20% of the cattle in the pen were of the respective breed and equal to 0 otherwise.
EXOTIC X	(?)	
HEREFORD	(?)	
HERF ANG X	(?)	
HOLSTEIN[a]	(-)	
ENG EXOTIC X	(?)	
BRAHMAN	(?)	
MIXED	(?)	
JUNK[b]	(-)	
FEEDYARD:		
YARD i, i=1-10[c]	(?)	1 if cattle were from yard i, and 0 otherwise.

Table 1. Definitions of Variables (continued).

Variable	Expected Sign	Description
Market Conditions		
FUTURES	(+)	Nearby live cattle futures price, previous trading day's close if sold before 1 p.m. and current day's close otherwise ($/cwt).
AUGDUM, OCTDUM, DECDUM	(?)	1 if the August, October, or December live cattle futures contract is the nearby and 0 otherwise.
SALES	(-)	Kansas fed cattle marketings the week of sale (head).
Day of the week:		
MONDAY	(Default)	
TUESDAY	(-)	1 if the cattle were sold on that day and 0 otherwise.
WEDNESDAY	(-)	
THURSDAY	(-)	
FRIDAY	(-)	
BID NUMBER	(+)	Number of bids on the pen during the week of sale.
DELIVERY LAG	(?)	Number of days between sale date and delivery date.
Packer-Buyer:		
PACKER i, i=1-5	(?)	1 if the buyer was firm i and 0 otherwise.
Captive Supplies		
CAPTIVE	(?)	Percentage of weekly Kansas slaughter that were contracted or formula cattle shipments from Kansas feedyards during the delivery week.
CAPFIRMA[d]	(?)	Percentage of weekly Kansas slaughter that were
CAPFIRMB	(?)	contracted or formula cattle shipments by firm
CAPFIRMC	(?)	from Kansas feedyards during the delivery week.

[a] If any cattle were Holstein cross HOLSTEIN was assigned a value of 1.

[b] If cattle in the pen were generally of nonassignable breeds and of varied and low quality JUNK was assigned a value of 1.

[c] A total of 13 feedyards were included in the study. Because of low volume 4 small yards were grouped together in one of the YARD variables.

[d] Five firms were represented in the region studied. Two firms represented the majority of captive supplies during the period. Thus, captive shares were defined for Firm A, Firm B and all other firms were summed as Firm C.

Quality Factors

Buyers observe cattle quality characteristics associated with individual pens of cattle and develop bid prices based on the characteristics. Thus, characteristics important to packers are expected to be reflected in transaction prices. These characteristics include items that affect packers' revenues and/or costs of processing.

Several traits of cattle in a pen are expected to impact packer gross revenues. Foremost are the percentage of cattle expected to grade Choice and the price spread between Choice and Select grade wholesale beef. Wholesale prices for Choice beef are higher than those for Select beef. As the percentage of Choice cattle increases, product value increases, which is expected to result in a fed cattle price increase. The higher the expected dressing percentage, the higher the presumed meat yield from the pen, which is expected to be associated with a higher price. Similarly, the lower the percentage of yield grade 4 cattle in a pen, the higher the expected fed cattle price. Other factors that may impact packer revenues include cattle breed, number of brands, age, and sex. Breed, brands, sex, and age may include quality factors not captured in the other measures. For example, the number of brands may impact hide values and the presence of heiferettes or late cut bulls in a pen may influence the value of beef products forthcoming from the pen.

Other characteristics of the pen may influence packer costs. The number of cattle procured at a particular feedlot on the same day is inversely related to procurement costs. If a packer can purchase large quantities of cattle from a single feedlot, this reduces buyer time and travel in addition to reducing trucking costs. The uniformity of finish of a pen could reduce sorting costs. Cattle weight may influence processing costs.[1] In Kansas, fed cattle are generally priced fob the feedyard with the packer paying shipping. Thus, the distance from the packing plant to the feedyard directly affect packer shipping costs. The further the distance, the lower the expected price.

Market Conditions

Market conditions refer to supply and demand in the local fed cattle market. Prices of Choice and Select grade boxed beef are expected to impact the demand for live cattle. The futures price for live cattle is also expected to influence fed cattle transaction prices (Ward 1979, 1981, 1990b). The inelastic supply of cattle is measured by local marketings of fed cattle, which may also influence prices.

Other factors related to the short-run demand for fed cattle are also included as market conditions. The day of the week the cattle are sold may influence price. Ward (1990b) suggested that cattle sold early in the week, when packers are competing to fill slaughter needs, are often higher than prices later in the week. In addition, cattle feeders may become anxious late in the week if cattle

---

[1] A concern often voiced by packers is that large framed, heavy cattle may have fabricated cuts that are too large for standard boxed beef packaging.

are not sold and may be willing to accept relatively lower prices. The number of bids received on a pen of cattle during the week sold is included as an indicator of packer competition for cattle. More bids may imply greater demand for cattle and therefore higher prices.

The number of days between sale date and the packer delivery date may also be associated with price. Ward (1981) found that as the number of days between sale and delivery declined, packers paid more for cattle, perhaps reflecting increased demand to fill last minute slaughter needs. However, in the presence of captive cattle supplies, packers may have more control over delivery schedules. Packers may be willing to pay cattle feeders for the ability to defer delivery date. In more recent work, Ward (1990b) found that price increased as number of days between sale and delivery increased.

Captive Supplies

Changes in the level of captive supplies reduce both the short-run supply of and demand for cash market fed cattle. These shifts may not have significant price impacts. However, in addition to shifting, if the elasticities of supply and/or demand change, or if market competition is altered, then the level of captive supplies could have a significant impact on cash market price.

The demand for cash cattle may be more elastic in the presence of captive supplies. Purcell (1990a) argued that given large short-run cost economies and associated declining marginal value of product for cattle by packers as they approach operating capacity, the short-run demand curve for fed cattle could become more elastic with higher levels of captive supplies. Also, a packer having relatively large numbers of cattle contracted for delivery on demand within the next few weeks could use captive supplies as a substitute for cash market cattle. If current prices appear unfavorable to the packer, previously contracted cattle could be used to meet slaughter needs rather than cattle purchased in cash markets. Both arguments support the possibility of a more elastic demand for cattle with large captive supplies that could result in downward pressure on cash prices. These hypotheses however, would be difficult to verify empirically. Finally, the presence of captive supplies could reduce packer bidding aggressiveness for cash market cattle, increasing packer market power, and the possibility of price reductions (Purcell 1990a).

In the long run the presence of captive supplies could lower packer average costs by securing plant operation near capacity resulting in higher fed cattle prices. There are, then, plausible arguments that suggest captive supplies can decrease or increase fed cattle supplies. Only empirical tests over time will determine which of these price impacts is dominant. This study provides evidence only for short-run implications of the level of captive supplies on fed cattle markets.

To determine the impact of captive supplies on cash price variability the residuals from the ordinary least squares estimation of equation (1) can be used. The residuals from equation (1) are the price differentials across pens and over time that are not explained by the factors included in the model. Assuming the model is appropriately specified, to determine whether captive supplies impact price variability (after accounting for the relevant factors affecting price

differences) the squared residuals from equation (1) were regressed on captive supplies as follows:

$$(2) \qquad \text{Residual Squared} = b_0 + b_1 \text{ Captive Supplies} + e$$

A t-test of the statistical significance of b_1 provides a test of the hypothesis that captive supplies had no influence on price variability. Rejection of the hypothesis that b_1 is equal to zero would suggest that captive supplies were related to price variability after accounting for other pricing factors.

Data

Data were collected on individual transactions from 1407 pens of cattle representing 166,338 head from May 21, 1990 through November 24, 1990 from 13 feedyards in Southwestern Kansas.[2] The collected data may be subject to selection bias. Data are only from feedyards that were willing to participate. The general market area of the feedyards included in the study and the location of major beef packers are shown in Figure 1. For each pen of cattle sold a record was made of price bids, feedyard and animal characteristics, market conditions, and the level of captive supplies. Specific variables used in the estimation of equation (1) are defined in Table 1.

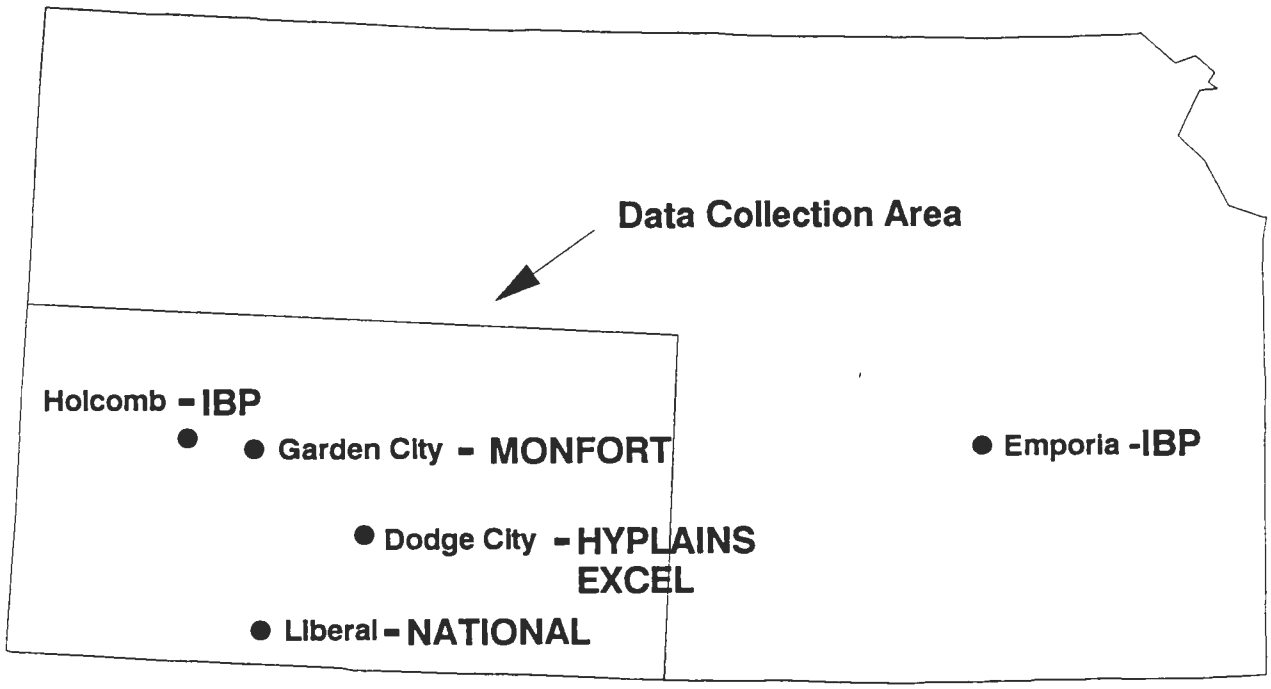


Figure 1. Kansas Map Showing Locations of Major Buying Packing Plants and Data Collection Area.

[2] Because of resource constraints, 5 of the 13 feedlots were dropped from the data survey at the end of August 1990. Thus, 8 of the yards participated in the survey from September through November 1990.

Figure 2 exhibits the average transaction prices for fed cattle included in the survey. The Chicago Mercantile Exchange nearby live cattle futures price was included in the model to account for changing national cattle prices during the period of data collection. The settlement price the day prior to the sale date was used for transactions completed before 1 p.m. For transactions completed after 1 p.m., the current day's settlement price was used. Binary variables were included to account for discrete shifts in the futures price when the nearby futures price shifted to the next contract month.[3]

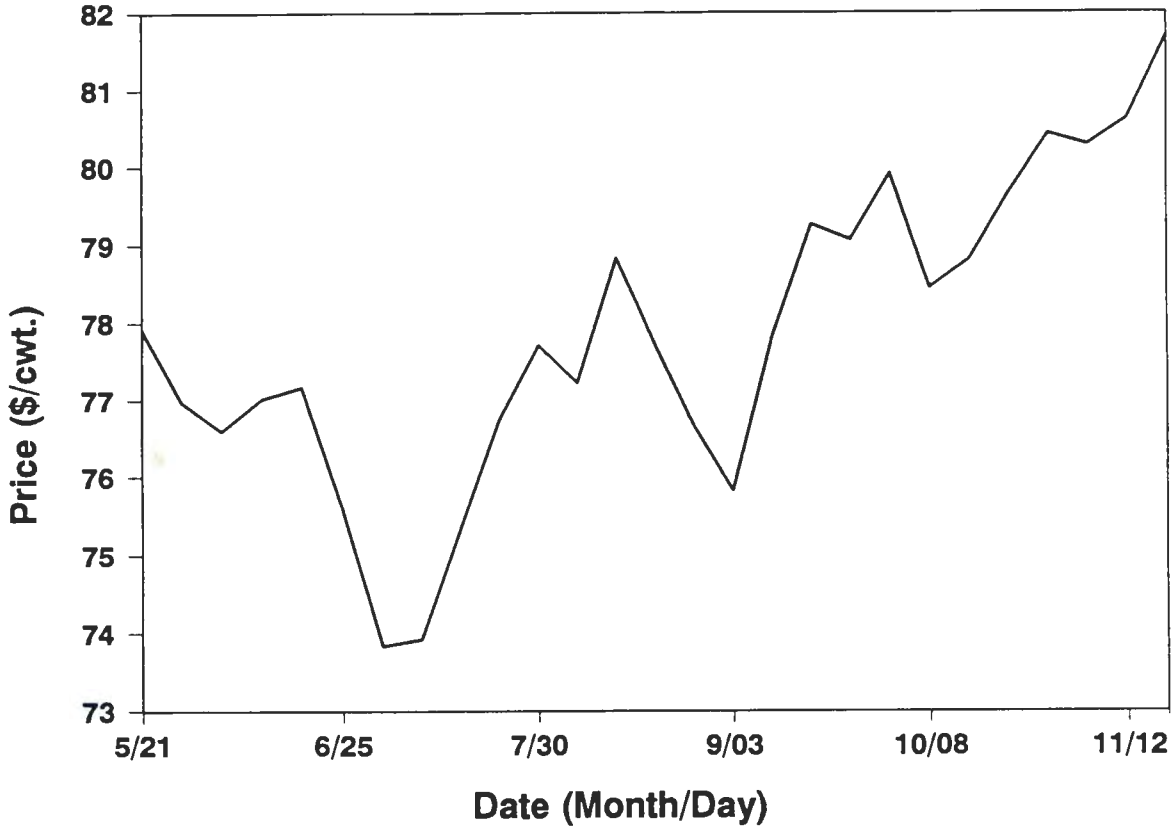


Figure 2. Weekly Average Transaction Price for Steers and Heifers, May through November 1990.

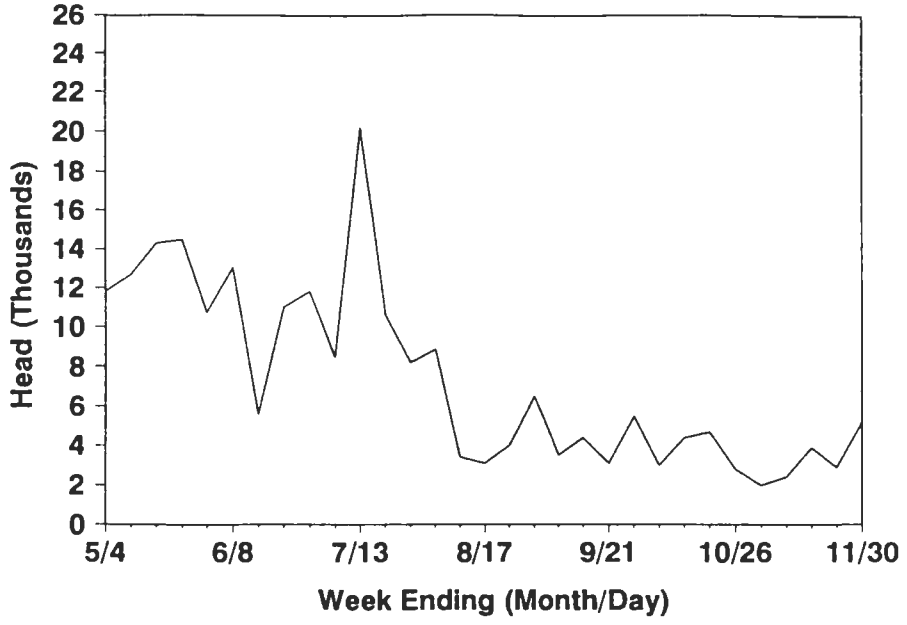
[3] To reduce price disturbances caused by expiration week volatility in the futures market, the nearby contract period was defined as the 16th day of the previous contract expiration month through the 15th day of the contract month in question.

To account for changes in the derived demand for cattle, the USDA wholesale Choice and Select grade boxed beef cutout carcass-equivalent prices were included. The spread between Choice and Select boxed beef carcass prices was not constant over the six month data collection period. Thus, the value differential varied across individual pens of cattle having dissimilar quality grades. Interaction terms of the Choice wholesale price times the percentage of cattle expected to grade Choice (or better) and the Select wholesale price times the percentage of cattle expected to grade Select were included to account for this shifting value differential. If the cattle were sold prior to 1 p.m. the previous day's wholesale price was used. The current day's price was used if the cattle were sold at 1 p.m. or later.

The number of captive supply cattle shipped for slaughter each week from Kansas feedyards was collected from the USDA's Agricultural Marketing Service in Dodge City, Kansas. The Dodge City regional office conducts a weekly telephone survey of feedlots in Kansas to determine the number of fed cattle scheduled for shipment under formula arrangements and contracts (packer-owned cattle are not included). Contract and formula fed cattle shipments during the period of analysis are reported in Figure 3. The number of captive cattle ranged from 20,000 head during the week ending July 13 to less than 3,000 during the week ending November 2. The percentage of Kansas fed cattle marketings and slaughter represented by formula and contract cattle during May through November 1990 is presented in Figure 4. Captive supplies ranged from 2% to 15% of weekly slaughter.

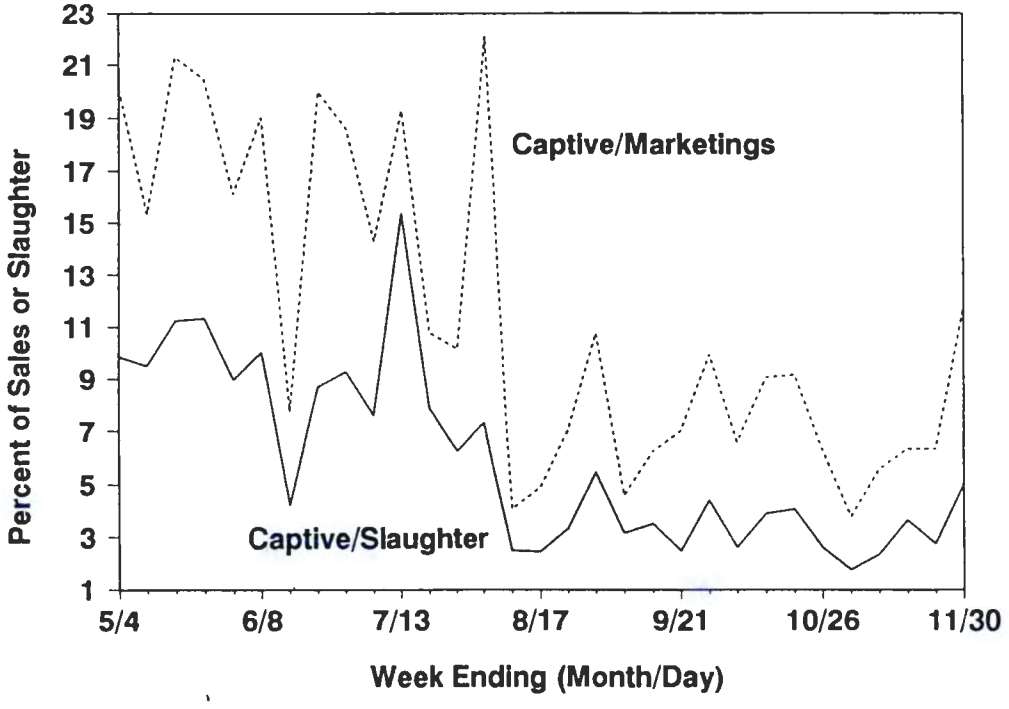
Five firms represent essentially the total slaughter capacity in the Southwestern Kansas marketing region. Table 2 reports the five firms' shares of cash cattle purchases from the feedyards included in the survey for the entire data collection period and during 2-month subperiods (because data collection started in late May, this month is included with the June and July period). Excel, National, and Monfort purchased the largest shares of cattle from the feedyards in the survey with each slaughtering approximately 25% of the cattle marketed. Variability in the market shares occurred across time. National had the largest share during May through September, with more than 28% of the market. In October and November, Monfort purchased the largest share (30.2%) of cattle.

Actual slaughter levels of individual firms were unavailable. However, Excel, IBP, and National represent the largest slaughter capacities of the five plants with each having between 4,000- and 6,000-head weekly slaughter capacity (Dhuyvetter and Laudert, 1991). IBP's market share of cattle slaughter in the region is likely larger than that reflected in the feedlots surveyed. Under the formula agreement IBP has with National Farms in Kansas (not National Beef Packing), IBP may secure a considerable amount of its Southwest Kansas slaughter from National Farm's feedyards (which were not included in the data survey). The number of feedyards in the survey was reduced from 13 to 8 during September through November because of data collection resource constraints (these were primarily the largest 8 yards in the study, but were still as geographically dispersed as the original 13 yards). The market shares from these 8 yards were nearly identical to those for all 13 yards. The reduction in the number of yards in the survey had no discernable impact on the packer shares.



Source: U.S. Dept. of Ag., Ag. Mktg. Service, Dodge City, Kansas

Figure 3. Number of Weekly Captive Supply Fed Cattle Shipments in Kansas, May through November 1990.



Source: U.S. Dept. of Ag., Ag. Mktg. Service, Dodge City, Kansas

Figure 4. Captive Supply Fed Cattle Shipments as a Percentage of Kansas Slaughter and Marketings, May through November 1990

Table 2. Average Market Share of Packer-Buyers at Feedlots Represented in the Study.

Packer-Buyer	Time Period			
	May-November	May-July	August-September	October-November
	% of Cattle (% of Pens)			
Excel	25.4 (25.1)	27.8 (27.5)	21.3 (22.3)	27.2 (24.3)
HyPlains	10.1 (10.0)	10.3 (10.0)	10.9 (11.0)	7.5 (7.4)
IBP	15.4 (15.4)	13.7 (13.2)	17.2 (17.0)	16.6 (17.7)
National	27.0 (25.1)	28.8 (26.9)	28.1 (25.8)	18.5 (18.5)
Monfort	22.2 (24.5)	19.3 (22.2)	22.4 (23.9)	30.2 (32.1)

Results and Discussion

Equation (1) was estimated using ordinary least squares. The model was estimated using two different measures of captive supplies. The first measure is the USDA formula and contract shipments from Kansas feedyards during the delivery week of each pen divided by total weekly Kansas slaughter (CAPTIVE). This measure provides for estimation of the impact of regional captive supplies on cash market prices. The second measure of captive supplies is each individual packer's share of captive supplies as a percentage of Kansas slaughter. This includes three separate variables; the captive supplies of firm A (CAPFIRMA), firm B (CAPFIRMB), and firm C (CAPFIRMC) as a percentage of the total Kansas cattle slaughter.[4] Of the five packing firms that are represented in the Southwestern Kansas region, only two had appreciable levels of captive supplies: CAPFIRMA and CAPFIRMB represent the captive supplies of individual firms and CAPFIRMC represents the sum of the captive supplies of the remaining three firms.

[4] Private industry analysts supplied estimates based on feedyard surveys of the firm shares of captive supplies. To maintain anonymity, packing firms were not identified in empirical estimates.

Summary statistics of the levels of captive supplies during the time period investigated are reported in Table 3. Captive supply shares by firm were variable: firm A and firm B each controlled over 80% of the total captive supplies during some weeks, and controlled less than 10% in other weeks during May through November 1990. All other firms combined generally had less than 20% of the captive supplies. Average aggregate captive supplies represented 5.9% of Kansas slaughter during May through November 1990. However, during May through July contracting was approximately 50% greater than during the entire 6-month period, averaging 9.3% of slaughter. Firm A had the largest share of contracting over the entire period and from May through July; firm B had the largest share during August through November. The largest single firm's captive supply as a percentage of Kansas slaughter was 12.8% during July.

Table 3. Summary Statistics of Total Captive Supplies Relative to Total Kansas Slaughter and Captive Supplies by Firm Relative to Total Kansas Slaughter.

Captive Supply Variable	Time Period	Mean	Standard Deviation	Minimum	Maximum
		- - - - - - - - - - % - - - - - - - - - -			
CAPTIVE	May-November	5.94	3.50	1.78	15.38
	May-July	9.27	2.68	4.23	15.38
	August-September	3.86	1.63	2.49	7.35
	October-November	3.21	1.03	1.78	5.03
CAPFIRMA	May-November	3.31	2.96	0.13	12.83
	May-July	5.99	2.76	2.04	12.83
	August-September	1.39	0.85	0.47	3.14
	October-November	1.37	0.78	0.13	2.46
CAPFIRMB	May-November	2.06	1.13	0.33	4.35
	May-July	2.41	1.26	0.50	4.35
	August-September	2.11	1.15	0.59	4.28
	October-November	1.49	0.72	0.33	2.40
CAPFIRMC	May-November	0.57	0.54	0.00	2.12
	May-July	0.87	0.69	0.00	2.12
	August-September	0.36	0.27	0.00	0.76
	October-November	0.35	0.22	0.03	0.71

Entire Period Estimates of Models I and II

The parameter estimates of the two models, reflecting different measures of captive supplies, over the May through November 1990 period are reported in Table 4. Both models explain 92% of the variability in transactions prices. Parameter estimates of the two models are similar. Several quality factors were significant. In particular, average weight had a negative influence, price premiums were received for higher percents of cattle grading Choice, dressing percentage had a positive influence, and pens having uniform finish received premiums. Sex influenced price: pens of steers and pens of heifers received premiums of $0.49/cwt and $0.34/cwt respectively, relative to pens containing both steers and heifers. Pens containing heiferettes received discounts in excess of $1/cwt. Breed had a limited influence on price with only pens categorized as JUNK receiving discounts (more than $2/cwt) relative to pens of other breeds.

All of the feedyards received discounts relative to the randomly selected base yard. The marketing methods of individual feedyard managers may influence prices. However, feedyard premiums were not correlated with feedyard size. The nearby live cattle futures price had a positive influence on transaction price, with magnitudes similar to those reported by Ward (1990b).

Figure 5 shows the distribution of the days of the week during which cattle were sold. Nearly 70% of the pens were sold on Monday or Tuesday. Cattle sold early in the week received $0.30/cwt to $0.60/cwt higher prices relative to the national market than cattle sold later in the week. Ward (1990b) found similar day-of-the-week effects. Stronger demand earlier in the week, together with increased desire by feedyard managers to dispose of unsold pens later in the week, may explain the downward pressure on prices. Jones et al. reported that feedyards' asking prices also decline as the week progresses.

The number of bids received on the pen during the week of sale was associated with higher prices. Each additional bid increased transaction price by approximately $0.11/cwt. Ward (1990b) estimated that each bid from different buyers increased fed cattle price by $0.05/cwt to $0.07/cwt. The number of bids received are shown in Figure 6. Over 60% of the pens were sold on the first bid. Asking price persistence may result in lowered price as the week progresses and the cattle are not sold (i.e., the day-of-the-week effect and the number of bids received could offset each other).

Considerable variation occurred in the number of days between sale and delivery (Figure 7). Pens were held from 0 to 17 days after the sale date, and over 80% of the pens were delivered within 2 to 7 days. For each day the feedyard was expected to keep cattle after the sale date, price increased by a modest, but significant, $0.014/cwt (table 4). Ward (1990b) estimated that each additional day the feedlot held cattle after the sale date increased price by a similar $0.025/cwt. Packers may have been willing to pay feedyards to hold cattle to facilitate packing plant slaughter schedules. Different packers paid different prices for fed cattle. On average, packer 3 paid $0.24/cwt and packer 2 paid $0.19/cwt less for cattle than the default packer. Average prices paid were not associated with packer size.

Table 4. Parameter Estimates of Models Explaining Transaction Prices of Fed Cattle.[a]

Dependent Variable = TRANSACTION PRICE ($/cwt)

Independent Variable	Model I		Model II	
	Estimate	t-statistic	Estimate	t-statistic
Quality Factors				
WEIGHT	-0.0010	-3.81**	-0.0010	-3.98**
CHOICE * CPRICE	0.0037	30.44**	0.0036	30.03**
SELECT * SPRICE	0.0038	30.10**	0.0038	29.76**
DRESSING	0.344	3.18**	0.338	3.17**
YLDGRD4	-0.011	-0.64	-0.013	0.77
FINISH UNIF	-0.252	-2.19**	-0.231	-2.03**
BRANDS	0.004	0.13	0.005	0.17
HEAD	-0.00001	-0.35	0.0000	0.24
DISTANCE	0.000	0.26	0.000	0.55
SEX (Default = STEERS AND HEIFERS)				
STEERS	0.487	4.55**	0.477	4.52**
HEIFERS	0.339	3.14**	0.322	3.02**
BULLS	0.097	0.79	0.064	0.52
HEIFERETTES	-1.035	-9.07**	-1.036	-9.21**
BREED				
ANGUS	0.121	1.40	0.130	1.52
CHAROLAIS	-0.097	-1.24	-0.075	-0.96
SIMMENTAL	0.046	0.50	0.029	0.32
LIMOUSIN	-0.098	-0.90	-0.101	-0.94
EXOTIC X	-0.036	-0.48	-0.045	-0.61
HEREFORD	0.134	0.73	0.101	0.56
HERF ANG X	0.037	0.49	0.049	0.65
HOLSTEIN	0.196	1.12	0.217	1.26
ENG EXOTIC X	0.040	0.49	0.042	0.52
BRAHMAN	-0.153	-1.11	-0.189	-1.38
MIXED	0.058	0.61	0.046	0.49
JUNK	-2.119	-7.94**	-2.070	-7.87**
FEEDYARD (Default = YARD 1)				
YARD 2	-0.029	-0.51	-0.034	-0.61
YARD 3	-0.171	-3.10**	-0.179	-3.28**
YARD 4	-0.227	-4.10**	-0.230	-4.15**
YARD 5	-0.087	-1.36	-0.109	-1.73*
YARD 6	-0.078	-0.82	-0.087	-0.93
YARD 7	-0.245	-3.31**	-0.241	-3.29**
YARD 8	-0.252	-2.05**	-0.272	-2.25**
YARD 9	-0.324	-4.26**	-0.294	-3.89**
YARD 10	-0.399	-4.32**	-0.424	-4.64**

Table 4. Parameter Estimates of Models Explaining Transaction Prices of Fed Cattle (continued).[a]

Dependent Variable = TRANSACTION PRICE ($/cwt)

Independent Variable	Model I		Model II	
	Estimate	t-statistic	Estimate	t-statistic
Market Conditions				
FUTURES	0.547	39.93**	0.545	40.00**
AUGDUM	-1.274	-19.72**	-1.209	-18.68**
OCTDUM	-1.147	-14.08**	-1.100	-13.52**
DECDUM	-0.125	-1.57	-0.126	-1.50
SALES	$-1.07 \cdot 10^{-5}$	-9.30**	$-1.41 \cdot 10^{-5}$	-9.69**
Day of the Week (Default = MONDAY)				
TUESDAY	-0.114	-2.87**	-0.131	-3.32**
WEDNESDAY	-0.369	-7.69**	-0.375	-7.92**
THURSDAY	-0.422	-6.40**	-0.428	-6.57**
FRIDAY	-0.562	-6.96**	-0.588	-7.36**
BID NUMBER	0.108	5.49**	0.116	5.97**
DELIVERY LAG	0.014	1.80*	0.014	1.77*
Packer-Buyer (Default = PACKER 1)				
PACKER 2	-0.244	-3.82**	-0.217	-3.44**
PACKER 3	-0.193	-3.61**	-0.177	-3.36**
PACKER 4	0.004	0.09	-0.009	-0.20
PACKER 5	-0.050	-1.11	-0.003	-0.63
Captive Supplies				
CAPTIVE	-0.024	-3.59**	-	-
CAPFIRMA	-	-	-0.012	-1.37
CAPFIRMB	-	-	-0.082	-4.45**
CAPFIRMC	-	-	-0.238	-5.61**
INTERCEPT	-27.935	-4.00**	-26.178	-3.80**
R-Square	0.92		0.92	
RMSE ($/cwt)	0.53		0.53	
F-Statistic	332.64**		330.01**	
Observations	1407		1407	

[a] Single and double asterisks indicate parameter significantly different from zero at the 0.10 and 0.05 levels, respectively.

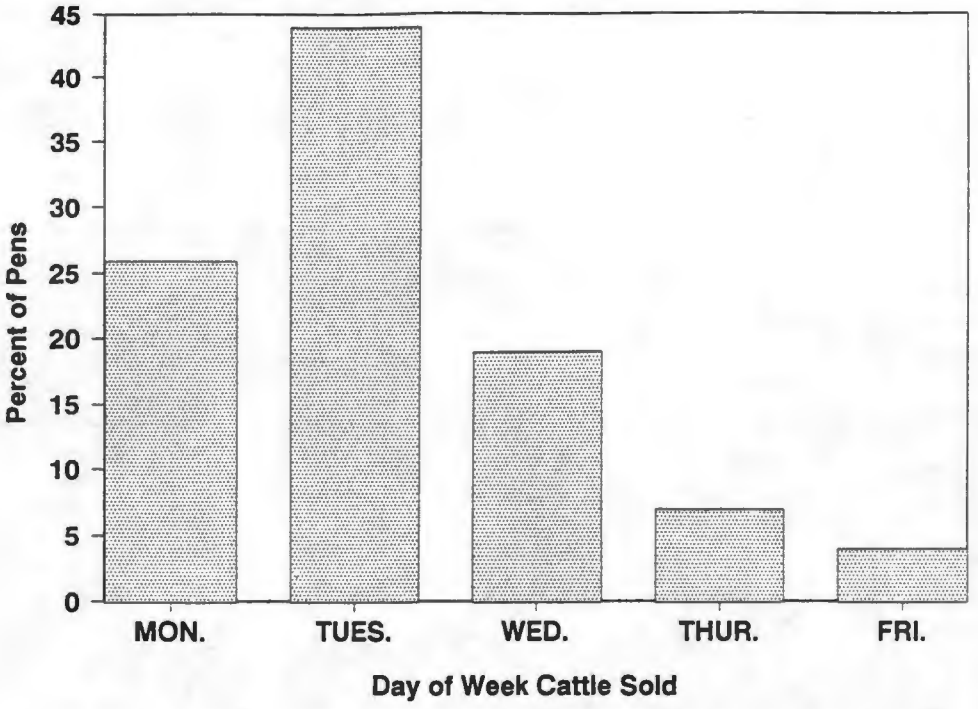


Figure 5. Day of the Week Cattle Were Sold.

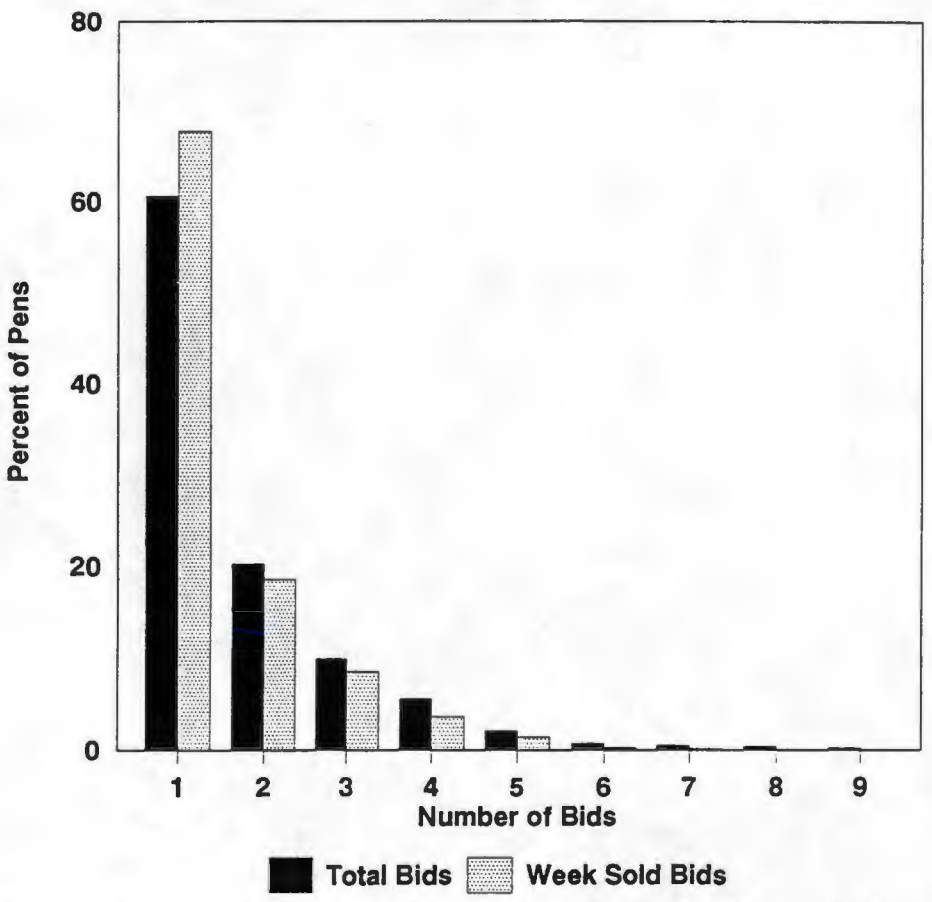


Figure 6. Total Number of Bids Received Per Pen and Bids Received During the Week of Cattle Sale.

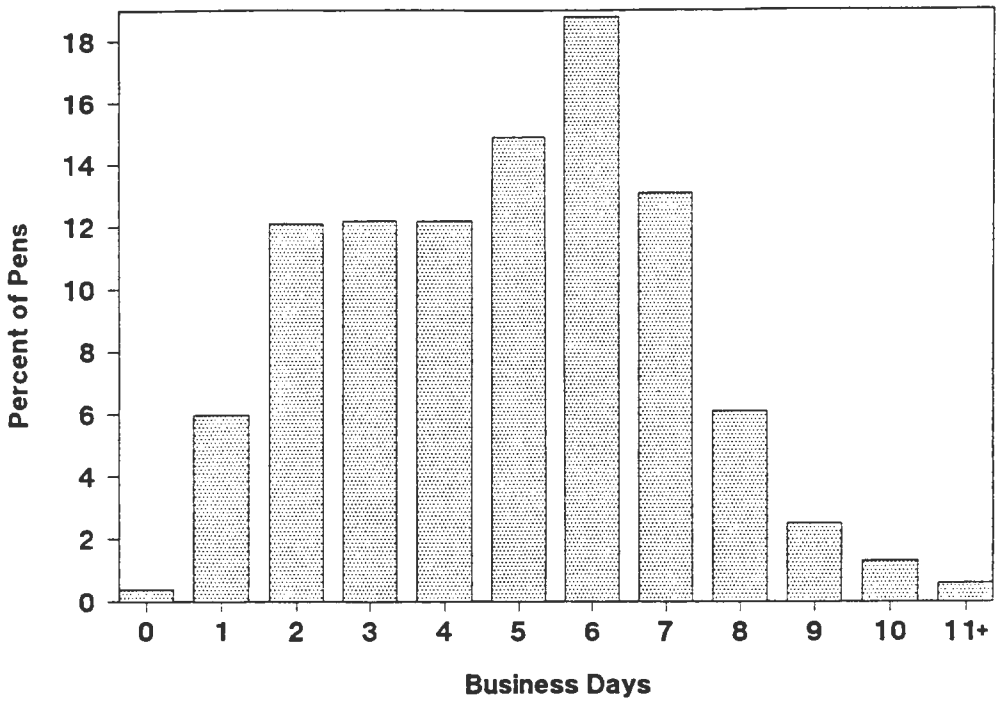


Figure 7. Number of Business Days Between Cattle Sale Date and Delivery Date.

The level of captive supplies had a statistically significant (0.05 level) negative influence on price. For each one percent increase in contract and formula cattle shipments from Kansas feedyards as a percentage of Kansas slaughter (model I), the transaction price declined by $0.024/cwt. The captive supplies of individual firms (model II) had significant negative influences on price as well, with the exception of firm A. A 1% increase in captive supplies as a percent of total Kansas slaughter by firm B reduced price by $0.08/cwt and, a 1% increase in CAPFIRMC reduced price $0.24/cwt. These coefficient estimates must be interpreted with care. As with any regression result, the parameter estimates should not be interpreted as being valid for captive supply levels outside the bounds of the data set (Table 3).

Subperiod Estimates of Models I and II and Average Price Impacts

Because of the changing level of contracting activity during the study period, the models were re-estimated for two-month intervals to provide insight into the price impact of the level of captive supplies over different time periods, as reported in Table 5. Also included in Table 5 are the price impacts of captive supplies during the respective time periods evaluated at each period's mean level of captive supplies.

Table 5. **Parameter Estimates of the Price Impacts of Captive Supplies From Models I and II Across Different Time Periods.**[a]

Captive Supply Variable	Estimation Period: Full Period May-November	Subperiod: May-July	Subperiod: August-September	Subperiod: October-November
Model I				
CAPTIVE	-0.024**	-0.033**	-0.063*	0.049
	(-3.59)	(-4.61)	(-1.64)	(0.77)
Average Price Impact ($/cwt)[b]	-0.14	-0.31	-0.24	0.16
Model II				
CAPFIRMA	0.012	-0.021**	0.041	0.128
	(1.37)	(-2.42)	(0.68)	(1.47)
CAPFIRMB	-0.082**	-0.071**	-0.176**	-0.108
	(-4.45)	(-3.15)	(-3.07)	(-0.88)
CAPFIRMC	-0.238**	-0.228**	0.121	0.523
	(-5.61)	(-5.71)	(0.47)	(1.19)
Average Price Impact ($/cwt)[b]	-0.26	-0.15	-0.06	-0.20
Observations	1407	755	444	208

[a] Single and double asterisks indicate parameter significantly different from zero at the 0.10 and 0.05 levels, respectively.

[b] Calculated as the average level of captive supplies during the period times the estimated regression coefficients.

Over the entire six month period, captive supplies reduced prices in the surveyed feedyards by $0.14/cwt to $0.26/cwt. The impact was not constant. When captive supplies were highest (May through July), the net impact was a price reduction of $0.31/cwt in model I and $0.15/cwt in model II. All of the parameter estimates on captive supply measures during May through July were negative and statistically significant (0.05 level). During August through September, captive supplies reduced price relative to the national market by $0.06/cwt to $0.24/cwt. In October through November, captive supply shipments had no significant price impact.

Captive Supplies and Cash Price Variability

To test whether captive supply shipments influenced price variability, equation (2) was estimated using ordinary least squares. The estimates of the equation over the entire data collection period (using the aggregate measure of captive supplies) are:

$$\text{(3)} \quad \text{Residuals Squared} = \underset{(5.79)}{0.326} - \underset{(-1.08)}{0.00884}\ \text{Captive Supplies}$$

$$\text{R-squared} = 0.0008$$

The coefficient on captive supplies was not significantly different from zero. Thus, price variability, as measured by the squared residuals from the estimated price equation, was not related to captive supplies during the entire study period. The same conclusions held for two of the three subperiods. For the August-September subperiod, the estimated coefficient on captive supplies was positive and statistically different from zero at the 0.05 level. This provides evidence that during the August-September subperiod, captive supply shipments were correlated with increased price variability.

The Impact of Captive Supplies on Bid Numbers

The level of captive supplies may place downward pressure on local cash prices for several reasons. First, when large captive supplies are held by packers the competition for remaining cattle on spot markets may decline. Previous studies found that selling price declined as the number of buyers bidding on livestock declined. The models here concur with this. It is also important to study the source or causes of the changes in the number of bids.

A model was estimated to determine the factors that affect the number of bids received per pen. The general form of the model was:

$$\begin{aligned}\text{(4) BID NUMBER} = {} & \beta_0 + \beta_1\text{CHOICE} + \beta_2\text{SPREAD} + \beta_3\text{SPREAD}^2 + \beta_4\text{TUESDAY} + \\ & \beta_5\text{WEDNESDAY} + \beta_6\text{THURSDAY} + \beta_7\text{FRIDAY} + \beta_8\text{YARD2} + \beta_9\text{YARD3} + \\ & \beta_{10}\text{YARD4} + \beta_{11}\text{YARD5} + \beta_{12}\text{YARD6} + \beta_{13}\text{YARD7} + \beta_{14}\text{YARD8} + \beta_{15}\text{YARD9} + \\ & \beta_{16}\text{YARD10} + \beta_{17}\text{HYPLAINS} + \beta_{18}\text{IBP} + \beta_{19}\text{NATIONAL} + \beta_{20}\text{MONFORT} + \\ & \beta_{21}\text{SALEDIF} + \beta_{22}\text{CAPTIVE} + \epsilon.\end{aligned}$$

Where SPREAD is the feedyard's asking price less the first bid price, SALEDIF is the weekly Kansas cattle slaughter minus the weekly Kansas fed cattle marketings, ϵ is a random error, and all other variables are as defined in Table 1. Explanatory variables used to explain the number of bids were selected based upon intuition of factors expected to influence bidding activity.

The expected signs of the parameters of equation (4) are as follows. The percentage of cattle expected to grade Choice is anticipated to be positively related to the number of bids because higher quality cattle are expected to generate higher levels of buyer interest. The spread between the feedyard's asking price and the first bid is also expected to be positively related to the number of bids. A large spread would suggest that a feedyard manager's price expectation is greater than the current packer offers and the yard manager may hold the cattle for more bids. Cattle not sold early in the week are expected to receive more bids simply because they are on the show list longer. Differences in feedyard selling and packer procurement strategies may result in different effects on the number of bids with no expectation on the sign. The difference between weekly Kansas cattle slaughter and Kansas fed cattle marketings may exert a positive influence on bidding activity. As marketings increase (SALEDIF declines) the number of bids per pen may decline because of ample local supplies. As SALEDIF increases, packers are purchasing cattle outside Kansas for slaughter within the state. Finally, as captive supplies increase, buyer competition could decline leading to a reduction in the number of bids.

The number of bids is a truncated variable with a lower limit of one. Thus, equation (4) requires Tobit Maximum Likelihood estimation (Tobin; McDonald and Moffitt).[5] Equation (4) was estimated with the number of bids received during the week the pen was sold as the dependent variable.

The estimated coefficients of equation (4) are reported in Table 6. The model explained 30% of the variability in the number of bids received during the week the cattle were sold. Statistically significant factors affecting the number of bids included percent of cattle grading Choice, the spread between the asking price and the first bid (and this term squared), the day of the week the cattle were sold, the feedyard, and if the buyer was IBP. The most important factor was the percentage of cattle grading Choice. The elasticity of the number of bids with respect to the percent of cattle expected to grade Choice was statistically significant, and equal to 1.167.

As SPREAD increased the number of bids increased at a declining rate. Pens sold on Tuesday, Wednesday, Thursday, or Friday all received more bids on average than cattle sold on Monday. Cattle sold on Wednesday and Thursday had the largest impacts with 0.37 to 0.29 more bids on average than pens sold on Mondays. Relative to the default, most of the feedyards received more bids. This may be attributable to different marketing techniques of the feedyard managers. Cattle purchased by IBP were generally sold with fewer bids (0.227 less bids) than the default pens purchased by Excel.

Finally, captive supplies relative to Kansas slaughter did not have a statistically significant (0.05 level) impact on the number of bids. Although captive supplies did not affect the number of bids during the week the cattle

---

[5] The procedure follows that of McDonald and Moffitt. Modification of the McDonald and Moffitt procedure were required because discrete explanatory variables were included in the model. In this case the derivatives were evaluated at discrete values (0 or 1) holding other variables at their means.

Table 6. **Maximum Likelihood Estimates for Tobit Model of Number of Bids Received During the Week the Cattle Were Sold.**

	Parameter Estimate	Asymptotic t-ratio[a]	Change in Probability	Total Change	
				Derivative	Elasticity
INTERCEPT	-4.179	-6.96*	-	-	-
CHOICE	0.021	-2.55*	0.006	0.008	1.167
SPREAD	2.141	11.26*	0.577	0.812	0.811
SPREAD-squared	-0.505	-6.12*	-0.136	-0.192	-0.216
TUESDAY	0.756	4.81*	0.182	0.221	0.259
WEDNESDAY	1.444	8.57*	0.374	0.553	0.288
THURSDAY	1.150	5.47*	0.291	0.394	0.328
FRIDAY	0.975	3.61*	0.242	0.312	0.033
YARD 2	2.630	9.36*	0.631	1.068	0.351
YARD 3	2.116	7.62*	0.502	0.717	0.241
YARD 4	2.779	10.25*	0.664	1.182	0.555
YARD 5	3.314	11.47*	0.760	1.625	0.403
YARD 6	1.106	2.75*	0.223	0.237	0.019
YARD 7	-7.539	-0.00	-0.114	-0.078	-0.011
YARD 8	1.877	4.15*	0.436	0.578	0.023
YARD 9	1.166	3.14*	0.239	0.258	0.034
YARD 10	3.099	9.70*	0.725	1.440	0.220
PACKER 2	-0.082	-0.41	-0.023	-0.034	-0.009
PACKER 3	-0.684	-3.63*	-0.174	-0.227	-0.093
PACKER 4	-0.125	-0.76	-0.034	-0.050	-0.034
PACKER 5	-0.039	-0.23	-0.011	-0.016	-0.011
SALEDIF	$-1.55 \cdot 10^{-6}$	-0.37	0.000	0.000	0.000
CAPTIVE	0.030	1.68	0.008	0.011	0.179
Censored Observations			954		
Non-Censored Observations			453		
Likelihood Ratio Statistic[b]			458.46*		
McFadden's R^2			0.30		

[a] An asterisk indicates statistical significance at the 0.05 level.

[b] Test that all non-intercept parameter estimates equal zero.

were sold, an important caveat is worth considering. If packers bid, but not necessarily aggressively, in hopes of getting some bids accepted, with the idea that if only a few of their bids are accepted they can rely on captive supplies to fill short-run slaughter needs. Under this possible scenario, simple bidding activity and captive supplies may have no relation. Unless one can distinguish between passive and active bidding by packers the true relationship between captive supplies and number of bids may be difficult to discern. If packers use captive supplies as a short-run substitute for the cash market at times when cash prices are relatively high, then captive supplies and number of bids or number of bidders may not be related, even though the captive supplies may affect the aggressiveness of certain bidders.

Limitations

Several caveats to the results of this study are important. First, the results may be sensitive to the time period during which the data were collected. During May through November of 1990, fed cattle supplies were relatively tight in Southwest Kansas, particularly during August through November. During some weeks, as much as two-thirds of the state's slaughter were cattle procured from other states (typically about one-third of the state's slaughter is cattle fed in other states). Purcell (1990b, p. 1214) states, "The relatively small supplies of cattle when compared to existing slaughter capacity are providing a safety net against any market power levied by the larger packing firms."

Second, only 26 degrees of freedom were available on the weekly captive supply variable. Estimates of the price impacts of captive supplies are based on these 26 weekly observations of captive supply in spite of having 1407 individual pen transactions. Third, the results could be sensitive to the Southwest Kansas marketing region. The market structure, local supply and demand, and other factors unique to the area make it difficult to generalize beyond this region.

Fourth, although detailed data were collected on cash market transactions, we have no knowledge of the cattle characteristics or of the prices received for captive supply cattle. Depending upon the price these cattle received, the net price effect of captive supplies across all cattle slaughtered is indeterminate. In addition, the feedyards surveyed were not a random sample. With the amount of data requested from feedyard managers, the sensitivity of the topic, and the logistics and time necessary to collect individual pen data, only willing feedyards in the region participated in the study.

Finally, the results are estimates of short-run impacts only. Long-run impacts of captive supplies could be markedly different. If in the long run packers can reduce costs significantly through contracting and stabilization of cattle flows through their plants, these savings could be passed on to producers and/or consumers and could, potentially, more than offset any negative impact on short-run cash prices.

Conclusions

Concurrent with increasing beef packer concentration have been changes in fed cattle procurement practices. Whether used to facilitate slaughter scheduling or as a procurement pricing strategy, forward contracting, formula purchase (marketing) agreements, and packer-owned cattle feeding have been popular procurement methods. Captive supplies may affect the short-run competition for fed cattle. This study examined the short-run price impacts of captive cattle supplies in the Southwestern Kansas marketing region during a six-month period in 1990.

Average prices received for cattle were affected by several factors. Cattle purchased late in the week received, on average, a $0.50/cwt weaker basis than early week sales. The number of bids received per pen had a significant price impact with each bid increasing average price by more than $0.10/cwt. This important result has been found in many previous studies and is reconfirmed here. Packers paid modest premiums for feedlots to hold cattle after purchase. During the entire six-months, captive supplies were associated with reduced average transaction prices by an estimated $0.14/cwt to $0.26/cwt. When captive supply levels were high, price was reduced by an average of as much as $0.31/cwt.

Generally, during the study period, the level of captive supplies was not related to price variability in individual pens of cattle, after accounting for quality factors and market conditions. However, during August-September 1990 increased price variability was significant and positively related to captive supplies. Changes in captive supply shipments did not influence the number of bids per pen during the week cattle were sold.

Knowledge of the consequences of captive supplies on fed cattle markets remains imperfect. Further research is needed to increase our understanding of the price impacts of changing fed cattle procurement methods. Captive supplies may have both long-run and short-run impacts. Future work is needed to further identify and test the causes and consequences of captive supplies in both the long run and short run.

References

Barkley, A.P. and T.C. Schroeder. "The Use and Impacts of Forward Contracts in Fed Cattle Markets." Paper presented at the Annual Meetings of the American Agricultural Economics Association, Manhattan, Kansas, August 4-7, 1991.

Center for Rural Affairs. Competition and the Livestock Market. Report of a Task Force Commissioned by the Center for Rural Affairs: Walthill, Nebraska, April 1990.

Connor, J.M. "Empirical Challenges in Analyzing Market Performance in the U.S. Food System." American Journal of Agricultural Economics 72(1990):1219-26.

Cornett, S. "Engler Sees IBP Deal as Opening New Horizons." Drovers Journal, October 6, 1988.

Dhuyvetter, K.C. and S.B. Laudert. Kansas Feedlot Industry: Facts and Figures. Unpublished manuscript, Kansas State University, May 1991.

Elam, E. "Pricing Fed Cattle with a Cash Forward Contract and the Impact on Cash Prices." College of Agricultural Sciences Publication T-1-forthcoming, Texas Tech University, September 1990.

Hayenga, M. and D. O'Brien. "Competition for Fed Cattle in Colorado vs. Other Areas: The Impact of the Decline in Packers and Ascent in Contracting." In proceedings of the NCR Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management, Chicago IL., 1990, pp. 169-178.

Jones, R., T. Schroeder, J. Mintert, and F. Brazle. "Determinants of Cash Fed Cattle Prices: Does Quality Matter?" Kansas State University, Department of Agricultural Economics Staff Paper No. 91-16, January 1991.

Lambert, C. "Beef Packing and Antitrust: A Case Study in Public Policy Education." In Increasing Understanding of Public Problems and Policies-1990. Oak Brook, IL: Farm Foundation. 1990, pp. 129-139.

Lambert, C. "A Producer's Viewpoint." In Symposium Proceedings Structural Change in Meatpacking: Causes and Implications. W.D. Purcell and J.B. Rowsell, editors. Miscellaneous Bulletin 1-89, Research Institute on Livestock Pricing: Blacksburg, Virginia, October 1989.

Marion, B.W., F.E. Geithman, and G. Quail. "Monopsony Power in an Industry in Disequilibrium: Beef Packing, 1971-1986." University of Wisconsin, WP-96, December 1990.

McDonald, J.F. and R.A. Moffitt. "The Use of Tobit Analysis." Review of Economics and Statistics 62(1980):318-21.

Menkhaus, D.J., J.S. St. Clair, and Z. Ahmaddaud. "The Effects of Industry Structure on Price: A Case in the Beef Industry." Western Journal of Agricultural Economics. 6(1981) :147-53.

Purcell, W.D. "Structural Change in the Livestock Sector: Causes, Implications, Continuing Issues." Structural Change in Livestock: Causes, Implications, Alternatives, Wayne D. Purcell, ed. Blacksburg, VA: Research Institute on Livestock Pricing, February 1990a.

Purcell, W.D. "Economics of Consolidation in the Beef Sector: Research Challenges." American Journal of Agricultural Economics. 72(1990b) :1210-18.

Quail, G., B. Marion, F. Geithman, and J. Marquardt. "The Impact of Packer Buyer Concentration on Live Cattle Prices." N.C. Project 117 Working Paper Series WP-89, May 1986.

Schroeter, J. and A. Azzam. "Measuring Market Power in Multi-Product Oligopolies: The U.S. Meat Industry." Applied Economics. 22(1990) :1365-76.

Tobin, J. "Estimation of Relationships for Limited Dependent Variables." Econometrica 26(1958):24-36.

U.S. Department of Agriculture. News Division. Office of Public Affairs. Program Announcement. May 24, 1991.

Ward, C.E. "Structural Change: Implications for Competition and Pricing in the Feeder-Packer Subsector." In Structural Change in Livestock: Causes, Implications, Alternatives. Wayne Purcell, editor. Research Institute on Livestock Pricing: Blacksburg, Virginia, February 1990a pp. 59-102.

Ward, C.E. "Fed Cattle Price Discovery Impacts from Structural and Behavioral Changes in Meatpacking." Department of Agricultural Economics, Oklahoma State University, unpublished manuscript journal contribution No. 5890, July 1990b.

Ward, C.E. Meatpacking Competition and Pricing. Blacksburg VA: Research Institute on Livestock Pricing. July 1988.

Ward, C.E. "Short-Period Pricing Models for Fed Cattle and Impacts of Wholesale Carcass Beef and Live Cattle Futures Market Prices." Southern Journal of Agricultural Economics 13(1981):125-132.

Ward, C.E. Slaughter-Cattle Pricing and Procurement Practices of Meatpackers. U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, AIB 432. December 1979.

Ward, C.E. and T.J. Bliss. Forward Contracting of Fed Cattle: Extent, Benefits, Impacts, and Solutions. Research Institute on Livestock Pricing, Research Bulletin 4-89, Blacksburg VA, November 1989.