Appendix B – Summary of Analyses of Captive Supply

Captive supply, its use, and its effects on livestock markets have been a steady topic of academic and government research for many years. This appendix summarizes this research.

Early Academic Studies

Ward and Bliss surveyed 3,700 cattle feedlots in 1989 to estimate the extent of forward contracting.[17] They also asked the feedlot operators to identify the benefits associated with forward contracts. Their survey results indicated that 96 percent of all forward contracting in 1988 was between feedlots and the largest 3 packers identified by Ward and Bliss as IBP, ConAgra, and Excel. Almost 67 percent of all forward contracting was by cattle feedlots that marketed 20,000 or more head of cattle per year. Ninety percent of forward contracting in 1988 occurred in the states of Nebraska, Colorado, Kansas, Oklahoma, and Texas. Nearly two-thirds of all contracting was found in just two states: Texas and Kansas. The survey also indicated that 12.7 percent of fed cattle in the major cattle feeding states were procured using forward contracts.

According to Ward and Bliss, the surveyed feedlot operators indicated that the primary benefits of forward contracting were improved financing and securing a known buyer. The feedlot operators indicated that they believed the primary benefits to packers were guaranteed supplies of cattle for slaughter and increased control over the timing of deliveries of cattle for slaughter.

Schroeder, Mintert, Barkley and Jones (1992) examined the short-run price impacts of captive supply on prices for fed cattle.[18] They collected data from 1,407 pens of cattle representing 166,338 head sold by 13 feedlots in selected counties in southwest Kansas from May 21, 1990 through November 24, 1990. For each pen of cattle sold, a record was made of price bids, feedlot and animal characteristics, transaction cost factors, wholesale market conditions, and the forward contracted deliveries of all cattle in the week the pen was sold. The number of contract cattle shipped for slaughter each week was collected from AMS's Dodge City, Kansas office. The percentage of cattle slaughter represented by contract cattle from May through November 1990 ranged from a low of 2 percent of weekly slaughter in August to a high of 15 percent in July.

Statistical results from the Schroeder, Mintert, Barkley and Jones (1992) study indicated a negative statistical relationship between fed cattle prices and captive supplies. Over the

[17] Ward, C. and T. Bliss. *Forward Contracting of Fed Cattle: Extent, Benefits, Impacts and Solutions.* Blacksburg, VA: Virginia Tech University, Research Institute on Livestock Pricing, Research Bulletin 4-89, November 1989.

[18] Schroeder, T., J. Mintert, A.P. Barkley, and R. Jones. "Implications of Captive Supply in the Fed Cattle Industry." *Pricing and Coordination in Consolidated Livestock Markets: Captive Supply, Market Power, and IRS Hedging Policy.* Wayne Purcell, ed. Blacksburg, VA: Virginia Tech University, Research Institute on Livestock Pricing. April 1992.

six-month period, contract deliveries were associated with decreased fed cattle prices in the surveyed feedlots of $0.15 to $0.31 per cwt.[19]

Elam conducted another early study of the market effects of captive supply,[20] looking at two possible implications of captive supply. In the first part of a two-part study, he compared forward contracted cattle sales in six Texas feedlots with hedged fed cattle from May 1987 to September 1989. His results indicated that contract prices were $0.28 to $0.59 per cwt lower than hedged prices for steers and $0.86 to $1.64 per cwt lower for heifers. Elam concluded cattle feeders were giving up a portion of the basis price to packers when they sold cattle through forward contracts, with the difference representing a risk transfer premium from cattle feeders to packers. Specifically, Elam's conclusion suggests that to the extent the packer assumes the feeder's price risk under a forward contract, the feeder receives a lower price for cattle.

Elam also examined the aggregate effect that deliveries of captive supply cattle had on fed cattle prices in the U.S. and in the states of Texas, Kansas, Colorado, and Nebraska. Using time series regression analysis, Elam found a negative statistical relationship between captive supplies and monthly average fed cattle prices over the period from October 1988 to May 1991. For each 10,000 cattle delivered under captive supply arrangements, U.S. fed-cattle prices were lower by $0.03 to $0.09 per cwt. Results for individual states varied from no price difference to lower prices ranging from $0.15 to $0.37 per cwt.

Hayenga and O'Brien (1992) examined the effect deliveries of captive supplies had on weekly average fed cattle prices and price variability in the major cattle feeding states during the 15-month period from October 1988 to December 1989.[21] They found no conclusive evidence that forward contracting diminished fed cattle prices over the period. They also found no conclusive evidence that forward contracting adversely affected the variability of fed cattle prices.

Schroeder, Jones, Mintert and Barkley (1993) expanded on their 1992 analysis examining the short-run impacts of forward contracted cattle. Using data from the same feedlots in southwest Kansas during the same six-month period in 1990,[22] they found that average cattle prices were affected by many factors, but that when forward contract shipment levels are high, changes in forward contract shipments had a larger impact on prices than when shipments are low, and that price variability increased under these conditions.

---

[19] cwt = 100 pounds. For a 1,200 pound steer, $0.15 per cwt equals $1.80 (15 cents times 12). In a $70 per cwt. cattle market, the steer would sell for $840.

[20] Elam, E. "Cash Forward Contracting vs. Hedging of Fed Cattle, and the Impact of Cash Contracting on Cash Prices." *Journal of Agricultural and Resource Economics* 17(1992): 205-217.

[21] Hayenga, M. and D. O'Brien. "Packer Competition, Forward Contracting Price Impacts, and the Relevant Market for Fed Cattle." *Pricing and Coordination in Consolidated Livestock Markets: Captive Supply, Market Power, and IRS Hedging Policy.* Wayne D. Purcell, ed. Blacksburg, VA: Virginia Tech University, Research Institute on Livestock Pricing. April 1992.

[22] Schroeder, T. and R. Jones, J. Mintert and A. Barkley. "The Impact of Forward Contracting on Fed Cattle Transaction Prices." *Review of Agricultural Economics* 15 (May 1993): 325-37.

USDA Sponsored Concentration Study

In 1992, GIPSA commissioned university researchers and researchers from ERS to conduct seven in-depth studies as part of a comprehensive investigation of concentration in the meatpacking industry. The studies examined whether large firms possess and use market power, and if efficiency gains from large-scale production exist to offset adverse market power effects of concentration.

University researchers conducted six of the studies, and the seventh was conducted by ERS. Four of the seven studies focused on cattle: "Definition of Cattle Procurement Markets," "Price Determination in Slaughter Cattle Procurement," "Role of Captive Supply in Beef Packing," and "Effects of Concentration on Prices Paid for Cattle." The results of the seven studies were summarized in GIPSA's February, 1996 report, *Concentration in the Red Meat Packing Industry*.

Overall, the report depicted a complex and dynamic meat packing industry. Information appeared to flow rapidly and freely among regions, encouraging a national cattle market in which forces of supply and demand largely determined behavior of market participants. Product movement did not appear to be inhibited. The relatively low cost of transporting cattle over long distances diminished the ability to manipulate prices in isolated regional markets. A variety of pricing methods and procurement methods were available and used, and they appeared to be associated with changing market conditions.

A study of the role of captive supply was conducted by Oklahoma State University's Clement Ward and Stephen Koontz and Kansas State University's Ted Schroeder and Andrew Barkley. GIPSA asked them to determine the extent to which various captive supply arrangements are used, and to determine relationships between captive supply and the structure, conduct, and performance of slaughter cattle markets. Of particular interest to GIPSA was the effect that captive supplies have on prices paid for cattle.

The researchers used data from 28 plants slaughtering 75,000 or more steers and heifers annually. The plants were owned by 9 firms. Together, the 28 plants accounted for 82 percent of the 1993 federally inspected steer and heifer slaughter. GIPSA provided the researchers with data from the plants on each transaction of 35 head or more slaughtered from April 5, 1992 to April 3, 1993, and supplemented them with data from AMS and the Chicago Mercantile Exchange.

The researchers surveyed the 25 largest beef packing firms and the 25 largest cattle feeding firms. Fifteen of the 25 feeding firms and six of the 25 packing firms responded to the voluntary survey. Survey responses supported the industry perception that use of captive supplies is generally higher in the late spring and early summer months than at other times of the year. Respondents to the survey identified three impacts from the use of captive supply: (1) captive supply benefits packers who use it; (2) captive supply ensures a given supply of cattle to packers; and (3) captive supply reduces market information since fewer prices are publicly reported. Feeders and packers agreed that

current spot market prices were most important in setting the delivery date of captive supply cattle. Cattle feeders additionally believed that captive supply arrangements benefit feeders who use them but benefit packers more, and that the use of captive supply arrangements result in lower spot market prices.

According to data used in the study, nationwide, about 300 large feedlots (those selling more than 16,000 head in a year) accounted for 82 percent of all marketing agreement transactions, 89 percent of all packer fed transactions, and 56 percent of forward contracts during the period April 1992 to April 1993. Those large feedlots handled 42 percent of all transactions and 57 percent of all cattle in all transactions.

By contrast, over 17,000 small sellers (those selling less than 1,000 head per year) accounted for 22 percent of all transactions and 13 percent of all cattle sold in all transactions. A large majority (88 percent) of small sellers were much more likely to use spot markets. Small sellers accounted for only 1.6 percent of packer fed transactions, 2.6 percent of marketing agreements, and 15.2 percent of forward contracts.

Ward, Koontz, Schroeder and Barkley divided the captive supply project into two studies. The first, conducted by Andrew Barkley and Ted Schroeder, examined the long-run impacts of captive supply. The second study, conducted by Clement Ward, Stephen Koontz, and Ted Schroeder, examined the short-run impacts of using captive supply arrangements on spot market prices.

The overall objective of the study of short-run impacts of captive supply was to quantify the relationships between using captive supply arrangements and spot market prices for fed cattle by estimating:

- the interdependence between deliveries of captive supply fed cattle and spot market prices for fed cattle;

- the relationship between inventories of captive supply fed cattle and spot market prices for fed cattle; and

- price differences between fed cattle purchased on the spot market and those purchased by captive supply methods.

Three models were developed to measure the short-run effects of captive supply on spot market prices. Model 1 focused on the effects deliveries of captive supply purchases had on spot market prices. Model 2 focused on the effects an inventory of captive supply purchases had on spot market prices, and Model 3 focused on differences between prices paid by packers for fed cattle purchased under captive supply arrangements versus prices paid for fed cattle purchased on the spot market.

In Model 1, Ward, Koontz and Schroeder found evidence that packers decide whether to take delivery of forward contracted and marketing agreement cattle at the same time they

decide whether to purchase spot market cattle. There was no similar relationship found for packer fed cattle. The research suggests that the reasons packers feed cattle are different than the reasons they use contracts and marketing agreements. Packer feeding may be motivated more by cattle feeding profit opportunities and by maintaining a steady flow of cattle to the plant than by its potential influence on spot market prices.

Model 2 yielded mixed results regarding the relationship between inventory of captive supply and spot market prices for fed cattle. For the total inventory of captive supply cattle, the relationship was consistently negative for the entire period examined. However, the impact was small and not economically significant. A 1,000-head increase in the total inventory of captive supply cattle was associated with a $0.01 per cwt or smaller decrease in spot market prices. When estimating the impacts of different captive supply methods, results were mixed. The inventory of forward contracted cattle was associated with a generally positive effect on spot market prices. For packer fed cattle, the inventory-price relationship was mixed negative and positive. The relationship for marketing agreement cattle was consistently negative.

Model 3 showed significant price differences among procurement methods. Forward contract prices were $3.02 to $3.16 per cwt lower than spot market prices for fed cattle. Prices for packer fed cattle were not significantly different than prices for spot market cattle. Prices for cattle purchased through marketing agreements were $0.07 to $0.10 per cwt higher than prices for cattle purchased on the spot market. These results suggest cattle feeders pay a risk premium to packers for forward contracting cattle, and higher marketing agreement prices suggest that packers pay a premium for the higher quality or quantity of fed cattle they purchase through marketing agreements.

Barkley and Schroeder attempted to examine the long-run relationships between captive supply and spot market prices for fed cattle. Data limitations precluded Barkley and Schroeder from estimating long-run supply and demand functions for contracted cattle, but they were successful in characterizing several determinants of captive supply use.

They used monthly packer transactions data provided by GIPSA at the firm and plant levels during 1989- 1993, from 31 plants representing 12 firms. The 31 plants accounted for 87 percent of the 1993 federally inspected steer and heifer slaughter. A slight downward trend in total captive supply use was observed from 1989 to 1993, but captive supply levels fluctuated annually. Forward contracted and marketing agreement cattle accounted for 75 percent of total captive supply, or an average of 9,100 head slaughtered per plant per month. Slightly less than 3,000 head of packer fed cattle were slaughtered each month.

Packer feeding remained fairly constant as a percentage of slaughter over the period, averaging just over 6 percent. Forward contracted and marketing agreement cattle decreased from 18 percent of annual slaughter in 1989 to 15.5 percent in 1993. Use of packer feeding was relatively constant during the period, whereas use of forward contracting and marketing agreements was more variable, increasing in April, June, and December. The April and December peaks in forward contracted and marketing

agreement cattle as a percentage of slaughter resulted in part from decreases in total slaughter levels during those months.

Barkley and Schroeder found that forward contracting, marketing agreements, and packer feeding vary greatly among plants. Use of captive supply was higher for larger plants than for smaller plants. Larger plants' average monthly captive supply purchases were nearly three times higher than small plants' (17,872 and 5,818 head per month, respectively, across all plants). Larger plants also had higher plant utilization than smaller plants.

Their findings suggest that large plants use captive supply strategically. Captive supply usage by larger plants increased as cash prices increased. This relationship between captive supply and cash prices did not hold for smaller plants. Captive supply usage increased as cash price variability increased, and more so for larger plants than smaller plants. They found larger plants used captive supply to increase plant utilization and to mitigate rising or more variable prices. Total cattle availability over the period of study did not affect captive supply levels.

Barkley and Schroeder's study of the determinants of captive supply had seven major findings:

- There is a huge variability of contracting and packer-feeding across plants, which does not appear to be systematically related to firms, plant locations, or regions.

- Spot market prices play a major role in determining the use of captive supplies among the 16 largest plants, but do not influence the use of captive supply by the 15 smaller plants.

- Spot market price variability is positively associated with the level of contract cattle for the 16 largest plants, but is not a factor in packers' use of packer fed cattle or packers' total use of captive supply.

- Plant utilization is an important determinant of captive supply for both large and small cattle packing plants, with a larger impact on small plants, reflecting high costs of slaughter levels below full capacity.

- Information on cattle availability, as measured by total U.S. slaughter from 1 year prior to slaughter, does not appear to be a consistently important determinant of captive supply.

- Contracted cattle and packer fed cattle appear to be substitute methods of meeting slaughter capacity for packers, particularly for the 16 largest plants.

- The level of captive supply is higher among small plants and large plants. Average-sized plants use captive supply to a smaller degree.

USDA Advisory Committee on Agricultural Concentration

On February 14, 1996, former Secretary of Agriculture Dan Glickman announced the formation of the USDA Advisory Committee on Agricultural Concentration. The Advisory Committee was charged with investigating concentration in virtually any segment of the agricultural economy where it might be evident. Among its many duties and responsibilities, the Committee was tasked with reviewing studies concerning captive supply arrangements and their market impacts, and making findings and recommendations based on its review. The Committee released its findings and recommendations on June 6, 1996 in *Concentration in Agriculture: A Report of the USDA Advisory Committee on Agricultural Concentration*.

The Committee reviewed existing scientific studies and reports from academicians and government agencies, including GIPSA's *Concentration in the Red Meat Packing Industry*. The Committee also studied reports of analyses commissioned by GIPSA concerning concentration in the red meat industry. The Committee encouraged and received input and advice from trade associations and other industry experts, and heard the concerns and advice of over 70 individuals and organizations, representing producers, processors, wholesalers, rural communities – their families and businesses – environmental groups, and animal rights groups in a series of public hearings. In addition, hundreds of pages of written testimony and correspondence were submitted to the Committee. The Committee also considered the current interpretation and application of antitrust policy.

The Committee reviewed evidence from government studies, academic studies, trade associations, and basic data. The Committee found that growing concentration in agricultural industries has not been accompanied by overt or obvious market power and the extraction of monopoly or monopsony profits; however, the potential and opportunity for extracting these profits has increased.

Among its many findings from all sources of evidence, the Committee found:

- Sharp declines in cattle prices in the period leading up to the Committee's formation were attributable to supply and demand conditions, but there is a growing sense in some parts of the producer community that these price declines extend beyond those attributable solely to ordinary market forces of supply and demand.

- Packers sometimes offer an above-market price on the condition that the higher price is not reported. This action is a price manipulation because it affects prices offered to other sellers. However, it is very difficult to verify this practice and its frequency.

- Some producers have a real and significant distrust of current procurement methods and believe that packer concentration is excessive and that this concentration has been used to depress cattle prices.

- The level of concentration is historically high and growing higher in meat packing. The merger movement of the past decade has contributed to the increasing concentration throughout the agricultural economy. This concentration increases the opportunity to both use and abuse market power.

- It is widely agreed that accurate market information available to all producers improves the price discovery and determination process. Poor information can lead to unnecessary price volatility or slow adjustment to changing supply and demand conditions. Inadequate information can cause some market players to be disadvantaged relative to others.

- GIPSA's *Concentration in the Red Meat Packing Industry* study does not provide an adequate basis for determining if smaller volume sellers receive lower prices than large volume sellers, because it was designed to assess the general state of competition in the market and not the extent of price discrimination. What price discrimination may exist, according to the study, is likely limited, and the study's collected price data were narrowly distributed around the average. It is possible that some sellers are receiving prices that are below those received by better-informed sellers.

- Captive supply and other forms of vertical integration and coordination at levels in which they occur – in some regions and at some times of the year – are potentially detrimental to both competition and price discovery. Captive supply arrangements tend to thin market reporting (reduce the volumes on which reported prices are based) and shorten the weekly marketing window, which can disadvantage suppliers who do not have a packer arrangement and distort reported market prices downward.

The Committee endorsed and recommended a policy to support and improve market information as a vital component of a competitive marketplace. One of the Committee's specific recommendations was that packers be required to report the following: numbers of cattle purchased in the spot market on a daily basis; all captive supply committed for delivery at the start of each week; numbers of forward contracted cattle in all future months; Canadian or Mexican cattle committed for delivery at the start of each week; numbers and prices of cattle slaughtered on a daily basis; and beef exports on a weekly basis.

Most diverging opinions dealt with the appropriate measures to implement the policies recommended. Where some committee members felt strongly about particular measures or approaches to implementing the recommended policies, their views were contained in the report's "Minority Views."

There were three minority views, two with findings concerning captive supply. According to the first minority report, USDA's study of concentration in the red meat packing industry and GIPSA's attitudes to enforcement in general are overly focused on general macroeconomic factors, such as average pricing. To be effective, GIPSA enforcement must be aimed more at specific company practices.

The first minority report argued that the use of captive supply engenders fear and distrust of market fairness and endangers competitive operation of livestock markets.[23] It also argued that "the use of factors within the control of packers as a base price for purchase of captive supply is a violation of section 202 of the Packers and Stockyards Act." Its recommendations on captive supply were:

- Packer feeding of livestock should be eliminated except where the owners of the livestock own the packing facility in a cooperative arrangement. If packer feeding is allowed, the livestock must be offered for sale on an open-market basis, and the price at which these livestock move into the market should be reported separately.

- Packers and principals in packing operations should be barred from custom-feeding livestock for others.

- Packers should be prohibited from futures market trading except for economically justifiable hedging activities.

- Formula contracts as they are presently constituted should be banned.

- Value-based pricing must be based upon readily verifiable market factors outside the control of the packer/buyer and must be made uniformly available within the limits of the packer's purchasing needs.

According to the second minority report, concentration in the meat packing industry has very little impact on producers and consumers, or other market participants. Further, captive supplies have very little or no impact on spot market prices.

The third minority report criticized the Committee for not adequately addressing concentration in the domestic lamb market.

Recent Academic Studies

Schroeder, Ward, Mintert, and Peel (1997) used interviews with cattle feedlots and packers and previous research to investigate why consumer demand for beef has declined. [24] Included in their investigation were questions concerning why packers and feedlots participate in captive supply arrangements, particularly exclusive marketing agreements and alliances.

The interviews revealed several incentives for forming or participating in exclusive marketing agreements, and that "(n)early all relate to moving toward value based pricing; improving price signals between stages in the vertical production, processing, and

[23] The first minority report defined captive supply as "packer-owned, formula, futures, and custom-fed cattle."
[24] Schroeder, T., and C. Ward, J. Mintert and D. Peel. *Value-Based Pricing of Fed Cattle: Challenges and Research Agenda*. Unpublished paper. March 18, 1997.

distribution channel; overcoming problems associated with and related to pricing on averages; and reducing the adversarial relationship between feeders and packer" (Schroeder, Ward, Mintert, and Peel, pp. 7, 8).

Most marketing agreements involve a pricing formula that consists of a base price with premiums and discounts for carcasses above and below some base quality characteristics. The researchers reported that how these base prices and quality premiums and discounts are established impacts price discovery in fed cattle markets.

Schroeder, Mintert, Barkley and Jones's interviews indicated that there were several base prices used. One was based on the average price of fed cattle purchased by the plant where the marketing agreement cattle were slaughtered. A second base price was tied to a reported price for the live cattle futures market price. Others were based on specific market reports, such as the highest reported price for a specific market. In some cases, the base price was negotiated, although typically it was not. Some base prices were defined on a carcass weight basis, others on a live weight basis.[25] Some respondents expressed the belief that the base prices need to be tied to boxed beef prices if the animal's realizable beef value is to be accurately captured in the live price.

A study by Parcell, Schroeder and Dhuyvetter (1997) built on previous studies of the impact captive supply have on fed cattle prices by focusing on live cattle basis,[26] the difference between a local cash price and live cattle futures price. Both producers and packers require accurate basis predictions to determine expected prices and make sound pricing, hedging, and forward contracting decisions.

Parcell, Schroeder and Dhuyvetter found that a one percent increase in captive supply shipments was associated with a $0.02/cwt and $0.03/cwt reduction in basis in Colorado and Texas. Parcell, Schroeder and Dhuyvetter did not find a statistically significant impact for Kansas or Nebraska. According to the authors, the $0.02/cwt to $0.03/cwt decrease in basis in Colorado and Texas is minimal in the cattle producers' formulation of price expectations, with other factors such as corn futures prices and live cattle futures prices playing more important roles.

Lyford, Hicks, Ward, Trapp and Peel used the Fed Cattle Market Simulator developed by Oklahoma State University to examine the effects that contracting has on the spot market price for fed cattle in the laboratory.[27] They found that "contracting substantially changes pricing dynamics and price formation related to supply conditions even at a modest contracting level of 25%" (p. 12). Contracting appeared to have a substantial impact on spot market price variability. The experimental market showed that, in the presence of contracting, spot market prices experience lower week-to-week volatility followed by

[25] Although priced on a live weight basis, they were based on yields of the cattle slaughtered.
[26] Parcell, J., T. Schroeder and K. Dhuyvetter. *The Effect of Captive Supply Cattle on a Live Cattle Basis.* Presented at 1997 Western Agricultural Economics Association Meetings, Reno, NV.
[27] Lyford, C., R. Hicks, C. Ward, J. Trapp and D. Peel. *The Effect of Contracting on Pricing Dynamics in the Fed Cattle Market: An Experimental Simulation Approach*. Paper presented at the American Agricultural Economics Association Meetings, Chicago, Illinois, August 5-8, 2001.

significantly large price changes when contracts exist. That was especially true as contracting levels increased.

Lyford, Hicks, Ward, Trapp and Peel's study suggests that the response of spot market price to changes in fed cattle supply with contracting depends on the level of fed cattle supply with contracting. Lyford, Hicks, Ward, Trapp and Peel's research suggests that earlier empirical studies that showed negative or mixed relationships of contracting with spot market prices may be the result of market supply conditions that existed at the time of the studies. Their research underscores the need to account for overall supply and demand conditions in analyses of captive supply's impact on spot market prices.

GIPSA Investigation of Fed Cattle Procurement in the Texas Panhandle

As part of its investigation of fed cattle procurement in the Texas Panhandle, GIPSA entered into a cooperative agreement with John R. Schroeter of Iowa State University and Azzedine Azzam of the University of Nebraska to examine the relationships between captive supply and spot market prices. The results of their study, *Econometric Analysis of Fed Cattle Procurement in the Texas Panhandle*, were published in November 1999.

Schroeter and Azzam used GIPSA data from February 5, 1995 through May 12, 1996 for four large beef packing plants located in the Texas Panhandle. The primary data set included information on every lot of cattle over 35 head purchased by the four plants during the period. Supplementary data included regional average steer and heifer prices, boxed beef cutoff values, Chicago Mercantile Exchange live cattle futures prices, and other variables.

Schroeter and Azzam addressed the following questions: (1) Who is responsible for deciding how many cattle procured by non-spot means will be delivered to a packing plant within any given week; and how far in advance of delivery is that determination made? (2) What is the empirical relationship, in the short run, between the use of non-cash supply sources and spot market prices? (3) What economic mechanisms could be behind the empirical relationship? (4) Does the nature of the base price in the formula used to price marketing agreement cattle influence a packer's spot market pricing conduct?

They found:

- The feedlot determines the number of cattle it will deliver to a plant under a given marketing agreement and within a given week. The feedlot normally determines the number of marketing agreement cattle to be delivered within any given week two weeks in advance of delivery. Once the feedlot sets the volume of marketing agreement deliveries for a given week, the packer chooses the specific day or days of the week on which delivery will be made.

- There is a negative statistical relationship between weekly non-spot procurement methods (captive supply) and the weekly average spot market price.

- In deciding when to deliver the cattle, rational, profit-maximizing feedlots chose to deliver marketing agreement cattle in that week which promised the highest expected spot market price because the marketing agreement cattle brought a price based on the spot market price. Because marketing agreement cattle delivered in two weeks bring a price based on the spot market price paid for cattle next week, one would expect to see a positive statistical relationship between captive supply delivered in two weeks and the expected spot market price for the next week. Similarly, one would expect to see a negative statistical relationship between captive supply delivered in two weeks and the current forecast of spot market price in two weeks. The observed statistical relationship between spot market prices and cash supply deliveries arises because expected prices are positively correlated with actual market prices. Under this scenario, deliveries of captive supply in a week do not cause spot prices during that week to be low. Rather, the expectation of low spot prices in two weeks time, which usually come to pass, leads feedlots to sell more cattle a week early and deliver them the following week later. This mechanism does not support the argument that increases in captive supply deliveries cause average spot market price decreases.

- Econometric results do not support the hypothesis that packers try to manipulate formula base prices through their pricing strategies in spot market purchases. When Schroeter and Azzam compared marketing agreement deliveries with a price based on plant-average hot cost to those with a price based on the USDA-reported price, they found no systematic difference in the relationship between the volume of market-agreement deliveries one week and spot market prices paid the previous week.

The researchers recommended "that the agency should not rely on the statistical finding of a negative correlation between the use of non-cash procurement methods and spot market prices as evidence of intent by packers to depress cattle prices through the use of non-cash procurement, or as evidence of the unintentional consequence of lower prices as a result of the use of non-cash methods" (pp. 9,10).

USDA Forum on Captive Supply in the Livestock Industry

USDA sponsored a forum on captive supply in the livestock industry in Denver, Colorado, on September 21, 2000 (the forum). At the forum, producers and others expressed concerns about captive supply:

- Captive supply arrangements may cause a lack of or reduced spot market information because they are private negotiations between packers and participating cattle feeders. With no mechanism for reporting captive supply prices or other conditions of trade, producers may not have enough information to make sound business decisions.

- Because contracts with formula pricing typically have base prices derived from spot market prices, captive supply may create an incentive for packers to lower spot

market prices. If packers use captive supply to push down spot market prices, then packers may pay less and producer revenues could fall.

- Captive supply arrangements may lower spot market prices if packers bid less aggressively for cattle in the spot market because they have large percentages of slaughter secured by captive supply.

- If spot market prices were to be lowered because large percentages of slaughter are secured by captive supply, then packers could be contributing to increased spot market price variability.

- Captive supply may result in thin or closed markets because the volume of cattle traded in the spot market falls when packers have large percentages of slaughter secured by captive supply.

- If spot markets thin or close, some cattle producers may be forced to enter contracts with packers or go out of business.

- Captive supply may restrict competition among packers. Large packers may use captive supply arrangements to block smaller packers from obtaining cattle. As a result, smaller packers may go out of business, further increasing concentration of an industry already highly concentrated.

- Over time, reported spot market prices could become less representative of market conditions as they account for a declining share of the overall market.

- Cattle sold under captive supply arrangements might receive higher prices than cattle of the same quality purchased on the spot market.

Known Effects of Captive Supply on Markets

Spot Market Price

Econometric studies of captive supply have shown a negative statistical relationship between levels of captive supply and spot market prices paid by packers for fed cattle; increases in the level of captive supply tend to be associated with reductions in spot prices. However, the studies have not shown that increases in the use of captive supply cause spot market prices to fall, or that packers' use of captive supply causes spot market prices to change.

Econometric studies have shown that the relationship between the use of captive supply and spot market prices for cattle differs according to the type of captive supply arrangement. For example, Ward, Koontz and Schroeder found the inventory of forward contracted cattle had a positive statistical relationship with spot market prices (increases in the number of forward contracted cattle are associated with increases in spot market prices); however, the relationship between the inventory of marketing agreement cattle

and spot market prices was negative. For packer fed cattle, the inventory-price relationship was mixed negative and positive.

In addition, the available research does not support the perception that packers decide the weekly levels and timing of captive supply deliveries. In their study of four large beef packing plants located in the Texas Panhandle, Schroeter and Azzam found that under a marketing agreement, the feedlot chooses which week to deliver the cattle and how many cattle to deliver. After the feedlot chooses the delivery week and quantity, the packer chooses the specific day or days of the week for delivery.

Captive Supply Prices

Prices for cattle purchased using different procurement methods vary according to the particular procurement method. Econometric studies of captive supply arrangements show spot market prices for fed cattle tend to be higher than forward contracted prices, but are not significantly different than prices for packer fed cattle. These studies also show spot market prices for fed cattle tend to be less than prices for marketing agreement cattle. Some researchers have interpreted these results to suggest that cattle feeders pay a risk premium to packers for forward contracted cattle and packers pay a premium to producers for some assurance of higher quality or quantity of fed cattle purchased through marketing agreements. Other researchers interpret these findings as evidence of price discrimination.

Unresolved Questions About Effects of Captive Supply on Markets

Causality

The cause-and-effect relationship between the use of captive supply arrangements and prices paid for cattle is not known. A negative statistical relationship between the use of captive supply and the spot market price of fed cattle has been identified in several studies, but researchers have not concluded that an increase in captive supply causes a decrease in spot market prices. Some researchers believe a more complete behavioral model is needed to test for causal effects.

Market Access Implications

Issues relating to the market access implications of captive supply have not been well documented. No study has shown that substantial numbers of producers have been precluded from selling cattle because others have captive supply arrangements or that marketing opportunities for producers have been enhanced by packers' captive supply arrangements. Studies have identified some of the features that make captive supply arrangements attractive for producers and packers, but have not shown how specific

management practices or production technologies at a feedlot factor into a producer's or packer's decision to establish a captive supply arrangement. In addition, studies have not shown how specific packer practices, contractual issues, or price settlement mechanisms factor into decisions to enter into captive supply arrangements.

Long-run Implications of Captive Supply on the Marketplace

Most studies of the impacts of captive supply have focused on short-term implications. In general, analysis of long-run implications of captive supply has been hampered by lack of detailed data over long periods of time. A comprehensive analysis of the long-run effects of captive supply would look at its effects over a complete cattle cycle or several cycles.[28] With cattle cycles lasting an average of 7-11 years, a long-term analysis of this type would require several decades of information. Many of the captive supply procurement methods common today were not in common use in previous cattle cycles. Therefore, this type of study could not be done with data for previous cattle cycles. In addition, with the rate of change in the development of new procurement methods, both the types of captive supply arrangements and their importance relative to total procurement will continue to change. Whether studying the long-run effects of captive supply over a cattle cycle or another long time period, the data required to analyze captive supply's implications for price in the long run are, in effect, changing and moving targets. Hence, there are few quantitative findings regarding long-run implications of the use of captive supply.

Market Information

With voluntary price reporting prior to April 2001, the use of captive supply was linked to a reduced amount of market information because fewer prices were publicly reported. Less market information can inhibit efficient price discovery and determination. Poor information may lead to unnecessary price volatility or slow adjustment to changing supply and demand conditions. Currently, under mandatory price reporting, information for all types of purchases is reported to AMS. Nonetheless, questions remain about the amount of information reported about captive supply and the commensurate effects on the market.

[28] Livestock production historically follows a pattern of decreasing production followed by a period of increasing production. The period of time from a production trough to the next production trough is known as a "cycle."