Analysis of the Cattle Price Discovery and Transparency Act of 2021

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Executive Summary

Alternative Marketing Arrangements (AMAs or formula pricing) have become the dominant means of trading fed cattle. AMAs reduce transactions costs and provide risk management advantages on both sides of the market. Still, the proliferation of AMAs and consequent thinning of cash negotiated trade has raised significant concerns among market participants. These concerns relate primarily to the potential exercise of market power to reduce fed cattle prices and/or inflate marketing margins and to the quality of price discovery in the relatively thin negotiated cash market.

Fed cattle market data from the last decade give no indication of a positive causal relationship between negotiated trade volumes and fed cattle prices (Figure 2 in the full report). From 2002 to 2015, negotiated sales decreased steadily, and this decline coincided with a substantial increase in prices. In fact, record cattle prices in 2014-2015 correspond to the period of lowest negotiated sales. More recently, from 2020 to 2021, fed cattle prices increased 11.7%, while negotiated sales decreased 16.1%. Statistical analysis into the relationship between negotiated fed cattle trade and both price levels and marketing margins supports the conclusions of the informal visual appraisal of the data (and with previous literature): there is no statistically significant relationship between negotiated cash trade volume and either fed cattle prices or beef marketing margins. In short, our results suggest AMAs do not allow beef packers to increase beef margins and lower cattle prices.

With respect to price discovery, recent analysis by Anderson, McKenzie, and Mitchell (2021) found that price discovery appears to be functioning effectively in even the thinnest regional fed cattle markets. This is consistent with previous research covering a variety of commodity markets. If transactions are reasonably representative of the overall market, even a relatively small handful of transactions can effectively discover prices.

AMAs result in substantial transactions cost savings in the fed cattle market (Koontz, 2020). To the extent that the Cattle Price Discovery and Transparency Act (CPDTA) reduces the use of AMAs compared to the status quo, it will also raise costs in the sector. Plant level impacts of the CPDTA may be quite large and will probably actually be greatest in regions where negotiated cash trade is currently highest because plants in these regions could have to adjust the most to comply with the terms of the bill.

Quantitative and qualitative results suggest that the CPDTA may decrease Arkansas cattle prices, reduce incentives to improve cattle quality in Arkansas, and shrink the size of the Arkansas cattle industry. Impacts are difficult assess with any precision since the bill does not clearly establish transaction volumes. Results from the literature and our own analysis show that even small increases in negotiated trade volumes through mandates could reduce Arkansas cattle value by $4 million to $6 million per year.

Benefits of reduced AMA use (alternatively, higher negotiated cash trade) are generally speculative. As noted, evidence that higher negotiated trade will positively impact prices, reduce marketing margins, or improve price discovery is lacking. However, many market participants clearly see negotiated cash trade as a good in and of itself. To the extent the industry desires greater cash market engagement, lower-cost means of achieving this outcome are available. A market maker program would incentivize negotiated cash sales through means of an assessment on AMA cattle. Such a program (or similar incentive strategies) would leave marketing decisions to cattle owners, offering a means of increasing negotiated cash sales that would likely be far less costly and less disruptive to the market than a mandate.

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Among all the food and agricultural supply chains in the United States, the beef supply chain faced the biggest economic disruptions from COVID-19. Packing plant closures, labor shortages, and supply chain logistics were all challenges that the beef industry had to contend with during the early stages of the pandemic. There were also significant consumer demand impacts from consumer panic buying, local pandemic restrictions, and restaurant and bar closures (Anderson, Mitchell, and Maples, 2021). Several of these supply chain issues persist today. Add packing plant fires, cyber-attacks, Winter Storm Uri, and severe drought, and it is easy to see why the past few years have been especially challenging for cattle producers.

Against the backdrop of COVID-19, there are increasing calls for legislative action. Many in the beef cattle industry feel the system is broken. One notable policy is the Cattle Price Discovery and Transparency Act of 2021 (CPDTA). CPDTA would establish regional mandatory minimum thresholds of negotiated cash and negotiated grid trades for the five regional fed cattle markets. By establishing these minimum thresholds, the bill aims to limit the use of formula pricing, or alternative marketing arrangements (AMAs), which have come to dominate the fed cattle market in recent years. This would represent a significant intervention in this important sector of the economy. It is important to understand, to the fullest extent possible, the potential costs and benefits of this intervention. That is the purpose of this analysis.

Evolution of Fed Cattle Pricing and the Role of Alternative Marketing Arrangements

Fed cattle pricing practices have evolved substantially over the past three decades. Until the 1990s, virtually all fed cattle were traded through negotiated transactions. This mostly consisted of direct negotiation between buyers (packing plants) and sellers (feedlots), though some fed cattle, mostly in the Corn Belt, were sold through livestock auctions. In the 1990s, the use of standing contractual arrangements between feedlots and packers became a common means of trading fed cattle. These arrangements typically involved the use of a mutually-agreed upon formula for establishing the sales price on cattle exchanged under terms of the agreement in any given week. They were thus commonly referred to as formula pricing arrangements. Now generally referred to as alternative marketing arrangements (AMAs), these standing agreements between feeders and packers have become the dominant means of trading fed cattle. Figure 1 shows fed cattle transactions by transaction type nationally (i.e., aggregating across USDA's five major reporting regions) over the past twenty years.[1]

As Figure 1 shows, negotiated transactions across the five regions fell steadily for about a decade between around 2005 and 2015. Since that time, the balance between negotiated and AMA transactions in the market has been relatively stable. In 2021 across the five major feeding areas defined by USDA Agricultural Marketing Service (AMS) for reporting purposes, AMAs accounted for approximately 60% of fed cattle transactions between feeders and packers; negotiated sales accounted for about 30% of transactions, and forward contracts (e.g., fixed price or basis contracts) account for about 10% of transactions.[2]

[1] The five market reporting areas defined by USDA Agricultural Marketing Service are Texas, Oklahoma, and New Mexico (TX/OK/NM); Kansas (KS); Nebraska (NE); Colorado (CO); and Iowa/Minnesota (IA/MN).

[2] These percentages do not include the relatively small number of packer-owned cattle, which typically account for less than 2% of total slaughter in any given week.

The use of AMAs has proliferated for some very good reasons. A significant deficiency of the negotiated trade system that dominated the fed cattle market before the emergence of AMAs is that all animals in a given sale lot receive the same price: that is, prices are negotiated at the pen level (at least, a single negotiation often includes multiple pens) and all animals in that group receive the same price. In short, there is little incentive for sellers to control quality. In an average pricing mechanism, below average cattle receive the same price as above average cattle. Such a mechanism does not effectively transmit market signals from buyers to sellers. In the beef/cattle industry, this meant that price signals about consumer preferences related to beef did not necessarily make it back to producers (feedlots and cow/calf producers). This put the beef industry at a significant competitive disadvantage relative to chicken and pork, whose more tightly integrated/coordinated supply chains conveyed market signals very efficiently. Both industries took market share from beef throughout the 1980s and 1990s.

Individual pricing arrangements in which a base price was adjusted by premiums and discounts for carcass merits to establish a price for each animal based on its quality (i.e., grid pricing) greatly improved price signals in the industry and facilitated closer alignment between consumer preferences and production decisions. Rather than repeatedly negotiating base prices and premium and discount structures on each transaction, buyers and sellers quickly realized the transaction cost advantages of establishing standing formula arrangements to establish pricing terms. Thus, the rise of individual pricing gave a significant boost to the use of AMAs (Peel and Anderson, 2021).

An important point to note in the foregoing summary is that AMAs developed primarily at the behest of cattle feeders. Grid pricing systems (which is what AMAs largely evolved from) originated as a way for feeders to be compensated for higher quality cattle. AMAs have done a great deal to incentivize higher quality, more consistent product in the beef supply chain. One of the common complaints about the widespread adoption of AMAs is that AMA users benefit from the information generated through negotiated trade. This is certainly true (and will be explored in more detail below), but it is equally true that the market as a whole has benefited from the richer information flow and clearer price signals related to end product attributes that AMAs have facilitated (and to which average price sales contribute very little).

While AMAs developed primarily as a means to properly incentivize cattle producers, they have come to play an important risk management role for participants on both sides of the market (Ward et al., 1996a). For meat packers, due to the significant economies of size associated with packing plant operation, maintaining optimal (i.e., cost-minimizing) plant throughput is a high priority (Morrison-Paul, 2001). The use of AMAs (as well as other forms of contracting) gives them greater control over the flow of cattle through their plants and is therefore an important tool for packers in managing their cost of production (Schroeder et al., 1998). On the other side of the transaction, feeders face a number or risks that can be mitigated or eliminated through some form of contracting, including advance production risk, matching risk, and negotiation failure risk.[3] Essentially, feeders face the prospect of incurring large production costs that they won't be able to recoup in the event of an adverse price move (advance production risk); in negotiation, they will potentially be at a bargaining disadvantage for a variety of reasons (matching risk); and if they can't settle on terms of trade with a buyer, they face the costly prospect of carrying market-ready cattle forward for at least a week, incurring substantial costs to do so

[3] For a summary discussion of the risks facing cattle feeders and how these affect their bargaining position in the market as well as their incentives for contracting, see Bastian (2021).

(negotiation failure risk). Having a secure, standing arrangement with a buyer who will take cattle in the week of the feeder's choosing (which is typical of AMAs) goes a long way toward alleviating these risks.

The combined benefits of AMAs to the beef industry in the form of reduced transactions costs, lower operating costs, and risk reduction are substantial. Extrapolating from the results of Muth et al. (2007), Koontz (2020) estimates the value of AMAs to be at least $35 per head (with benefits split roughly one-third to packers and two-thirds to feeders).

One concern is that thinning cash markets and increased AMAs use have led to decreasing cattle prices. Specifically, the concern is that AMAs allow beef packers to exercise market power on the fed cattle market. Concerns about market power, AMAs, and cattle prices have been thoroughly examined in the literature (e.g., Ward, Koontz, and Schroeder, 1996b; Ward, Koontz, and Schroeder, 1998; Muth et al., 2007; Koontz, 2020; Koontz, 2021). Results in the literature show that AMAs do not result in lower cash prices or that the effect is small (not economically significant) and far outweighed by the value of efficiency gains attributable to AMAs.

Figure 2 shows the relationship between the 5-area fed cattle price and negotiated trade volume. From 2002 to 2015, negotiated trade volume in the fed cattle market decreased. At the same time, fed cattle prices increased. Record cattle prices for 2014-2015 correspond to the lowest negotiated trade volume. More recently, from 2020 to 2021, fed cattle prices increased 11.7%, while negotiated trade volume decreased 16.1%. The following two sections closely examine the relationship between cattle prices, price spreads, and negotiated cash trade volume and discuss why the three involve separate but related economic concepts.

AMAs, Cattle Prices, and Farm-to-Wholesale Price Spreads

While the benefits of AMAs are well-documented, as use of these instruments has come to dominate the market, concerns have arisen about the potential negative consequences of AMAs. Related to these concerns, one key question that the beef cattle industry and policymakers are asking is whether CPDTA will increase cattle prices and decrease the farm-to-wholesale beef marketing margin. This section aims to provide answers to these critical policy questions.

To determine whether CPDTA will affect beef and cattle markets, we investigate the relationship between fed cattle prices, beef marketing margins, and negotiated cash trade volumes, developing a two-sector model of the beef supply chain. This model is then used to derive expressions for fed cattle prices and beef marketing margins. The model expands on Brester and Marsh (2001) by incorporating negotiated cash trade volume as an exogenous supply and demand shifter. Using monthly data and regression analysis, we estimate the relationship between fed cattle prices, beef marketing margins, and negotiated cash trade volume in the fed cattle market.

This is not the first study to examine the relationship between fed cattle prices and market volume. The USDA GIPSA RTI Livestock and Meat Marketing Study conducted in 2007 provides perhaps the most comprehensive analysis of this research question. In their analysis, Muth et al. (2007) uses packer-specific transactions data to determine whether AMAs allow packers to exercise market power and depress cattle prices. The main finding from Muth et al. (2007) was that fed cattle price declines stemming from AMA use and market power were far outweighed by AMA benefits to the cattle industry. While Muth et al. (2007) might seem dated, the project took several years to complete, uses several proprietary data sources, and is still considered the gold standard for research investigating cattle markets and AMAs. Still, the research question is worth revisiting. Moreover, Muth et al. (2007) did not directly estimate the relationship between cash market volume and the beef marketing margin.

In their analysis, Pendell, Schroeder, and Knoeber (2003) determine whether or not marketing agreements and forward contracts relate to the farm-to-wholesale beef margin. Using a relative price spread model, Pendell, Schroeder, and Knoeber (2003) do not find a statistically significant relationship between captive supplies and the beef marketing margin. Ward, Koontz, and Schroeder (1998) use transactions data to examine the relationship between captive supplies and fed cattle prices. Their results do not indicate that packer captive supplies impact fed cattle cash prices. Ward, Koontz, and Schroeder (1996b) find that packer captive supplies were associated with a decline in fed cattle cash prices but argue that the effect is small and economically insignificant.

Conceptual Framework. Answering both questions, as described above, is straightforward. It requires the development of a model of the beef supply chain. Several such models are described in the economics literature, but all are built on the same conceptual framework. To reduce unnecessary complexity, but without loss of generality, we will proceed with a two-sector model of the beef supply chain.

In the model, feedlots are the primary supply. Each feedlot uses feeder cattle, feed, and labor (production inputs) to produce fed cattle (production output), which they supply to beef packers. On the other side, beef packers represent derived demand for fed cattle. Beef packers use fed cattle, labor, capital, and utilities (production inputs) to produce wholesale beef (production output). Each packer supplies wholesale beef to food processors and retailers. Finally, food processors and retailers demand wholesale beef, which is sold to consumers.

Equations (1)-(8) depict the two-sector beef supply chain.

Beef Packing Sector

(1) $P_w^s = f_1(Q_w^s, NT, X)$ (Inverse Supply)

(2) $P_w^d = f_2(Q_w^d, Y)$ (Inverse Demand)

(3) $P_w^s = P_w^d = P_w$ (Market-Clearing Price)

(4) $Q_w^s = Q_w^d = Q_w$ (Market-Clearing Quantity)

Feedlot Sector:

(5) $P_f^s = g_1(Q_f^s, NT, A)$ (Inverse Supply)

(6) $P_f^d = g_2(Q_f^d, NT, B)$ (Inverse Demand)

(7) $P_f^s = P_f^d = P_f$ (Market-Clearing Price)

(8) $Q_f^s = Q_f^d = Q_f$ (Market-Clearing Quantity)

In equation (1), the wholesale supply price (P_w^s) is a function of the wholesale supply quantity (Q_w^s), percent negotiated cash trade in the fed cattle market (NT), and other exogenous supply shifters (X). Equation (2) shows the wholesale demand price (P_w^d) as a function of wholesale demand quantity (Q_w^d)and exogenous demand shifters (Y). Equations (3) and (4) are the wholesale beef price and quantity that clear the wholesale beef market, respectively.

For the feedlot sector, equation (5) is inverse supply of fed cattle, where the feedlot supply price (P_f^s) is a function of the feedlot supply quantity (Q_f^s), percent negotiated cash trade in the fed cattle market, and exogenous supply shifters (A). In equation (6), the feedlot demand price (P_f^d) is a function of the feedlot demand quantity (Q_f^d), percent negotiated trade, and exogenous demand shifters (B). Equations (7) and (8) are the fed cattle price and quantity that clear the fed cattle market, respectively.

Inserting equations (5) and (6) into equation (7) and utilizing the identity in equation (8) gives:

(9) $P_f = g_3(Q_f, NT, A, B)$.

Equation (9) provides a way to examine the relationship between fed cattle prices and the percent of negotiated cash trade in the fed cattle market. Fed cattle prices are a function of slaughter cattle quantity, the volume of cash trade in the fed cattle market, and exogenous supply and demand shifters. Supply and demand shifters might include input prices for feedlots and beef packers, output prices for beef packers, technology change, and seasonality.

Utilizing equations (1)-(8), we can also arrive at an equation for the beef marketing margin. Substituting equations (1) and (2) into equation (3) and equations (5) and (6) into equation (7) provides us with expressions for P_w and P_f, respectively. Using the identities in equations (4) and (5) and subtracting P_f from P_w gives:

(10) $M_{wf} = P_w - P_f = f_3(Q_w, Q_f, NT, X, Y, A, B)$.

Fed cattle quantity (Q_f) is dropped from equation (10) because it is virtually the same variable as the wholesale quantity (Q_w) if we assume an average dressed weight and dressing percentage for fed cattle slaughter (Brester and Marsh, 2001). Equation (10) provides a way to examine the relationship between fed cattle prices and the percent of negotiated cash trade in the fed cattle market.

Empirical Framework. The key question we are examining is whether negotiated cash trade volume affects fed cattle prices and the farm-to-wholesale beef marketing margin. To do this, we approximate equations (9) and (10) with linear regression models:

(11) $PFed = \beta_0 + \beta_1 NT + \beta_2 SLTR + \beta_3 Choice + \beta_4 Wage + \sum_j \gamma_j X_j + \sum_t \delta_t D_t + \varepsilon$

and

(12) $Margin = \alpha_0 + \alpha_1 NT + \alpha_2 BProd + \alpha_3 Choice + \alpha_4 MCI + \sum_k \theta_k Z_k + \sum_t \eta_t D_t + \upsilon$

where $PFed$ is the fed cattle price, NT is the volume of negotiated cash trade in the fed cattle market, $SLTR$ is the quantity of steer and heifer slaughter, $Choice$ is the percent of fed cattle grading choice, $Wage$ is the Producer Price Index for wages, X_j are other exogenous supply and demand shifters, D_t are seasonal dummy variables, and ε is the error term. $Margin$ is the farm-to-wholesale beef marketing margin, $BProd$ is the quantity of beef production, MCI is an index of food manufacturing costs, Z_k are exogenous supply and demand shifters, and υ is the error term. In equations (11) and (12), β_1 and $\alpha_1$are the effects of interest, providing a measure of relationship between cattle prices, beef marketing margins, and negotiated cash trade volume.

It is well documented in the literature that the use of alternative marketing arrangements (AMAs) have, in part, led to quality and consistency improvements for the beef cattle industry. Figure 3 shows the percent of fed cattle grading choice and prime for the 2002-2021 period. In 2002, 62% of cattle were grading choice or higher. Today, approximately 85% of fed cattle in the U.S. grade choice or higher. Improvements in product quality have added significant value to the beef industry. During that same period, AMA use increased from 49% in 2002 to 62% in 2021 (see Figure 1). Both figures suggest a positive correlation between quality grade and AMAs—or conversely, a negative correlation between quality grade and negotiated cash trade volumes.

Research also finds that AMAs lower operating costs, reduce transactions costs, and offer efficiency gains for the beef industry (Koontz, 2020). Transactions costs reflect the value of time and effort associated with arriving at a transaction. Participating in the fed cattle market involves significant

transaction costs. Search costs, information collection, planning, scheduling, evaluating alternatives, transportation, and labor are all aspects of the transaction costs for participants in the negotiated fed cattle market. Failing to arrive at a trade is another source of transactions costs. AMAs reduce these transaction costs and allow for more efficient management of cattle supplies. Koontz (2020) estimates cost savings from $7.65 to $9.90 per head from fed cattle marketing agreements. Most of the cost savings are attributed to labor cost savings, $1.25 to $10.00 per head (Koontz, 2020).

Cattle quality and transactions costs are two confounding factors that likely affect cattle prices and the beef marketing margin. That is, both will affect supply and demand fundamentals in the beef and fed cattle markets. Cattle quality and transaction costs are also expected to negatively correlate with the volume of negotiated trade in the cash market. In both regression models, $Choice$ is included to capture changes in cattle quality over time. $Wage$ and MCI proxy the value of time and effort, reflecting changes in transactions costs.

We hypothesize that controlling for cattle quality and transactions costs in equations (9) and (10) will result in the volume of negotiated trade having no effect on cattle prices and the beef marketing margin. That is, after partialling out the effects of cattle quality and transactions costs, the remaining variation in negotiated trade will not affect cattle prices and the marketing margin. With reference to equations (9) and (10), our hypothesis is tested by determining if β_1 and α_1 are statistically different from zero.

Data. We use monthly data from April 2001 to October 2021 to examine the effects of negotiated trade volume on cattle prices and the farm-to-wholesale beef marketing margin. Price data for cattle prices, cutout values, and farm by-product values were collected from the Livestock Marketing Information Center (LMIC). Table 1 reports variable symbols, names, and definitions.

Live fed cattle prices (*PLive*) are the 5-area monthly weighted average price for steers sold on a live basis. We also collected data on fed steers sold on a dressed basis for the 5-area market (*PDress*). Wholesale beef prices are measured by the choice boxed beef cutout value (*Cutout*). *ByProduct* are farm by-product values for beef including hide and offal. The farm-to-wholesale beef marketing margin is *Cutout* plus *ByProduct* minus *PLive* and is measured on a carcass equivalent basis.

Data were collected for three measures of negotiated cash trade volume. The first, *NTT,* variable is the number of negotiated transactions for the 5-area market as a percent of the total number of fed cattle transactions (live and dressed basis). *NLT* in Table 1 is the number negotiated transactions for the 5-area market as a percent of the total number of fed cattle transactions for fed cattle sold on a live basis. *NDT* is the number fed cattle sold on a dressed basis that were negotiated transactions as a percent of the total number of fed transactions for 5-area markets.

Slaughter cattle quantity is measured by the monthly federally inspected steer and heifer slaughter (*SLTR*). Beef quantity is measured by per capita beef production on a retail weight equivalent basis (*BProd*). Both beef and slaughter cattle quantities were collected from the LMIC.

The value of time is proxied with the Producer Price Index for wages collected from USDA-NASS. Similarly, the food manufacturing cost index (*MCI*) is a proxy for production costs for beef packers. The manufacturing cost index was collected from the University of Missouri's Agricultural Markets and Policy Group. The index consists of 50% wages, 10% fuel, rubber & plastics, and general commodities and services, and 5% rent, taxes, interest and repairs. The percent of cattle slaughtered that grade choice (*Choice*) is a proxy variable for changes to cattle quality and is collected from LMIC.

Additional control variables (X_j and Z_k) for the fed cattle price and beef margin equations include per capita pork and poultry production, choice boxed beef cutout values, farm by-product values for beef, Oklahoma City feeder cattle prices, Nebraska corn prices, and average steer carcass weights. Control variable selection is based on the research findings from Wohlgenant and Mullen (1987), Brester and Marsh (2001), and Pendell, Schroeder, and Knoeber (2003).

Feeder cattle and corn prices are input costs for feedlots. Carcass weights measure technology change for feedlots i.e., beef per animal. Boxed beef cutout and farm by-product values are a measure of output prices for beef packers. Per capita pork and poultry production data were collected to measure output substitution for beef packers. Finally, monthly dummy variables capture seasonality in fed cattle prices and beef marketing margins. Table 2 reports summary statistics for the variables used in the analysis. All prices are deflated to constant dollars using the Consumer Price Index.

Results. The fed cattle price and beef marketing margin equations are estimated with maximum likelihood. Two fed cattle price equations are estimated (Table 3). The first model is for fed cattle prices and negotiated trade volume for cattle sold on a live basis. The second fed cattle price model is fed cattle prices and negotiated trade volume for cattle sold on a dressed basis. We examine live and dressed prices separately to determine whether results are consistent across markets. Also, there is considerably less negotiated trade for fed cattle sold on a dressed basis. For the sample period, negotiated cash trade averaged 63% and 22% for live and dressed fed cattle, respectively. The beef marketing margin results in table 4 are for total negotiated cash trade volume (live and dressed).

Augmented Dickey-Fuller tests indicate that several variables in the fed cattle and beef margin models are non-stationary. Unit root tests on the model residuals were conducted to determine whether there is a cointegrating relationship. Results indicate that the model residuals are stationary for both the fed cattle price models and the beef marketing margin model. Models are estimated with the data in levels. Results indicate the presence of autocorrelation in all three models. For each model, residuals are modeled as an autoregressive process.

Results in table 3 indicate that negotiated cash trade volume does not have a significant effect on fed cattle prices. The coefficients for *NLT* and *NDT* are positive but not statistically significant at any conventional level. These results suggest that mandating a minimum for negotiated cash trade will not necessarily translate to higher cattle prices. Results were consistent across functional forms, choice of control variables, and residual correlation structures.

Importantly, table 3 shows that fed cattle prices are determined by factors consistent with expectations. Feeder cattle and corn prices have a positive and statistically significant effect on fed cattle prices. For example, a $1/bu increase in corn prices results in a $2.03/cwt increase in fed cattle prices. A $1/cwt increase in Oklahoma City feeder cattle prices increases fed cattle prices by $0.44/cwt. As input costs rise, so do fed cattle prices. Average steer carcass weights have a negative and statistically significant effect on fed cattle prices. Technology improvements have led to declines in cattle prices as we can produce more beef per animal. Wholesale beef prices are positive and statistically significant.

Results in table 4 indicate that negotiated cash trade volume does not significantly affect the farm-to-wholesale beef marketing margin. The coefficient for *NTT* is positive but not statistically significant at any conventional level. Results suggest that mandating a minimum for negotiated cash trade will not necessarily translate to a smaller spread between cattle prices and wholesale beef prices. Our findings do not support arguments that AMAs allow for beef packers to exert market power and increase beef margins (Pendell, Schroeder, and Knoeber, 2003).

Findings are consistent with previous estimates in the literature. Pendell, Schroeder, and Knoeber (2003) do not find that marketing agreements and forward contracts have increased the beef marketing margin. Ward, Koontz, and Schroeder (1998) find that beef packer use of AMAs has no significant effect on fed cattle cash prices. The main finding from Muth et al. (2007) was that fed cattle price declines stemming from AMA use and market power were far outweighed by AMAs' benefits to the cattle industry.

Policy Implications. As noted earlier, there are known costs associated with negotiated cash trade mandates. Participating in the negotiated fed cattle market takes significant time and effort. The value of time and effort is higher today than ever, which will contribute to transaction costs being higher than what recent estimates might suggest. It takes two to negotiate, and beef packers and feedlots will both have higher costs if they are mandated to negotiate more of their transactions.

In contrast with the known costs associated with increasing negotiated trade, the benefits of such an increase are mostly speculative. In terms of the key issue of cattle prices and farm-to-wholesale price spreads, the evidence of this study suggests that increasing negotiated trade provides no benefit at all. Estimates show that changes in the volume of negotiated cash trade do not affect fed cattle prices. The farm-to-wholesale beef marketing margin does not change in response to changes in the volume of negotiated trade. Our results suggest AMAs do not allow beef packers to increase beef margins and lower cattle prices.

The result of no statistically significant relationship between the volume of negotiated transactions and fed cattle price and marketing margins should not be a surprise. The behavior of fed cattle prices and marketing margins is an issue of price determination; that is, whether these values are high or low is determined by fundamental supply and demand conditions in the farm and wholesale markets. Based on this fact, we would not expect to find a significant relationship between fed cattle prices, marketing margins, and negotiated trade volume: how fed cattle trade hands does nothing to alter the underlying supply/demand balance in the market. That is not to say, however, that the means by which cattle trade hands is entirely insignificant.

Price discovery is the process by which information gets incorporated into prices. Buyers and sellers of a commodity perform the price discovery task. It is how they arrive at a price on a specific transaction. The volume of trades through specific pricing mechanisms may not affect underlying market fundamentals, but it is an important element of price discovery. The potential impact of AMA use on price discovery is explored in greater detail in the following section.

AMAs and Price Discovery

While AMAs provide direct benefits to the market participants who use them and, as noted earlier, indirect benefits to the broader industry as a result of clearer price signals, from virtually their first appearance AMAs have raised concerns within the cattle industry. Much of the early discussion related to AMAs focused on “captive supplies” (i.e., cattle committed to packers well in advance of slaughter) and the impact that these committed cattle had on the bargaining position of cattle feeders (see, for example, Ward et al., 1996c). Koontz (2021) notes that the term “captive supplies” is something of a misnomer in that feedlots actually retain control of AMA cattle; that is, the feeder has discretion over which week to market cattle, with packers only deciding which day of that week to schedule delivery. Koontz further notes that to the extent AMAs reduce the demand by packers for cattle in any given week, those arrangements also reduce the available supply by that same amount, leaving the supply/demand balance in the market essentially unaffected.

While concern over the market power effects of AMAs has not entirely gone away, the focus of arguments for restricting their use has shifted to the issue of their impact on price discovery. This focus is not entirely new. Early in the AMA era, Schroeder et al. (1998) noted the potential for price discovery to be degraded by AMA use if the cattle traded through AMAs were substantially different from cattle traded through direct negotiation. Concern about the impact of AMA use on price discovery has increased as the volume of AMA trades has grown to dominate the market. AMAs typically use some prior negotiated price (e.g., last week's negotiated live price for the reporting region in which the cattle are located) as the base price in formula calculations (Coffey, Pendell, and Tonsor, 2019). Thus, as the volume of negotiated trade dwindles, fewer and fewer and negotiated transactions are leveraged into more and more AMA transactions. In other words, a large volume of AMAs depends on the price discovery taking place in a relatively small volume of negotiated transactions; AMAs don't contribute to this price discovery but depend on it being done in the negotiated market. This situation raises the possibility that any pricing inefficiencies in the thinner and thinner negotiated market will be propagated much more widely due to AMAs, potentially leading to the mispricing of cattle and the consequent misallocation of resources (Adjemian et al., 2016).

The conceptual case for price discovery issues in the fed cattle market as negotiated transactions decline (referred to as a thinning market) is straightforward; however, whether or not the market actually manifests problems with price discovery is an empirical question – one that has been widely investigated over several years by many highly-qualified researchers using a variety of different methods and data. This work has yet to yield consistent evidence of price discovery problems in the fed cattle market (Crespi, Saitone, and Sexton, 2012; Brorsen, Fain, and Maples, 2018).

Most recently, Anderson, McKenzie and Mitchell (2021) show that that all five Livestock Mandatory Price Reporting regions respond to new supply and demand information in a manner consistent with active price discovery – that is, prices adjust quickly and consistent with the expectations of economic theory in response to new information. Using an event study approach, negotiated cash trade price reactions were measured around the release of *Cattle on Feed* (*COF*) reports, which contain supply and demand information about cattle on-feed, placements and marketings. New information in the reports, is measured as the percentage difference between the USDA numbers and the median private market analyst forecasts for on-feed inventory, placements, and marketings with respect to each monthly report. These differences are referred to as shocks. By isolating specific supply and demand shocks, Anderson, McKenzie, and Mitchell (2021) are able to examine the extent to which market prices respond in a rational manner consistent with effective price discovery.

Given that the percentage volume of negotiated cash transactions in the Texas/Oklahoma/New Mexico region has decreased dramatically since 2014, one part of the analysis analyzed differences in price reactions over two sample periods: (1) between January 2004 – December 2013 and (2) between January 2014 – December 2020. In addition, the analysis focuses on clear and unambiguous supply and demand news. This is achieved by including only observations for months when positive placement shocks are simultaneously observed with negative marketings shocks (bear market shocks); and when negative placement shocks are simultaneously observed with positive marketings shocks (bull market shocks). The main results of the analysis are most easily seen in tables 5 and 6, which present correlations between weekly price changes across the five regions and on-feed, placement and marketing shocks. Table 5 reports correlations for the January 2004 – December 2013 sample period and table 6 reports correlations for the January 2014 – December 2020 period. The most noticeable

difference is that the correlations between placement and marketings surprises and all regional cash prices has doubled over the more recent 2014 – 2020 period. All of the regional cash markets are now more responsive than ever to unambiguous price signals contained in *COF* reports. Also, the fact that weekly price changes over both sample periods are highly correlated across regions (0.9 or higher) indicates that the markets respond in similar manner to new information – irrespective of the percentage of negotiated trades to overall transactions.

In summary, despite the thinning of the fed cattle market (in terms of negotiated trade) evidence to date suggests that price discovery continues to function quite well, even in the southern Plains. To an academic investigator, this result is not all that surprising: evidence from other agricultural markets suggests that if transactions are reasonably representative of the market as a whole, even a very small volume of trade can result in effective, efficient price discovery (Tomek, 1980; Franken and Parcell, 2012; Adammer, Bohl, and Gross, 2016). By contrast, market participants who have seen transparent negotiation erode to a fraction of past levels seem to find that result difficult to fathom.

Price Discovery, Negotiated Cattle Trade and Public Goods

The central role that negotiated transactions play in pricing fed cattle more broadly through AMAs highlights the public good character of price discovery. Market information, specifically including prices, has long been recognized as possessing elements of a public good (Riemenschneider, 1977). In brief, a public good has the characteristics of non-excludability and non-rivalry: that is, it is impossible to exclude someone from the consumption of the good, and one person's consumption of the good does not negatively impact another's consumption of the good (Samuelson, 1954). Because of these characteristics, public goods are subject to the free rider problem: people using the good without contributing to its provision. Consequently, these goods tend to be provided at considerably less than the socially-optimal level in the absence of some intervention in the market.

With respect to the fed cattle market, there seems to be increasingly sharp disagreement over what, specifically, is the relevant public good associated with negotiated trade. Is the relevant public good the function of price discovery performed through negotiated trade, or is it rather the negotiated trade, *per se*? This is more than semantic hair-splitting; the distinction has vital policy implications.

If the function of price discovery is the public good that matters with respect to fed cattle markets, then as long as price discovery is efficiently taking place, no compelling justification for intervention in the market exists: the public good of interest is being adequately provided. The effectiveness of price discovery can be measured reasonably objectively. Indeed, that has been the focus of much of the work already cited here; work that has generally concluded that thin fed cattle markets still discover prices quite efficiently. On the basis of that work, and with price discovery as the public good in view, policy prescriptions aimed at increasing negotiated trade appear quite beside the point.

On the other hand, if negotiated trade itself is the relevant public good (irrespective of the quality of the resulting price discovery), then the case for market intervention is easier to make: if negotiated trade volume is too low, market intervention is justified. The operational deficiency of this position is immediately obvious: "too low" is a thoroughly subjective concept. In the absence of some kind of objective standard, defining a threshold for negotiated trade is an inherently political rather than scientific exercise. The strong support for a policy mechanism to increase negotiated trade suggests that this view of negotiated trade as a public good is widespread within the industry.

Implications of the Cattle Price Discovery and Transparency Act

Given the evident political imperative to increase negotiated fed cattle trade as a public good in and of itself, some approach to addressing the subjective establishment of negotiated trade volumes is necessary. The bill under consideration here is somewhat vague on how minimum volumes will be set, but the volume in each region will be no lower than the average negotiated trade volume over the past 18 months, with the additional requirement that the minimum volume in any region not exceed 300% of the minimum volume in the lowest region.

As has been widely discussed within industry and policy circles, the use of AMAs varies considerably across the five reporting regions, with AMAs used much more in the southern Plains (TX/OK/NM and KS) than in the Corn Belt (IA/MN and NE). Figure 4 shows the average percentage of fed cattle transactions by transaction type for all AMS reporting regions, excluding Colorado, over the 18 months ending November 2021.[4] Over the most recent 18-month period, negotiated trade in the southern Plains regions has been quite sparse: 12 percent of transactions in TX/OK/NM and 19 percent in KS. Negotiated trade remains a large share of transactions in NE at 38 percent and a majority share, by a substantial margin, in IA/MN at over 60 percent of transactions.

Based on the numbers in Figure 4 and a straightforward reading of the CPDTA, the minimum volume of negotiated trade could be no lower than 12% in TX/OK/NM and 19% in KS. Assuming those minimums were applied (not a given, as the bill would permit a higher threshold than the 18-month average), the minimum volume of negotiated trade in NE and IA/MN would then be capped at 36% (i.e., 300% of TX/OK/NM). At the regional level, this approach merely locks in the status quo for negotiated trade. However, enforcement of trade volumes is applied at the plant level. This creates the potential for significant market disruption from the bill's implementation, even at the minimum levels described here. For example, a packer operating a plant on 100% formula cattle in the NE or IA/MN regions would have to shift over a third of that plant's throughput to negotiated trade in order to comply with terms of the bill.[5]

It is difficult to quantify the cost of CPDTA without knowing more specifically how it would be implemented. Without question, the bill will lead to an increase in costs in the industry. Even in regions where minimum negotiated volumes will be set below current regional negotiated trade averages, individual plants will still likely be forced to alter their purchasing practices. This will lead to higher transactions costs for those plants. Ironically, if the bill is implemented with negotiated transaction levels established at or very near 18-month averages, it may actually end up being more disruptive in the Corn Belt than in the Southern Plains because of these plant-level effects. Imagine, for example, the case of a Texas plant and an Iowa plant both operating on 100% AMA cattle. The former plant would have to adjust to purchasing something like 12% of its cattle via negotiated trade; the latter plant would have to adjust to purchasing something like 36% of its cattle through negotiation. In short, it is not

[4] Colorado fed cattle transactions have been sparsely reported in recent years due to USDA confidentiality restrictions on data release. The incompleteness of the public data makes it impossible to calculate transaction type percentages for this region with any degree of accuracy.

[5] The bill includes an exception to these provisions for firms operating a single packing plant. A single plant firm could, conceivably, operate on 100% formula cattle in any region regardless of minimum thresholds for negotiated trade established under the terms of this bill.

inconceivable that the cost of the bill could be higher in regions that are currently already trading a relatively large number of negotiated cattle.

Taking a longer view of the situation, the CPDTA runs the risk of stifling further innovation in pricing mechanisms in the fed cattle sector. As already noted, at their inception, AMAs represented an innovation in marketing that greatly improved the quality of price signals in the beef supply chain and facilitated a number of changes in production practices at all levels of the industry that have improved beef quality and consistency and thereby supported beef demand. By privileging an average pricing system in the sector, the CPDTA makes it less likely that further such innovations will be pursued. The implications of this situation are not insignificant. Beef already faces a significant price disadvantage in the broader meat sector relative chicken and pork. Innovations that might further reduce transactions costs and/or support further production changes to more closely align the beef end product with consumer tastes and preferences could be beneficial to maintaining and even growing beef demand in the future. The history of average pricing in the industry suggests that such innovations are probably less likely under the terms of the CPDTA. By contrast, the chicken and pork sectors have a long history of relentlessly pursuing such innovations.

Specific provisions of the CPDTA may also influence investment decisions in the sector. For example, a multi-plant packer deciding where to expand may well consider CPDTA provisions in that decision, likely being biased toward the region allowing the most flexibility in choice of transaction types. Similarly, a single-plant packer interested in expanding may be discouraged from adding a plant in order to avoid complications related to CPDTA compliance for multi-plant firms.

While the costs of the CPDTA may be difficult to accurately quantify, there are certain to be some costs – if only (in the short run) higher transactions costs at plants affected by minimum negotiated trade thresholds. The benefits of the bill are more difficult to identify even conceptually. As discussed previously, proponents of more negotiated trade clearly see negotiated trade as a good, *per se*. Thus, to its proponents, more negotiated trade is the primary, and likely sufficient, benefit of the bill. In the absence of any existing identifiable problem with price discovery, though, it is difficult to assign a pecuniary value to more negotiated trade. This is not to deny that more negotiated trade has real value to some market participants. Clearly, some people in the cattle industry will have greater confidence in reported prices if those prices include more negotiated trade; some will also feel more secure in their position in the market relative to their customers (i.e., packers) if more negotiated trade is taking place more regularly. For those market participants (and this clearly includes a significant number of cow/calf producers, stocker operators, and cattle feeders), the value of more negotiated trade is very real. It is also, however, just about entirely subjective. Such benefits, while important to consider in any policy discussion, are exceedingly difficult to quantify. This leaves the industry (and policy makers) in the uncomfortable position of having to evaluate tangible costs against intangible benefits. Unfortunately, the tools of economic analysis are not particularly well-suited to that sort of comparison.

Impact on Arkansas and other Cow/Calf States in the Southeast

CPDTA has the potential to impact the Arkansas cattle industry in three ways:

1. Feeder cattle prices,
2. Cattle quality, and
3. Industry size and structure.

This section provides a discussion on each of these potential impacts.

With respect to its beef industry, Arkansas is primarily a cow/calf state. While a significant number of the state's producers background stocker cattle (both home-raised and purchased stocker cattle from in-state and out-of-state), virtually all of these animals leave the state as feeder cattle for finishing and slaughter in one of the major feeding regions. USDA 2017 Census of Agriculture data for Arkansas report over 25,000 farms with cattle but no commercial feedlots.

Information on where the state's cattle go for finishing is limited.[6] However, given the state's orientation to primary transportation routes as well as the compatibility of the state's cattle with Southern Plains feeding systems, it would make sense that a substantial majority of the state's cattle go on feed in the TX/OK/NM and KS feeding regions. Anecdotal evidence from industry participants supports this conclusion. This means that Arkansas cattle are fed in regions where AMA's represent the dominant pricing mechanism – recall that negotiated transactions have accounted for less than 20% of total fed cattle transactions in these two regions over the most recent 18 months.

If AMA use in the Southern Plains is restricted, the most likely immediate outcome is that transactions costs related to negotiated exchange between feeders and packers will go up. The lion's share of this increase in costs will most likely be borne by cow/calf and stocker producers in the form of lower feeder cattle prices. The magnitude of this impact will depend on the extent to which AMA use is restricted. If transaction types are locked in at essentially the status quo, impacts are likely to be small; however, the more restrictive the mandate on AMA use, the larger the impact will be.

Given the uncertainty over how CPDTA would ultimately be implemented, it is difficult to quantify the cost of the bill with any degree of accuracy. In assessing the value of AMAs generally, Anderson, Martinez, and Benavidez (2021) apply Koontz's (2020) conservative estimate of a $25 per head for the value of AMAs to an equilibrium displacement model, calculating that the loss of AMAs would result in declines in stocker and feeder calf prices of $2.62/hundredweight (cwt) and $2.32/cwt, respectively. These price declines represent a 1.6% drop from the 2019 base price used in their analysis.

Assuming a 1.6% decline in value of production is reasonably consistent over time and applying that level of loss to USDA's value of production estimates by state, the decline in value from the loss of AMAs over the five-year period ending with 2020 would have averaged about $6 million per year for the state of Arkansas. Figure 5 shows hypothetical average annual losses for the primarily cow/calf producing southeastern region (AL, AR, FL, GA, KY, LA, MS, MO, NC, SC, TN, VA). The combined average annual loss in value across all 12 of these states would be just under $93.8 million per year.

Another way to look at the potential effects of CPDTA on Arkansas cattle prices is to examine the correlation between Arkansas prices and negotiated trade in the fed cattle market (Figures 6 and 7).

[6] Shields and Matthews (2003) conducted a deep-dive into interstate livestock shipments using data from the early 2000s. They reported that 57% of cattle shipped from the Delta states (Arkansas, Texas, and Oklahoma) went to Texas and Oklahoma. Another 21% went to the Northern Plains, which in their classification scheme included Kansas. Only about 3% went to the Corn Belt or Lake State (Iowa and Minnesota). This information is somewhat dated. The rise in Corn Belt feeding that accompanied the growth of ethanol production in the Corn Belt may have led to some increase in shipments of Arkansas cattle to Midwest feedlots, but the general pattern of cattle shipments should not be dramatically different from this early 2000s data. In fact, Gorsich et al. (2016) conduct a similar analysis using data from 2009 to 2011 and report results consistent with Shields and Matthew, locating Arkansas within a cattle shipment network including, primarily, Texas, Oklahoma, and Kansas.

Figure 6 shows the correlation between Arkansas calf prices and volume of negotiated trade in the five regional fed cattle markets. A 1% increase in negotiated fed cattle trade is associated with a $0.46/cwt decline in Arkansas calf prices. The Arkansas 2020 calf crop was 780,000 head (USDA-NASS, 2021). Increasing negotiated fed cattle trade by 1% is associated with a $1.974 million per year decline in Arkansas calf value. Figure 7 shows the correlation between Arkansas feeder cattle prices and fed cattle negotiated trade volume. A 1% increase in negotiated fed cattle trade is associated with a $0.37/cwt decline in Arkansas feeder cattle prices. Feeder cattle supplies as of January 2021 totaled 619,000 head in Arkansas (USDA-NASS, 2021). Increasing negotiated fed cattle trade by 1% is associated with a $1.712 million per year decline in Arkansas feeder cattle value. Combined the effect is about a $4 million decline in the value of Arkansas cattle. Estimates are simple correlations and should be interpreted with care.

Beyond the immediate price and farm income effects, CPDTA could have important implications for beef and cattle quality improvements. Changes in overall cattle and beef quality do not happen quickly. Figure 8 shows that it has taken the cattle industry twenty-five years for beef to consistently grade 80% choice or higher. Year-over-year improvements in quality grade started in the mid-2000s when AMAs became a widely used method for pricing cattle. Most AMAs involve some kind of grid pricing structure to reward superior carcass merits. If AMAs are restricted, cattle feeders' ability to capture the value of superior cattle will likely be reduced. To the extent that cattle feeders lose the ability to capture the value of superior quality animals, their willingness to pay more for these animals as feeder cattle will be diminished.

Beef and cattle quality improvements result, in large part, from long-term changes in herd genetics – changes that involve significant capital investment. Seedstock operations supply commercial cow-calf producers with genetics. Arkansas cattle come from a wide diversity of cattle breeds. The genetic diversity in the Arkansas cow herd is most noticeable as you go from the Ozark Mountains of northwest Arkansas, through the Ouachita Mountains region of central Arkansas, into the humid subtropical region of southern Arkansas. Arkansas has a significant number of seedstock operations that supply genetics to the commercial cow-calf operations in the state. Their business model is to produce genetics for a cow that will thrive in Arkansas and a calf that will perform in the feedlot. To the extent that CPDTA moves that industry away from AMAs and back to average pricing, in the long run, there will be a disincentive to make significant investments in herd genetics that support a high-quality end product. Again, it is hard to know the size of the costs, but Arkansas seedstock producers will bear a significant share of those costs.

Finally, there are also concerns about what CPDTA could do to the size of the beef cattle industry. As has already been described, AMAs allow beef packers and feedlots to maximize throughput. Using AMAs, beef packers can secure and coordinate supplies more effectively. For example, AMAs allow a beef packer specializing in producing beef for certified beef programs like Certified Angus Beef and Non-Hormone Treated Cattle Program to secure program cattle supplies quickly and in large numbers. Similarly, AMAs provide a known buyer and advanced commitment of fed cattle for feedlots. AMAs enhance supply chain coordination for feedlots, allowing for effective management of feeding capacity, pen space, and feeder cattle procurement.

CPDTA will force feedlots and beef packers to negotiate – that is what it is designed to do. For both, throughput will decline as costs go up, and eventually, processing and cattle feeding capacity will be

reduced. Beef packers can no longer process cattle as quickly in as large of numbers. It will take feedlots longer to manage fed and feeder cattle supplies. Simply put, CPDTA will raise costs and delay supply chain coordination. Both impacts point towards a smaller beef cattle industry, which translates to a smaller Arkansas cattle herd. It is hard to know how a declining beef cattle industry will impact specific states. However, unlike the Plains States, whose agricultural land has alternative uses, much of the cattle production land in Arkansas has no competing agricultural use. There is a reason why crops are not grown in the Ozark Mountains. It is, therefore, reasonable to expect CPDTA to impact Arkansas land values disproportionately relative to states with more flexible agricultural land use options.

A Market Maker Mechanism as an Alternative to Required Trade Minimums

The stated intent of the CPDTA is to ensure that all fed cattle market participants contribute to "sufficient levels" of negotiated trade. By requiring all plants to purchase some minimum volume of cattle through negotiated transactions, the bill likely will ensure that a large majority of market participants engage in negotiated trade. It is not clear that this will improve price discovery, but to the extent that industry participants feel that negotiated trade is itself a public good, the bill likely will increase the provision of it. It is worth considering, though, if there might be a less disruptive means of achieving this same goal.

The primary disruption likely to arise from the bill as proposed is that sellers will lose access to an existing AMA as packing plants are forced to purchase a minimum volume of negotiated cattle. A feeder sending cattle to a plant under a specific AMA may well see volume on that AMA capped so the plant can fulfill its negotiated trade requirements. If that AMA represents the best market outlet for those cattle, the feeder will realize a loss by shifting those cattle to the next best alternative pricing mechanism (negotiated trade with the original or a different plant or a different AMA with another plant). That loss will be greater if cattle have been managed for optimal market performance through that specific AMA (e.g., fed to a higher quality grade endpoint at the expense of a lower yield grade). Longer-term planning of market outlets will likely be made at least a bit more difficult under the terms of this bill.

Ideally, the mechanism for increasing negotiated trade would be flexible enough to leave the decision of how to market fed cattle entirely in the hands of cattle feeders, which may not be the case with plant-specific volume requirements. A market maker approach could offer that flexibility. In a securities exchange, a market maker is a trader who provides liquidity to the market, making it possible for other market participants to trade in a timely fashion (Baldacci, Possamai, and Rosenbaum, 2021). In general, the exchange administers a maker-taker compensation structure in which one providing liquidity (maker) receives compensation while one using liquidity (taker) is charged a fee. In broad strokes, such a model would seem relevant to the current situation in the fed cattle market: those contributing to negotiated trade could be compensated through a fee applied to those benefitting from but not contributing to negotiated trade (AMA users). The primary impediment to the application of this model would appear to be the lack of a central exchange to implement and administer this system (e.g., identifying market makers, developing a fee structure, collecting and distributing fees as appropriate).

The administration of a market maker program would not be unlike what USDA Agricultural Marketing Service does in a number of its marketing order and agreement programs related to dairy products and

specialty crops.[7] A marketing order to administer a market maker program in the cash fed cattle market could operate within the existing market reporting regional structure. After a reasonable period to gain experience with the program, it could be either confirmed or discontinued based on a referendum of market participants. Most importantly, it would provide a mechanism for increasing negotiated trade with maximum flexibility for cattle producers.

Since the fed cattle marketing decision resides with the cattle feeder, a market maker program would focus on cattle feeders. A basic market maker program would assess a fee on AMA cattle that would be used to provide compensation on negotiated cattle. It would be possible to establish a graduated fee structure such that fees would be higher the lower the volume of negotiated trade. Beyond some critical threshold, no fee would need to be assessed. Cattle feeders could offset their AMA cattle at a pre-determined ratio by selling negotiated cattle: for example, each negotiated head sold could reduce the number of AMA cattle assessed a fee by five (i.e., a 1:5 ratio). Table 7 summarizes the terms of a hypothetical market maker program.[8]

It is possible to illustrate the operation of the program using historic data on fed cattle transactions types. Such an illustration does not represent an adequate analysis of the program as decisions regarding whether cattle would be sold on a negotiated or AMA basis would change under a market maker program relative to what occurred over the period. Clearly, the market maker program itself would change fed cattle marketing decisions; it is intended to do so. A thorough analysis of a program like this is beyond the scope of this review, requiring a structural model of the fed cattle market with separate supply and demand functions for negotiated versus AMA cattle in order to determine the impact of the program on sale/purchase decisions. An illustration is instructive, though, to demonstrate both how the payment mechanism would function and what maker-taker fees might amount to in hypothetical situations that are reasonably represented in the historic data.

Program parameters from Table 7 were applied to weekly fed cattle sales by transaction type for the TX/OK/NM region from 2017 through 2021 (a five-year time series) to illustrate how the program might operate. Table 8 summarizes the results of this exercise.

Over the five years illustrated here, the hypothetical Market Maker program described in Table 7 would have paid an average of over $9 per head on each head sold in a negotiated transaction. The maximum per head payment would have been over $40 per head in a week in which AMA sales accounted for around 90% of the week's volume. In only three weeks would the market maker payment have been zero. Figure 9 shows the full series of weekly payments calculated in this illustration. Given the flexibility offered via a market maker program, the program provides an estimate of the cost of negotiated trade that would vary given seasonality, total cattle supplies, and region of the country.

Of course, different market maker program parameters could yield very different results. If more than 25% of negotiated cattle came from AMA sellers, reducing the number of cattle on which an assessment would be charged, a higher maker-taker payment rate would be needed to provide the same per head payment. For example, if 40% of negotiated cattle came from AMA sellers, the maximum payment rate

[7] For more information on existing marketing orders and agreements administered by USDA Agricultural Marketing Service, see https://www.ams.usda.gov/rules-regulations/moa.

[8] Peel et al. (2020) includes a market maker example. The example presented here draws from that example and provides an application using TX/OK/NM data from 2020.

would need to be just under $1.10 to provide the same $9.50 average payment as calculated in Table 8. Taking a different approach, if we assume that AMAs are worth an average of about $25 per head to feeders who are using them (*pace* Koontz, 2020), we can estimate the payment rate that would split that value evenly between AMA users and non-users: that is, the payment rate that would result in a maker payment averaging $12.50 per head. Using the same assumptions as in Table 7, that maximum payment rate would be $1.32.

The illustrations presented here clearly demonstrates that a relatively modest assessment on AMA cattle in a market like TX/OK/NM could provide a substantial incentive to negotiated sellers and provide an economic signal for more negotiated trade without a mandate. Government incentives could be included in a market maker program to also help incentivize larger cash trade. Of course, in a market like IA/MN that is already dominated by negotiated sales, such a program would offer much smaller payments, even if program parameters were changed considerably, because collections from a relatively small number of AMA cattle would be distributed across a relatively large number of negotiated cattle. (Rather than concentrating receipts from a larger group into payments to a smaller group, receipts from a smaller group would be diluted across a larger group.) This is not a flaw in the operation of the program: the program is intended to incentivize negotiated trade where little is taking place. This likely would, however, present a challenge in terms of generating industry support for such a program operating within individual reporting regions.

The primary advantage of a program similar to that outlined here, as opposed to mandated negotiated trade minimums, is that it leaves cattle producers in control of how to market their cattle. With reference to the first example above, if a cattle owner determines that continuing to sell cattle on a particular AMA is worth more than, on average, about $9 per head, he or she can continue with that marketing program. There is no possibility that the packing plant will have to decline to purchase cattle via that mechanism. On the other hand, if the cattle owner decides that the value of AMA participation is, on average, less than about $9 per head, he or she may opt to shift those cattle to negotiated trade. In short, this type of program would allow cattle producers to continue to select the marketing outlet that works best for their cattle while appropriately accounting for the public good value that the industry associates with a higher level of negotiated trade. In other words, cattle feeders will be free to direct cattle to where their combined private/public value is the highest.

The maker-taker payment rate provides a simple means of adjusting the program to move the industry toward its desired balance among transaction types: if the value associated with AMA participation is higher than assumed here, a higher rate can be applied to increase the effective compensation for giving up AMA participation in favor of negotiated trade. There may be alternative means of effecting the same outcome that are even simpler in terms of formal structure than a market maker program. For example, a designated tax could be applied to AMA sales (effectively an excise tax on AMA-purchased cattle). Alternatively (or, more likely, in conjunction) a refundable tax credit could be attached to negotiated cash sales. This tax/subsidy approach could be used to provide essentially the same incentives as a market maker program, though a market maker program would likely be superior in terms of being able to more quickly adjust the maker-taker payment structure as well as in having a mechanism in place (assuming implementation as a market order/agreement) to assess market participant support for the program.

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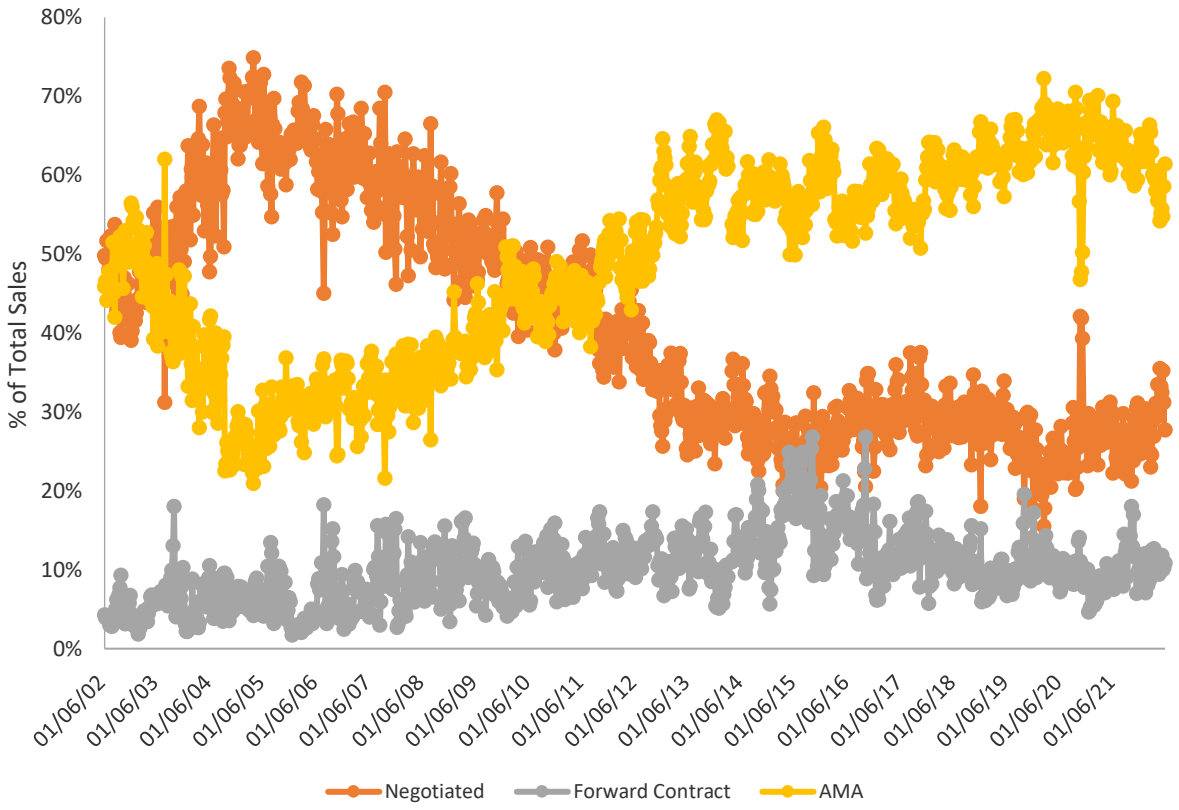
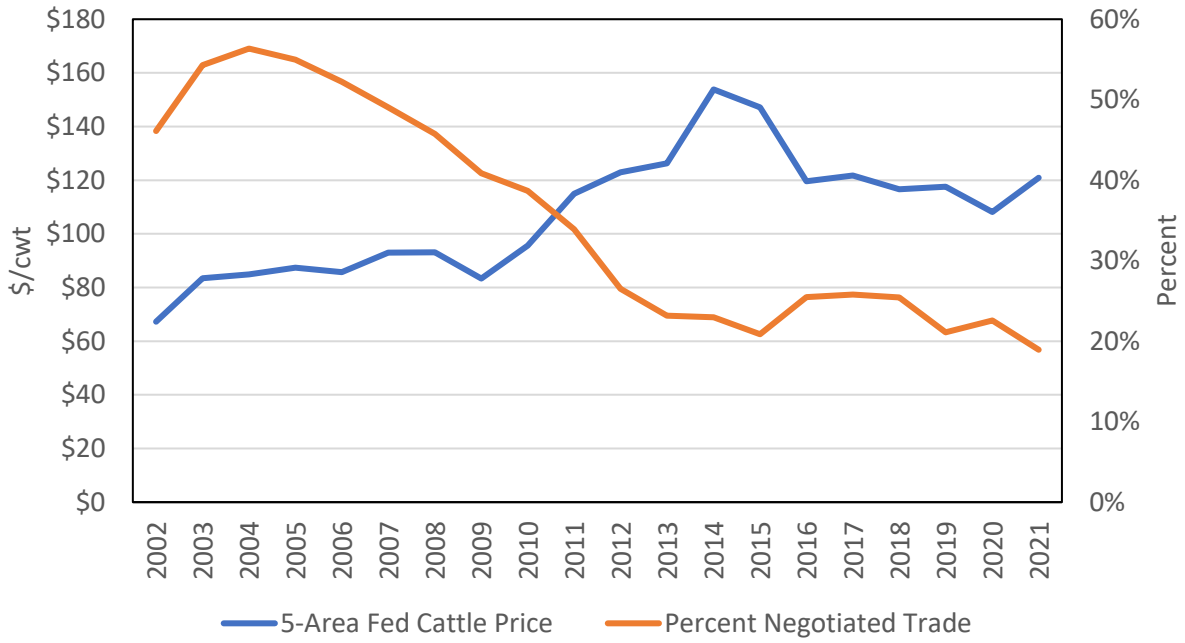


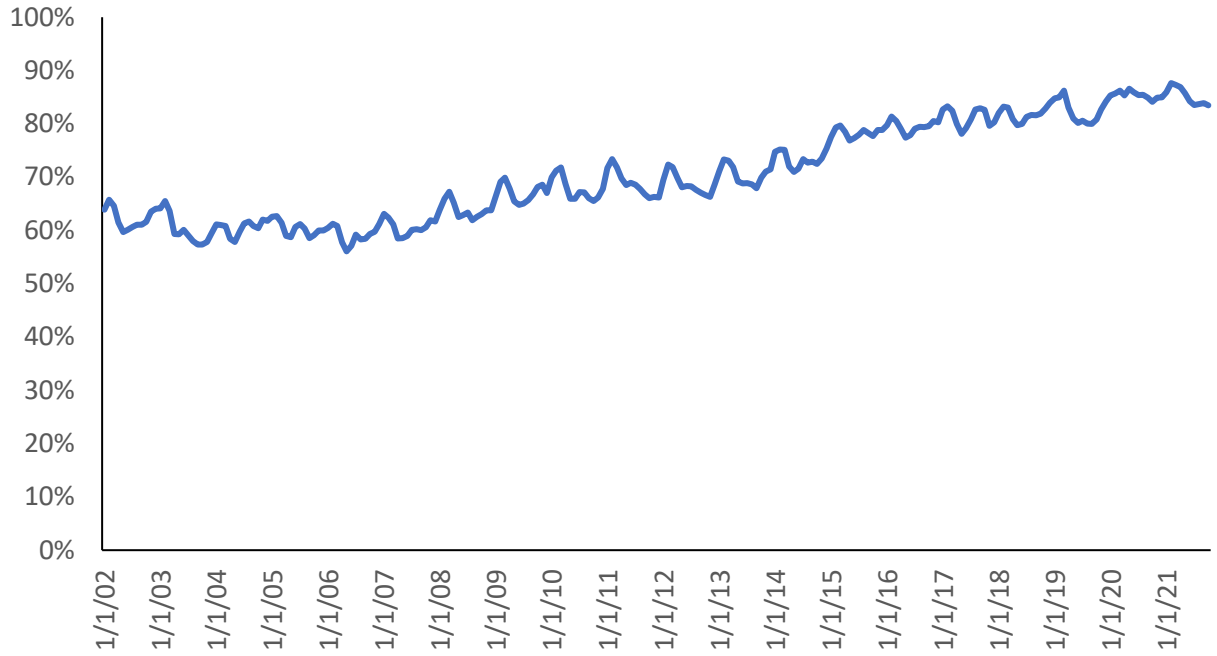
Notes: Negotiated transactions include negotiated grid transactions. Packer owned cattle not included in data.
Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center

Figure 1. Fed Cattle Transactions by Type: Weekly, 2002 through 2021



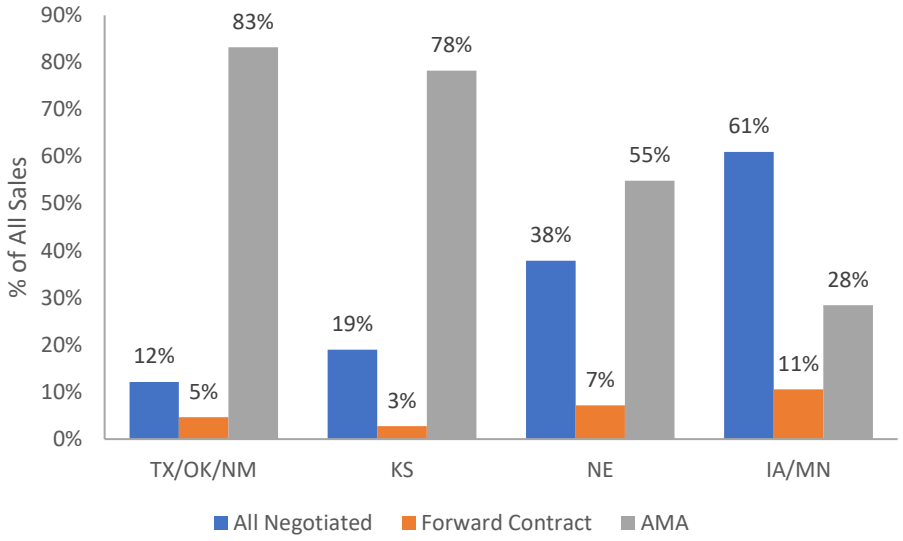
Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center.

Figure 2. Annual average 5-market fed cattle prices and percent negotiated cash trade



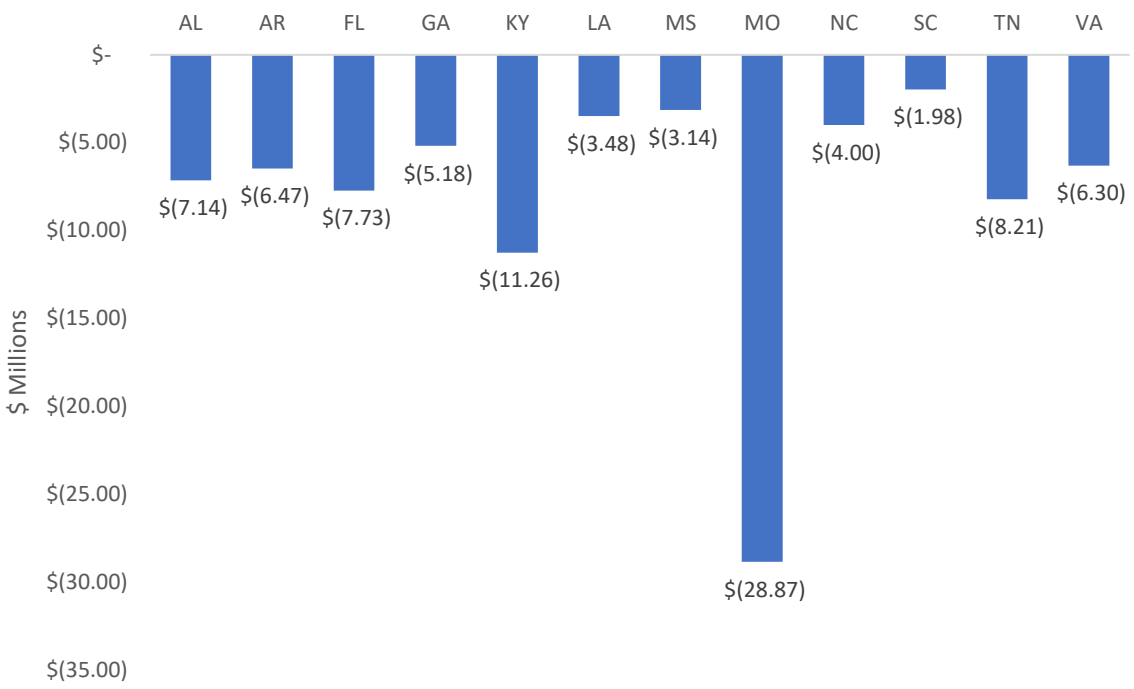
Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center.

Figure 3. Fed Cattle Grading Choice or Prime as Percent of Total Slaughter: Jan 2002-Oct 2021



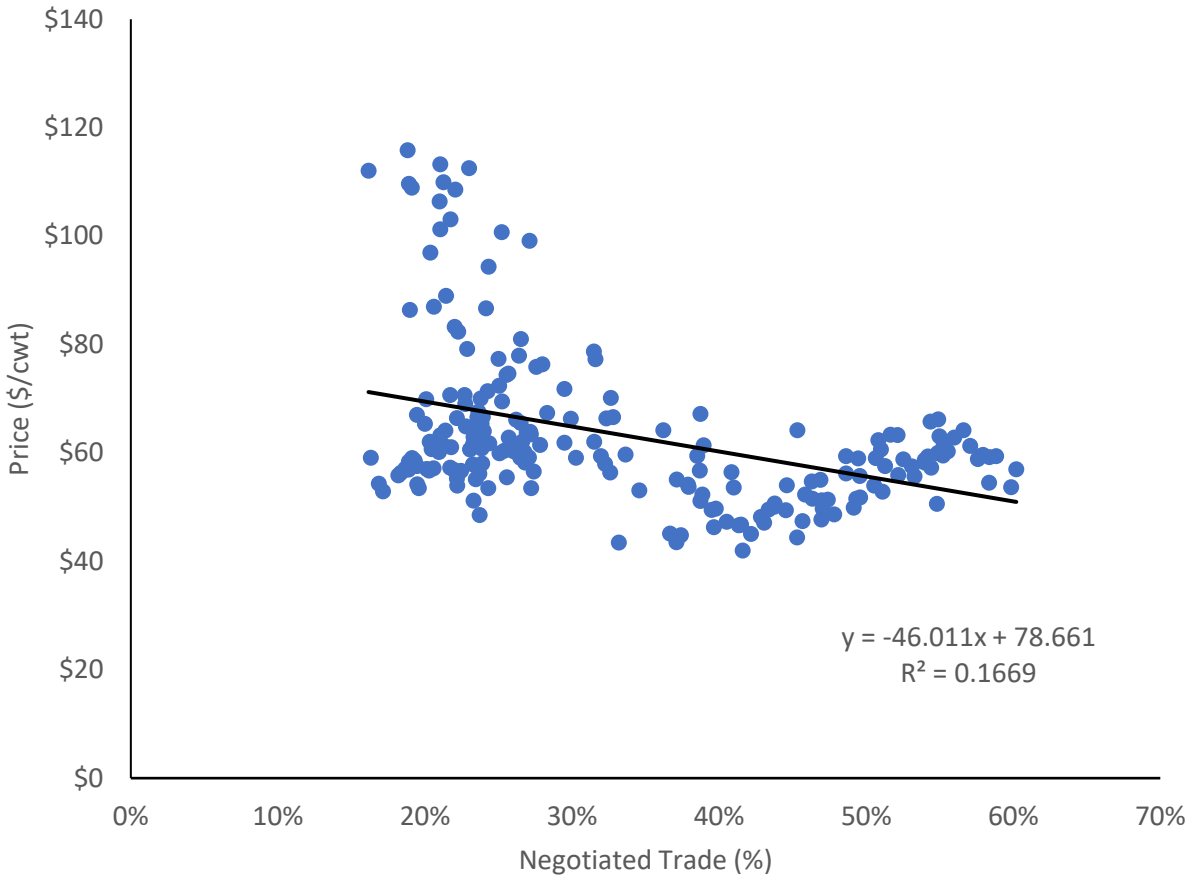
Notes: Negotiated transactions include negotiated grid transactions. Packer owned cattle not included in data.
Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center

Figure 4. Fed Cattle Transactions by Type and by USDA Agricultural Marketing Service Reporting Region: Average for 18 months ending with November 2021



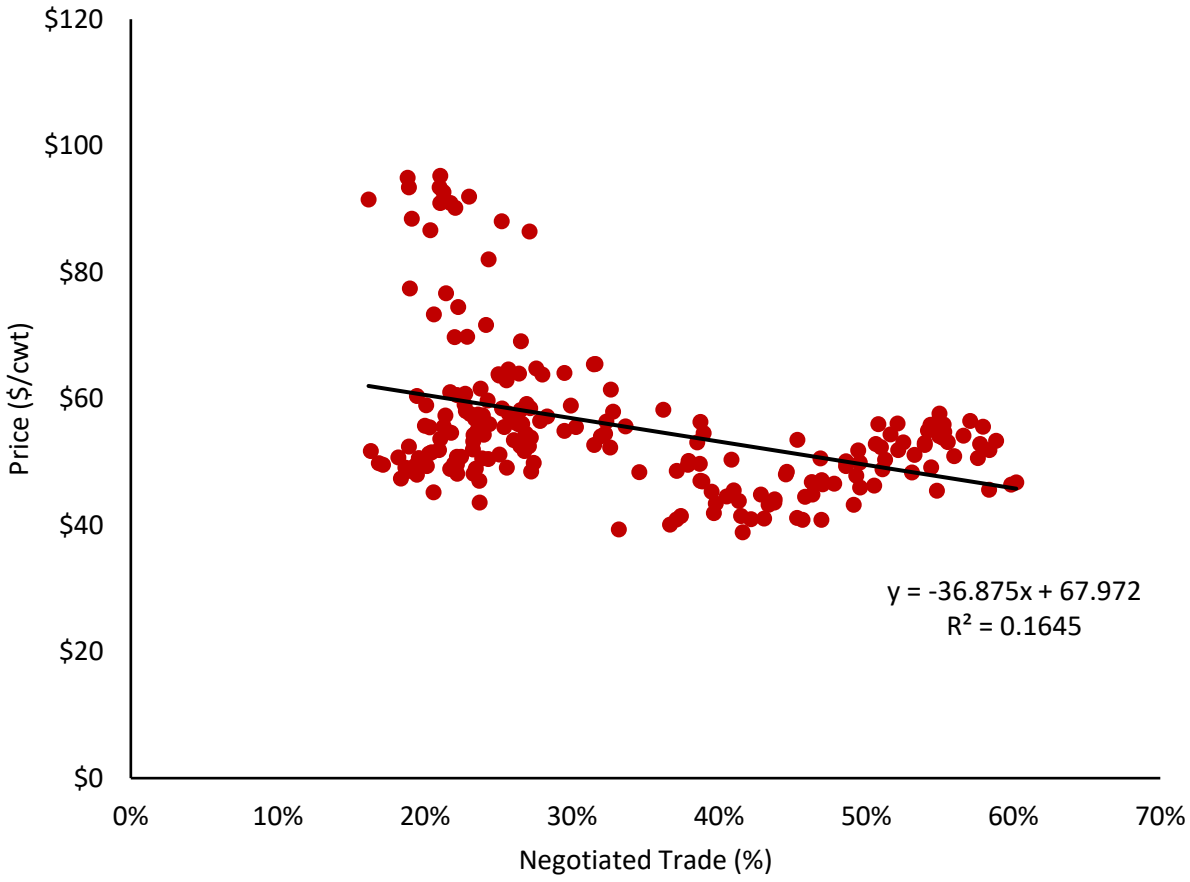
Notes: Decline in stocker and feeder cattle value estimated by Anderson, Martinez, and Benavidez (2021) applied to annual cattle value of production estimates from USDA-NASS for 2016-2020.

Figure 5. Annual Average Decline in Cattle Value of Production for Southeastern Cow/Calf States from the Loss of Alternative Marketing Arrangements



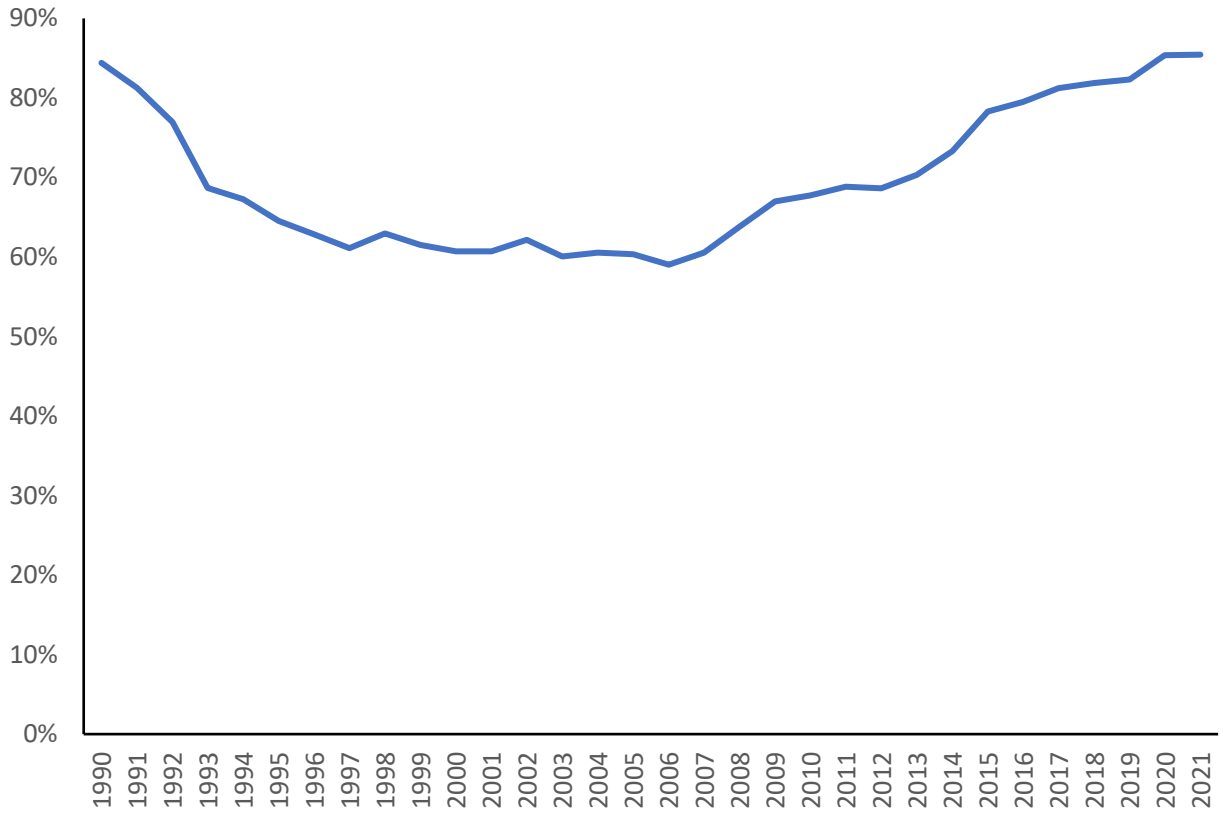
Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center

Figure 6. Relationship between Arkansas calf prices and negotiated cash trade in the 5-area fed cattle market. Prices for 500-600 lb. medium and large number 1 Arkansas steer calves.



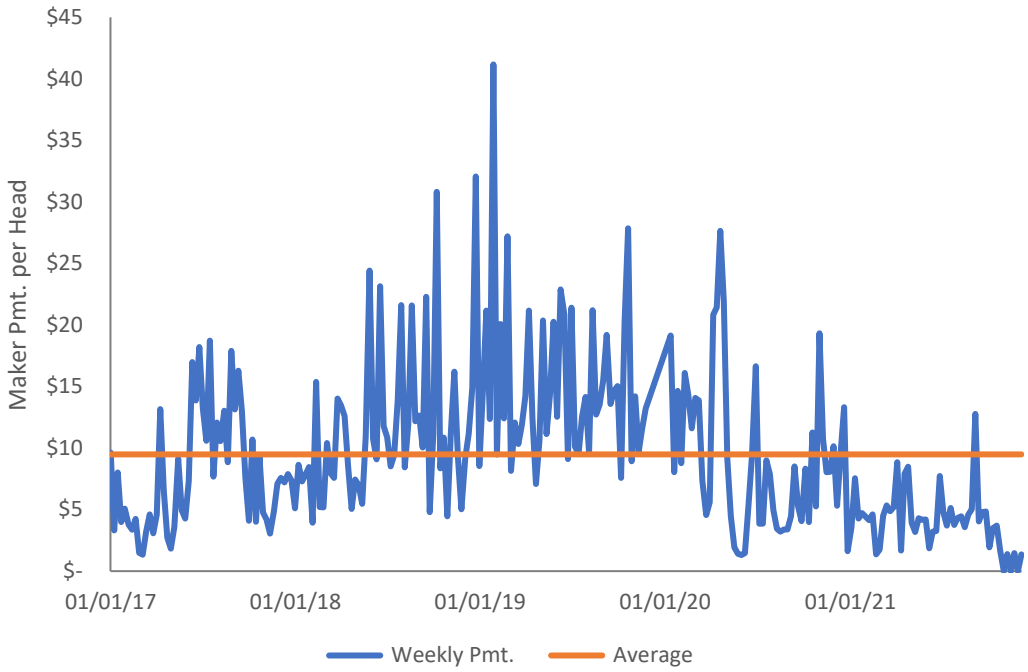
Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center

Figure 7. Relationship between Arkansas feeder cattle prices and negotiated cash trade in the 5-area fed cattle market. Prices for 700-800 lb. medium and large number 1 Arkansas steer.



Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center

Figure 8. Pounds of beef grading choice or prime as a percent of total pounds of beef produced, 1990-2021.



Data Source: USDA Agricultural Marketing Service through Livestock Marketing Information Center

Figure 9. Weekly Market Maker Program Payments (Hypothetical): TX/OK/NM, 2017-2021

Table 1. Variable Names and Descriptions

Symbol	Variable Name	Description
Margin	Farm-to-Wholesale Beef Margin	The choice boxed beef cutout value plus by-product value minus live fed cattle price ($ carcass weight basis).
PLive	Live fed cattle price	The 5-market weighted average live steer cattle price ($/cwt).
PDress	Dressed fed price	The 5-market weighted average dressed steer cattle price ($/cwt).
NTT	Percent negotiated trade	The number fed cattle that were negotiated transactions as a percent of the total number of fed transactions for 5-area markets (%).
NLT	Percent negotiated live trade	The number fed cattle sold on a live basis that were negotiated transactions as a percent of the total number of fed transactions for 5-area markets (%).
NDT	Percent negotiated dressed trade	The number fed cattle sold on a dressed basis that were negotiated transactions as a percent of the total number of fed transactions for 5-area markets.
SLTR	Steer and heifer slaughter	Federally inspected total number of steers and heifers that were slaughtered
BProd	Beef production	Per capita U.S. beef production (lbs. per capita)
PProd	Pork production	Per capita U.S. pork production (lbs. per capita)
YProd	Poultry production	Per capita U.S. poultry production (lbs. per capita)
MCI	Food marketing cost index	The index consists of 50% wages, 10% fuel, rubber & plastics, and general commodities and services, and 5% rent, taxes, interest and repairs (base=2011).
Wage	Wage index	Producer price index for wages (base=2011).
Cutout	Wholesale beef price	Boxed beef cutout value, Choice 600-900 lb. ($/cwt).
ByProduct	By-product value	Farm by-product values for beef (cents/lb.)
PFeeder	Feeder cattle price	Oklahoma City feeder cattle price for medium and large frame, no. 1, 700-800 lb. steers ($/cwt).
PCorn	Corn price	Nebraska average corn price ($/bu.
Choice	Percent choice	The percent of slaughtered steers and heifers that grade choice (%).
Carcass	Average carcass weight	Federally inspected Average dressed weight for steers (lbs.).

Table 2. Descriptive Statistics, N=247

Variable	Units	Mean	Std. Dev.
Margin	$ carcass wt. equivalent	88.97	62.10
PLive	$/cwt	47.26	7.56
PDress	$/cwt	75.05	12.02
NTT	%	0.36	0.13
NLT	%	0.63	0.13
NDT	%	0.22	0.12
SLTR	1,000 head	2178.95	202.59
BProd	Lbs. per capita, retail wt.	6.99	0.59
PProd	Lbs. per capita, retail wt.	6.22	0.59
YProd	Lbs. per capita, retail wt.	11.87	0.81
MCI	Index	96.33	16.93
Wage	Index	46.18	2.96
Cutout	$/cwt	81.01	13.14
ByProduct	Cents/lb.	51.23	9.78
PFeeder	$/cwt	61.37	13.24
PCorn	$/bu	1.69	0.65
Choice	%	0.65	0.07
Carcass	Lbs.	818.57	35.44

Note: Prices deflated to constant dollars (base=1982-84).

Table 3. Maximum Likelihood Estimation Results for the Effects of Fed Cattle Negotiated Trade Volume on Fed Cattle Prices

	Live Price Model		Dressed Price Model	
Variable	Estimate	Std. Err.	Estimate	Std. Err.
Intercept	39.237***	(9.833)	62.473***	(17.318)
Negotiated Live Trade %	1.039	(1.653)	-	-
Negotiated Dressed Trade %	-	-	2.654	(5.031)
Slaughter	0.000	(0.001)	0.001	(0.001)
% Choice	13.213	(8.586)	18.903	(14.249)
PPI Wages	0.047	(0.156)	0.206	(0.249)
By-Product Value	0.026	(0.018)	0.056*	(0.028)
Cutout Value	0.091***	(0.011)	0.166***	(0.017)
OKC Feeder Price	0.440***	(0.026)	0.687***	(0.042)
NE Corn Price	2.028***	(0.477)	3.258***	(0.752)
Avg Carcass Wts	-0.051**	(0.016)	-0.089***	(0.024)
Feb	-0.517	(0.329)	-0.962*	(0.512)
Mar	-1.373**	(0.491)	-1.909*	(0.770)
Apr	-2.624***	(0.700)	-4.324***	(1.115)
May	-3.815***	(0.776)	-6.515***	(1.247)
Jun	-4.661***	(0.723)	-7.832***	(1.169)
Jul	-4.340***	(0.616)	-6.906***	(1.004)
Aug	-3.611***	(0.594)	-6.132***	(0.970)
Sep	-2.630***	(0.589)	-5.028***	(0.955)
Oct	-0.874	(0.600)	-2.327*	(0.968)
Nov	0.099	(0.520)	-0.531	(0.831)
Dec	-0.207	(0.345)	-0.408	(0.555)
ρ_1	1.044***	(0.066)	1.064***	(0.069)
ρ_2	-0.248***	(0.065)	-0.260***	(0.066)
AIC	816		1033	
BIC	900		1038	
log likelihood	-384		-492	
N	247		247	

*** p<0.01; ** p<0.05; * p<0.1

Table 4. Maximum Likelihood Estimation Results for the Effects of Fed Cattle Negotiated Trade Volume on Beef Marketing Margins

Variable	Estimate	Std. Err.
Intercept	-887.286***	(286.602)
Negotiated Trade %	125.480	(83.112)
Beef Production	-41.093***	(10.833)
Pork Production	-53.340***	(13.274)
Poultry Production	36.300***	(7.575)
% Choice	79.959	(231.389)
Food Marketing Cost Index	-0.151	(0.815)
By-Product Value	0.977*	(0.556)
OKC Feeder Price	-2.662***	(0.631)
NE Corn Price	-8.700	(12.505)
Avg Carcass Weights	1.451***	(0.390)
Feb	-19.801*	(10.125)
Mar	24.786**	(10.788)
Apr	49.042***	(15.114)
May	77.386***	(19.018)
Jun	69.029***	(18.684)
Jul	17.153	(17.186)
Aug	27.917*	(14.365)
Sep	12.972	(12.676)
Oct	7.889	(13.548)
Nov	12.927	(12.539)
Dec	14.540	(10.634)
ρ_1	0.507***	(0.065)
ρ_2	0.290***	(0.071)
AIC	2502	
BIC	2568	
Log Likelihood	-1232	
N	247	

*** p<0.01; ** p<0.05; * p<0.1

Table 5. Correlations between Weekly Changes in Negotiated Live Cattle Cash Prices and Market Surprises with consistent Bull or Bear Market Surprises to Placements and Marketings 2004 – 2013

	Feed	Placed	Marketed	Texas[a]	Kansas	Nebraska	Colorado	Iowa[b]
Feed	1	0.88**	-0.81**	-0.22*	-0.21	-0.18	-0.15	-0.12
Placed		1	-0.71**	-0.25*	-0.25*	-0.21*	-0.20	-0.16
Marketed			1	0.29*	0.27*	0.24*	0.20	0.21
Texas[a]				1	0.97**	0.88**	0.90**	0.83**
Kansas					1	0.91**	0.93**	0.87**
Nebraska						1	0.96**	0.94**
Colorado							1	0.89**
Iowa[b]								1

* indicates the Pearson correlation coefficient is significant at the 10% level on a two tailed test.
** indicates the Pearson correlation coefficient is significant at the 5% level on a two tailed test.
61 observations.
[a]Texas refers to the Texas-Oklahoma-New Mexcio market.
[b]Iowa refers to the Iowa-Minnesota market.

Table 6. Correlations between Weekly Changes in Negotiated Live Cattle Cash Prices and Market Surprises with consistent Bull or Bear Market Surprises to Placements and Marketings 2014 – 2020

	Feed	Placed	Marketed	Texas[a]	Kansas	Nebraska	Colorado	Iowa[b]
Feed	1	0.84**	-0.72**	-0.43*	-0.38	-0.40	-0.31	-0.44*
Placed		1	-0.70**	-0.43*	-0.45*	-0.43*	-0.41*	-0.46*
Marketed			1	0.33	0.37	0.46*	0.41*	0.44*
Texas[a]				1	0.98**	0.95**	0.89**	0.93**
Kansas					1	0.96**	0.95**	0.92**
Nebraska						1	0.92**	0.95**
Colorado							1	0.86**
Iowa[b]								1

* indicates the Pearson correlation coefficient is significant at the 10% level on a two tailed test
** indicates the Pearson correlation coefficient is significant at the 5% level on a two tailed test
18 observations.
[a]Texas refers to the Texas-Oklahoma-New Mexcio market.
[b]Iowa refers to the Iowa-Minnesota market.

Table 7. Hypothetical Market Maker Program Structure for a Regional Fed Cattle Market

Negotiated Trade Percentage	Market Maker Rate	Negotiated : AMA Offset
Below 10%	$1.00/head	1:5
10% to 15%	75% of max. rate	1:5
15% to 20%	50% of max. rate	1:5
Above 20%	No Fee	N/A

Table 8. Market Maker Program Applied to Weekly TX/OK/NM Fed Cattle Marketings: 2017-2021

	Average	Minimum	Maximum
Negotiated Trade %	9.4%	2.2%	23.5%
Maker-Taker Rate/Head	$0.88	$0.00	$1.00
Maker Pmt./Head*	$9.49	$0.00	$41.17
	= $0.00	> $20.00	> $30.00
No. of weeks Maker Pmt. **	3	24	3

*Illustration assumes that 25% of negotiated cattle sold each week were from AMA sellers, thereby offsetting AMA sales at a 1:5 rate. Assuming zero offset would raise the weekly average payment by a little over $1.00 per head.

**252 weeks with data over the 5-year period analyzed.

Appendix A: Author Biographies

John D. Anderson is Professor and Head of the Agricultural Economics and Agribusiness Department and Director of the Fryar Price Risk Management Center of Excellence at the University of Arkansas, taking that position in January 2020. For over 20 years, John has worked as a professional agricultural economist in both academic and industry positions. His work has involved describing and assessing the farm- and sector-level impacts of policy, regulatory, and market developments across a wide variety of agricultural commodities and markets. John has served as a faculty member, with primary appointments in Extension, at the University of Kentucky and Mississippi State University. From 2010 through 2016, he served as the Deputy Chief Economist for the American Farm Bureau Federation in Washington, DC. From 2016 through 2019, John was Chair of the Agriculture department at his alma mater, College of the Ozarks in Pt. Lookout, Missouri (BS, Agribusiness, 1992), where his responsibilities included general management of the school's commercial farm operations. John received his Ph.D. in Agricultural Economics from Oklahoma State University in 1998. He is an Arkansas native, having grown up on a beef and poultry farm in Stone County.

James L. Mitchell is an Assistant Professor in the Department of Agricultural Economics and Agribusiness at the University of Arkansas and an extension livestock economist with the University of Arkansas System Division of Agriculture. James has B.S. and M.S. degrees from Oklahoma State University and a Ph.D. in Agricultural Economics from Kansas State University. Mitchell leads integrated extension and research programs that address issues that span the livestock and meat supply chain. His extension programming primarily focuses on livestock marketing and risk management. Mitchell's recent research has focused on biosecurity and foreign animal diseases, cattle traceability and identification, price discovery in fed cattle markets, and beef and livestock trade.

Andrew M. McKenzie is a Professor in the Agricultural Economics and Agribusiness Department and Associate Director of the Fryar Price Risk Management Center of Excellence at the University of Arkansas. He is a native of South Shields, Tyne and Wear, England. He specializes in price risk management, futures and options markets, grain marketing, and applied time series analysis. Andrew joined the faculty of the AEAB Department in December 1998. His current research interests include the role of transportation in grain marketing, price risk management strategies in poultry and grain markets, food safety issues, and the informational role played by financial and commodity markets in transmitting price signals. He has published over 30 refereed journal articles about commodity futures markets and is a nationally recognized expert in grain basis trading. His research relating to financial and futures market information and efficiency has been published in some of the most prestigious economics journals, including *Journal of Applied Econometrics*, *American Journal of Agricultural Economics*, and *Journal of Futures Markets*.