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## ECONOMIC FACTORS IMPACTING THE CATTLE INDUSTRY, THE SIZE OF THE BEEF COW HERD, AND PROFITABILITY AND SUSTAINABILITY OF COW-CALF PRODUCERS

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While industrial organization, industry concentration, and market power have been an important research topic for agricultural economists, it was clear that the content of this research has not been communicated to policy makers, industry members, and the media. Likewise, it is clear that the economic factors that have impacted the cattle industry for the past 10 to 30 years are not common knowledge beyond that industry. The purpose of this fact sheet is to offer a short summary of those factors and hopefully have a modest impact on the current policy discussion.

Often, I have seen concerns expressed over the shrinking size of the beef cattle industry – both in numbers of beef animals, most notably the beef cow herd, and the number of beef cattle producers. This was done often at the USDA/DOJ Competition Workshop in Fort Collins, Colorado, that was held during August of 2010. But good intentions can lead to poor policy if the policy alternatives are at odds with the facts or the science. A number of people have communicated that concentration is the only problem facing the cattle and beef industry and that the meatpacking industry is the main cause of most economic problems. The purpose in this document is to offer a summary of the economic factors that have impacted the beef industry over the past years and see if the meatpacking industry is the main problem.

### Supply and Demand

Figure 1 is a representation of the total cattle inventory in the US as of January 1 each year. The figure easily communicates the concerns expressed by a number of participants at the competition workshop. The cattle inventory in the US grew strongly from the 1930s through the mid-1970s and peaked at over 130 million head. The presence of the boom and bust cattle cycle is also easily seen. But something changed in the 1970s. Since the mid-1970s the inventory has declined substantially – while the cattle cycle persisted. A number of speakers at the competition workshop compared statistics between 1980 and 2009. Across this time period there has been a loss of approximately 20 million animals from inventory. What are the biggest causes of this?

Figure 2 presents the beef demand index that is much used in extension education, is tracked and published by a number of market followers, and was developed by Wayne D. Purcell at Virginia Tech in the mid-1990s. Dr. Purcell developed the index to facilitate demand education efforts with producers following the demand declines that were observed during the late 1980s. What does the index do? The index holds supply and inflation constant, and communicates an index

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Figure 1. Total Cattle Inventory

### JANUARY 1 TOTAL CATTLE INVENTORY U.S., Annual

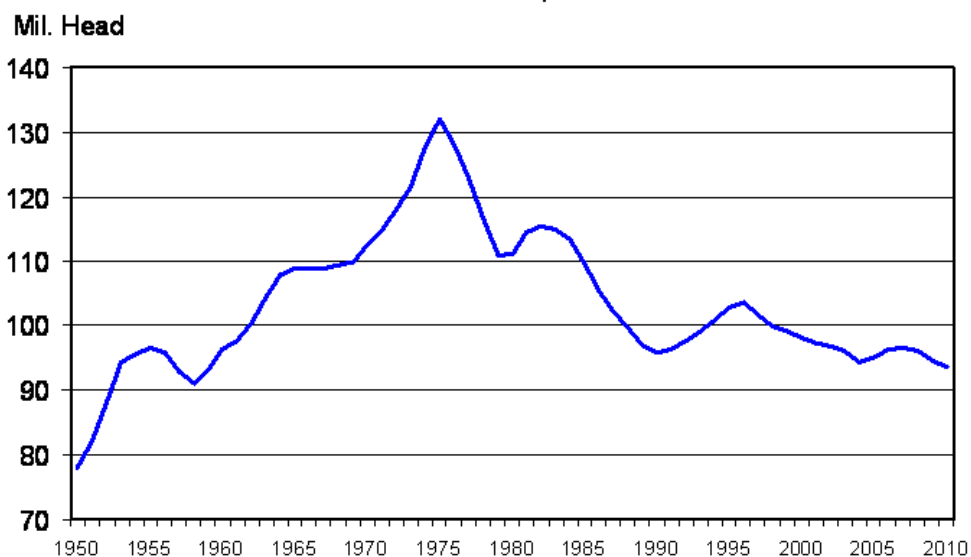
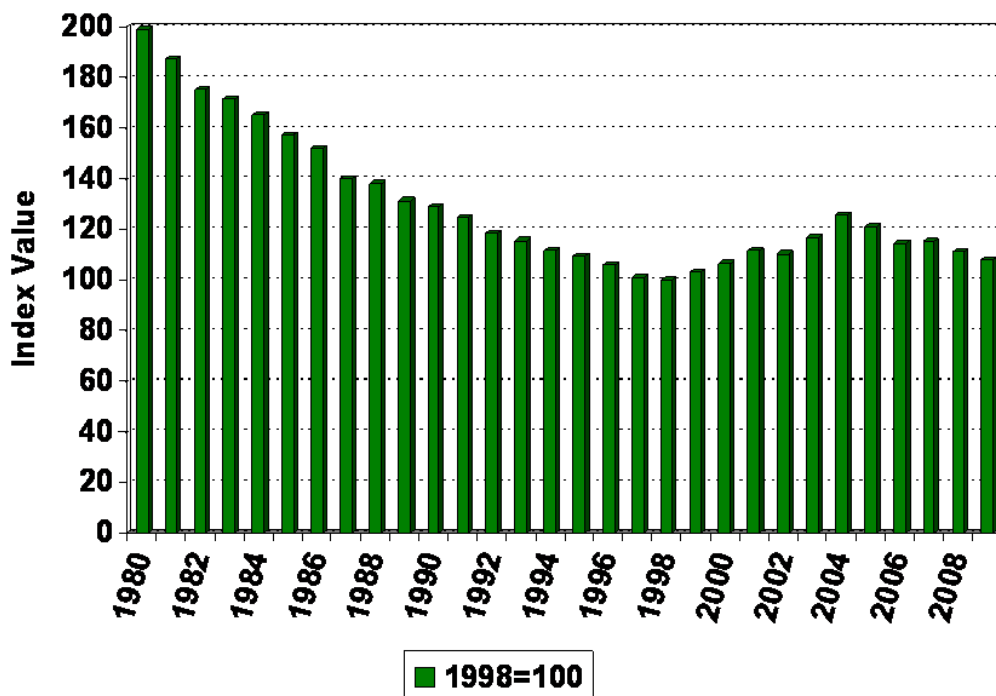


Figure 2: Retail Beef Demand Index.



of the consumers' willingness to pay for beef. For example, the index was approximately 200 in 1980 and had fallen to approximately 100 in 1998. What does that mean? It means between 1980 and 1998 that the US consumers' demand for beef approximately halved. This can only be described as catastrophic. In 1998 the consumers' willingness to pay for beef was half of that in 1980. This is without a doubt the single most important economic factor impacting the cattle and beef industry. Further, it is a well-known phenomenon. It is largely why the beef industry has a check-off program. It is why the industry invests in new product research and methods to improve beef quality. The only issue – in my mind – that is worse than this demand change is if demand would have continued to decline from 1997 until 2010. If the trend of the 1980s and 1990s is extrapolated into the 2000s then the index could be between 70-80% and this implies that beef and cattle markets would be 20-30% weaker than the prices we see at the end of 2010.

Is this demand decline a problem caused by the meatpacking industry? It is possible that the concentrated meatpacking industry added to this problem but industry structure is not the cause. The beef demand index presented makes use of a retail beef price and is thus not a price due to the packing industry. This price is determined before the packer and in the interface between the consumer and retailer. In fact, the meatpacking industry was negatively impacted by changes in beef demand. Declining demand makes maintaining market share and innovation difficult. And emphasizes cost cutting and cost management.

Figures 3 and 4 illustrate what was happening with production during the years of declining demand. While figure 1 shows a smaller cattle herd, the pounds of beef produced in 2009 is comparable to that produced in 1980 with 20 million fewer animals. How can the cattle industry produce as much beef with fewer cows? Increased productivity is the answer. The cattle industry thoroughly adopted Continental breed genetics into what was typically an English breed herd. The industry has also improved animal nutrition, animal management, and makes use of growth promotants. The bottom line is that beef production per cow has grown almost 150 pounds per animal. About 500 pounds of beef was produced per cow in 1980 and that number has increased to almost 650 pounds per cow in 2010. That is a 30% increase in productivity. It is an interesting and alarming exercise to think about what cattle and beef prices would be had the industry

maintained a 115 million head herd, experienced a 30% increase in productivity, and experienced the 50% demand decline. To focus on the numbers of beef cows and numbers of beef producers without considering demand and productivity is tunnel vision.

The important take-home message is that changes in demand and supply have had a substantial impact of the size of the cattle and beef industry and the number of producers participating in that industry. And have nothing to do with concentration and the packing industry.

### **Other Costs and Other Factors**

The changes in supply and demand are long term changes that clearly impact the shape of the current cattle and beef industry. What about other – shorter term – factors? In the early 1980s, trade played a minor role in cattle and beef markets. Less than 2% of production was exported and imports amounted to less than 4% of consumption. Trade was simply not important. The 1980s and 1990s changed all that. Beef exports grew considerably, relative to imports, over these 20 years. (See exports Figure 5.) By the late 1990s, net exports added \$1 billion to \$2.5 billion annually to the beef industry. The value of beef trade is presented in Figure 6. However, this new money disappeared in 2004 with the discovery of BSE in the US and the closing of world markets to US beef. Several important markets reopened immediately but trade of beef in 2010 has not yet returned to the levels established prior to 2004. Simply put, these are lost opportunities for cattle producers. This is money not made, product not sold to a consumer who values it most, and the losses in wealth over the last 7 years that can simply never be recovered.

Figure 7 presents a graphic of the University of Nebraska's Drought Monitor map for each August from 2000 until 2009. In only two or three of the past ten years has there not been drought within areas of the US with significant beef cow numbers. Persistent drought also appears to cause permanent economic losses to the cattle industry. During times of drought beef cows are sold and producers often exit the industry to not return.

Figure 8 presents the national average corn price paid to farmers from 1986 until 2010. There is one price spike upward prior to 2006, and that year was 1995, and 1995 was a drought impacted year. Prior to 2006,

Figure 3: Beef Production (Red Line) and Cattle Inventory (Blue Line)

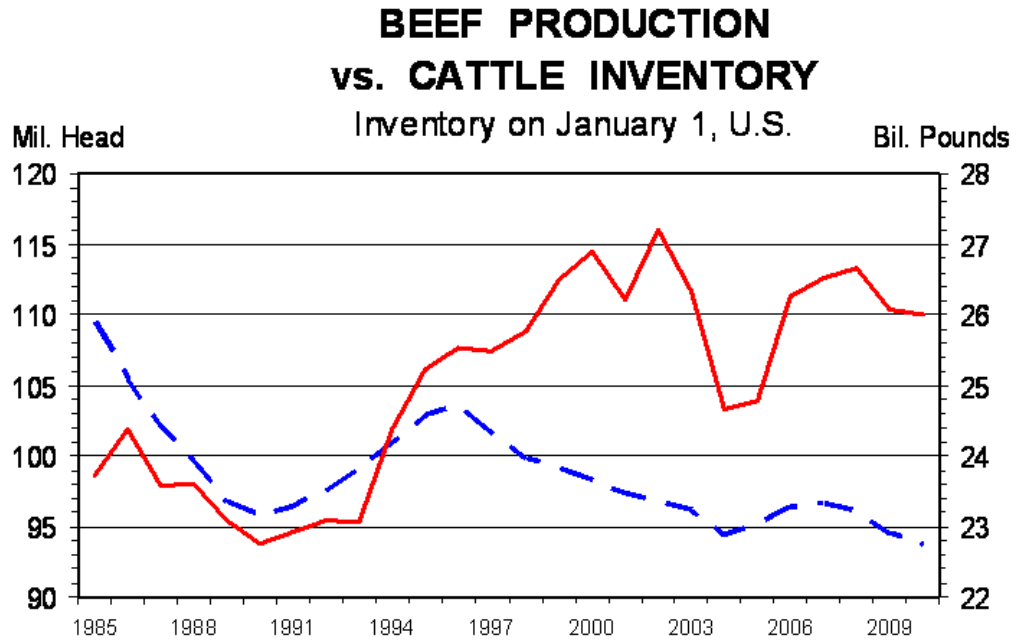


Figure 4: Beef Production Per Cow in the U.S. Inventory

### BEEF PRODUCTION PER COW 1984-2010 (Est.), Annual

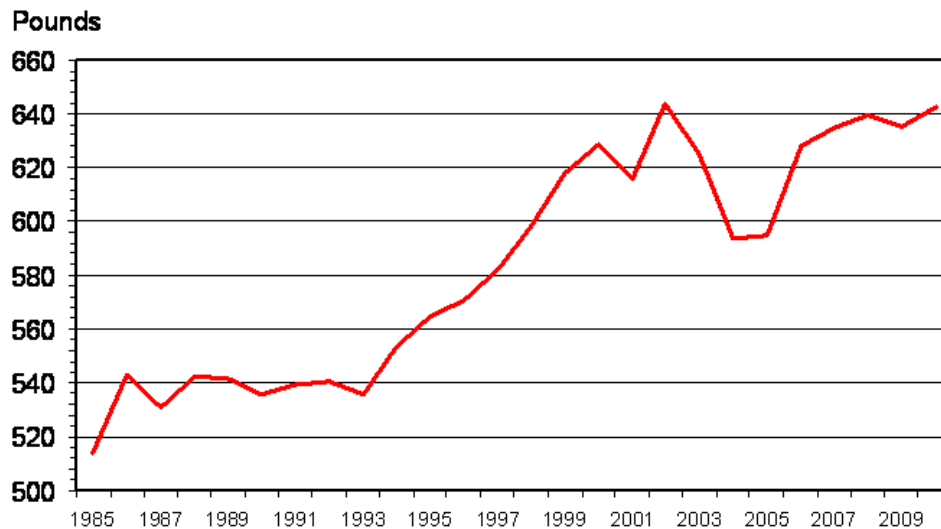


Figure 5: US Beef Exports as a Percent of Production

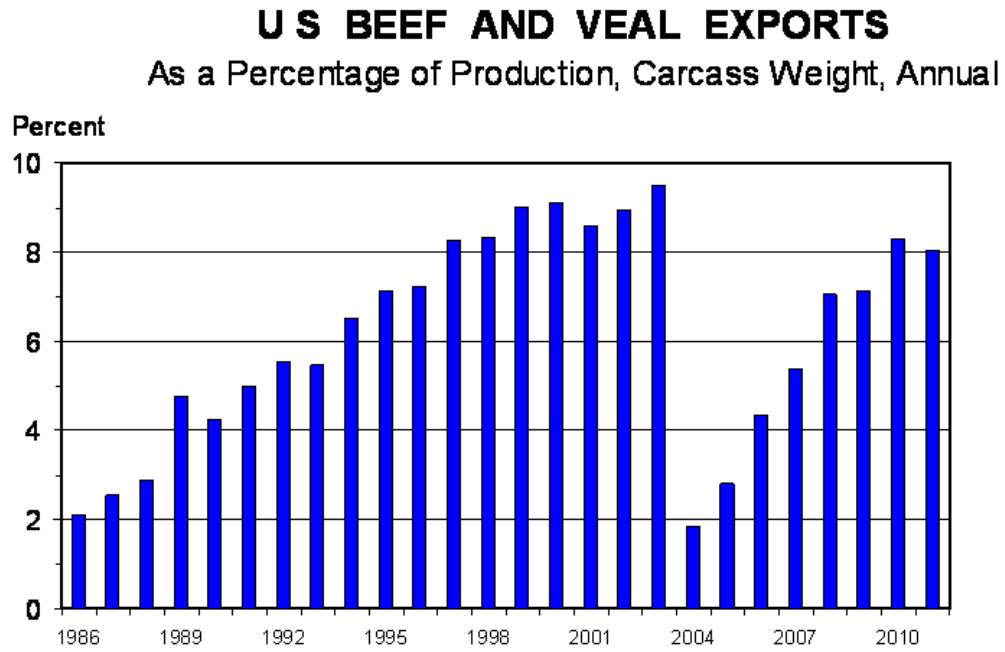


Figure 6: The Value of Exports of Beef and Cattle Net of the Value of Beef and Cattle Imports

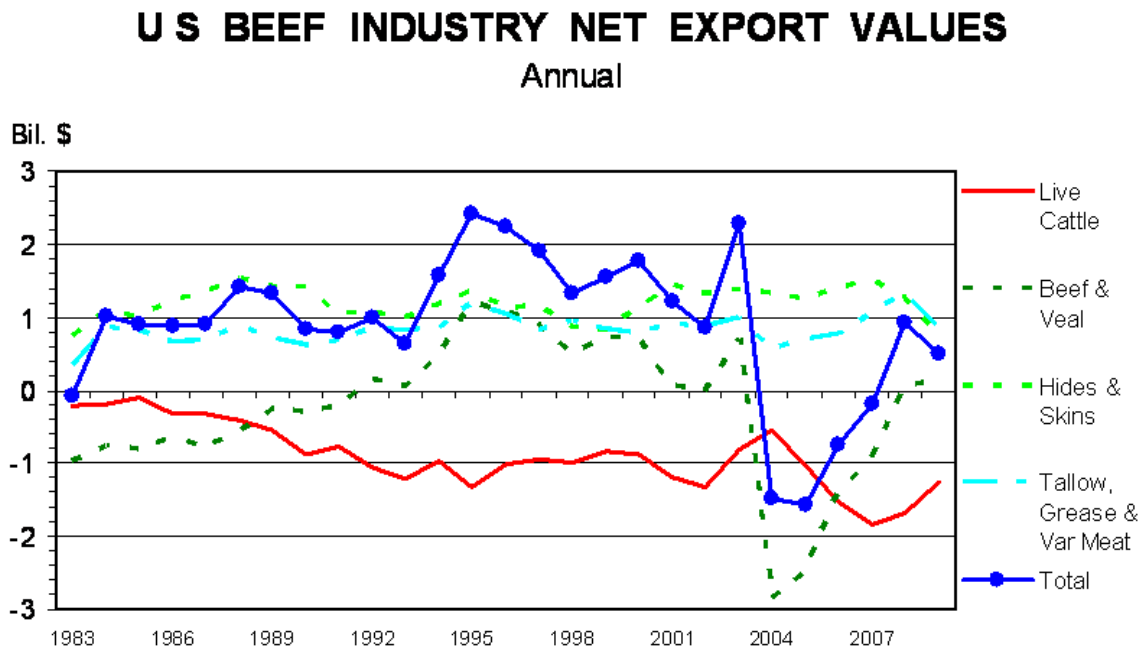


Figure 7: Drought Monitor Maps for Each August from 2000 to 2009

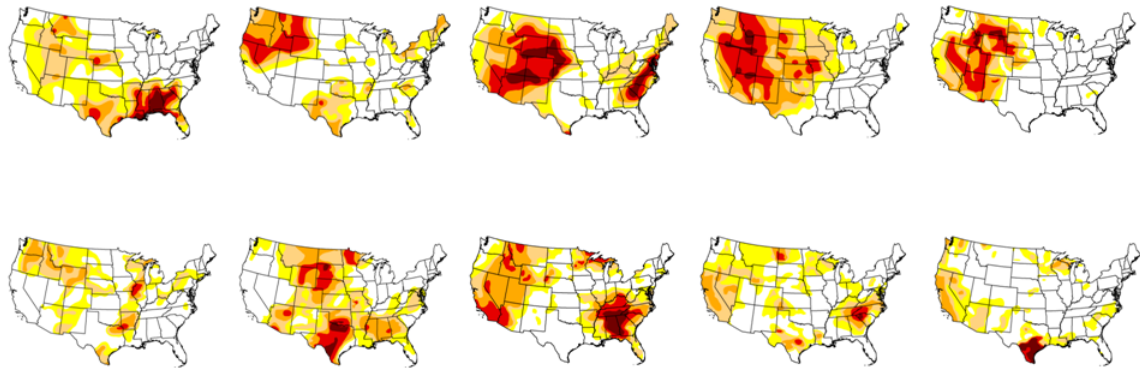
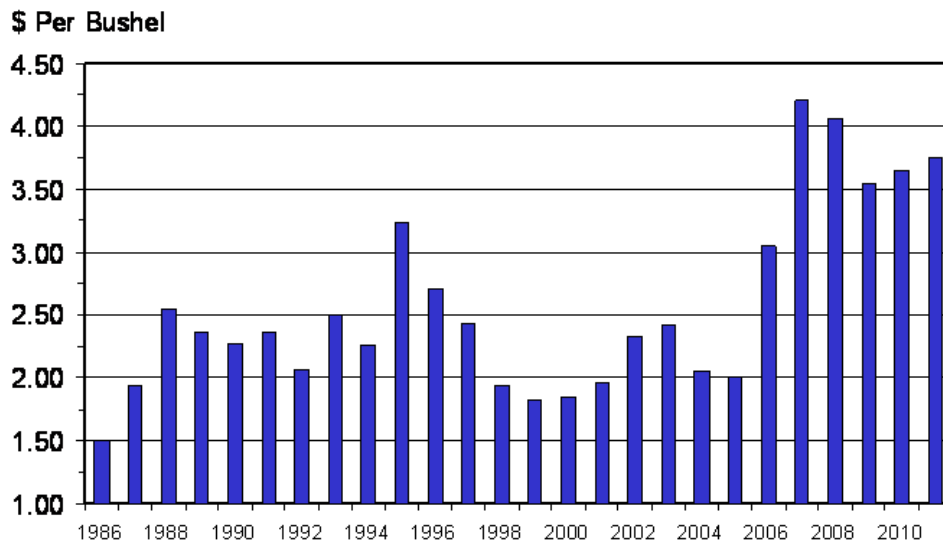


Figure 8: US National Average Corn Price Paid to Farmers

### NATIONAL AVERAGE CORN PRICE Crop Year, Received by Farmers



the corn market is predictability between \$1.50 and \$2.40 per bushel. After 2006 however, the price averages well above \$3.00 per bu. This is a substantial cost that impacts all of animal agriculture – probably impacting cattle the least – but impacting all animal agriculture nonetheless. And if growing and feeding costs increase then it is simple economics that prices paid for calves must be less. Figure 9 shows the

returns to cattle feeding using a USDA Economic Research Service budget. The missing piece to this cash returns series is returns from hedging and risk management. But the impact post-2006 is clear. Corn prices and the demand for corn-based ethanol that drove corn prices higher have had a considerable impact on cattle feeding enterprises and on prices that can be paid for calves and feeder cattle.

Figure 9: USDA Calculated Monthly Returns to Cattle Feeders

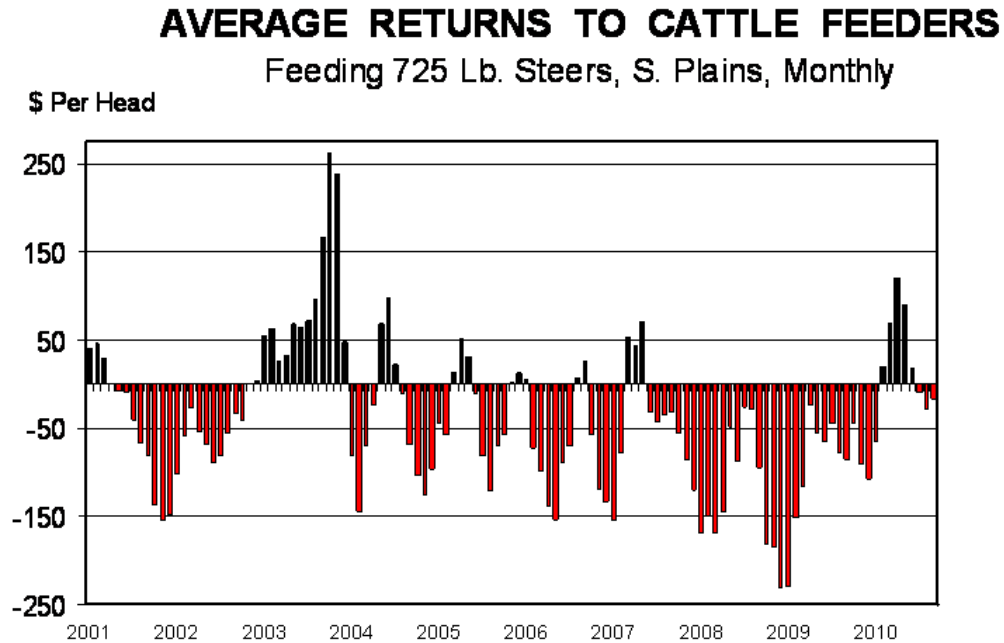


Figure 10 presents futures prices for light-sweet crude oil since the early 1980s. Prior to 2000, \$40 per barrel was a problem. It was a problem because such a high price would result in a slowing economy and a strong chance for a recession. Now, \$40 is also a problem but for the opposite reason. When we observed \$40 oil in 2008-09 it meant that the economy was growing so slow that the economy is in the biggest recession since the Great Depression. This fundamental change in energy prices, and in the prices for all energy intensive inputs that production agriculture needs, has had a substantial impact on production agriculture including cattle production.

Finally, while interest rates are at historical lows and have been since the early 2000s, there remains a credit crisis and difficulty in financing high risk enterprises. And high risk defines production agriculture and the cattle industry.

Thus, the numbers of other factors that impact costs one way or another all appear to stack one way and negatively impact the profitability of beef cattle production. These factors – as well as changes in demand and productivity – may be well known and experienced by many. But these factors were not discussed much at the competition workshop. Many were never

mentioned. There was almost no mention of demand, no mention of increased productivity, almost no mention of trade, no meaningful mention of corn prices and feeding costs, almost no mention of high input costs and limited access to capital. This lack of a grounding of the discussion in facts is a problem that has the potential to lead to poor policy choices. Economic realities need to be recognized in the policy arena. If policy choices the focus on minor economic issues then they will have little positive impact. And always have the potential for unintended consequences and negative impacts.

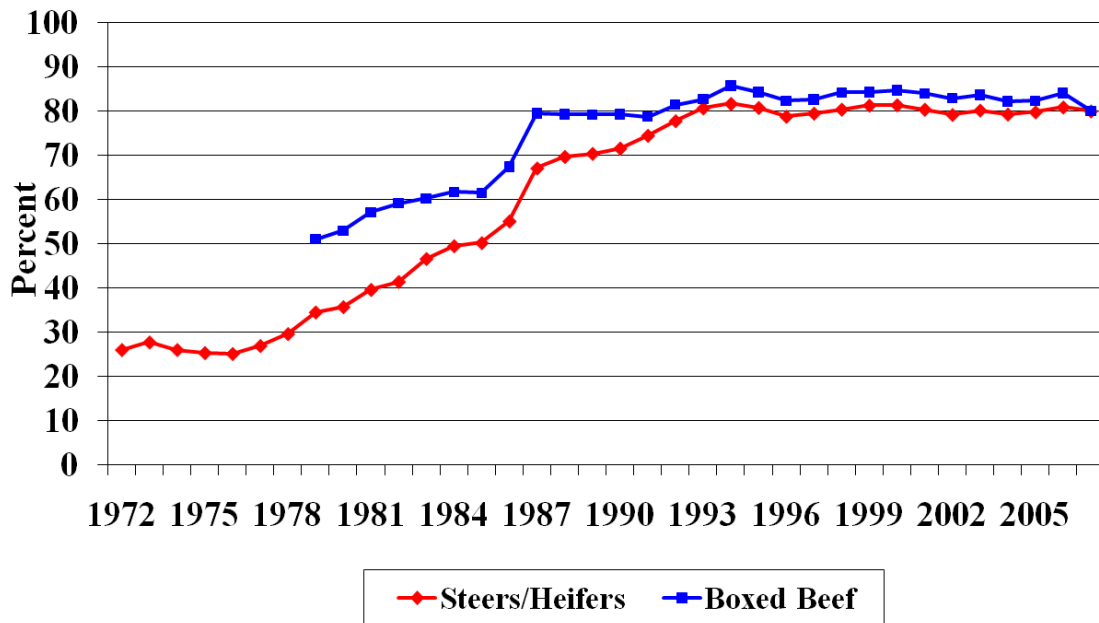
#### **Meatpacking Concentration and Economic Issues**

The issue that was much talked about in Fort Collins was the level of concentration within the meatpacking industry. Figure 11 presents the percent of steer and heifer slaughter and the percent of boxed beef production by the four largest beefpacking firms. The four largest firms slaughter and fabricate into boxed beef slightly more than 80% of the industry totals. This is a concentrated industry by any measure or comparison. However, it is not unprecedented – examine the software industry – and the concentration in the meatpacking industry has not changed since the late 1980s. The names of the firms have changed but the location and

Figure 10: Monthly Average Closing Prices for Crude Oil Futures Contracts



Figure 11: Four-Firm Concentration Ratio for Fed Steer and Heifer Slaughter and for Boxed Beef Production





composition of plants and company headquarters have generally not.

So what are the issues and what can be done about it? First, students of industrial organization know that measures of concentration – while easy to document – are not informative as to conduct. And it is conduct that is important. It is not illegal to be a monopolist but it is illegal to act like one. Monopolies – based on economic justification – may impart economic benefits as well as have the potential extract economic rents. Second, considerable research has been conducted into whether the level of concentration in the meatpacking industry has had bad economic outcomes. A multitude of research has been conducted and published in scientific journals as to this question. The research began in the 1940s, bloomed in the 1960s and 1970s, and had serious limitations of the early fruits addressed in the 1980s, 1990s and 2000s. What can be learned from 50 years of research?

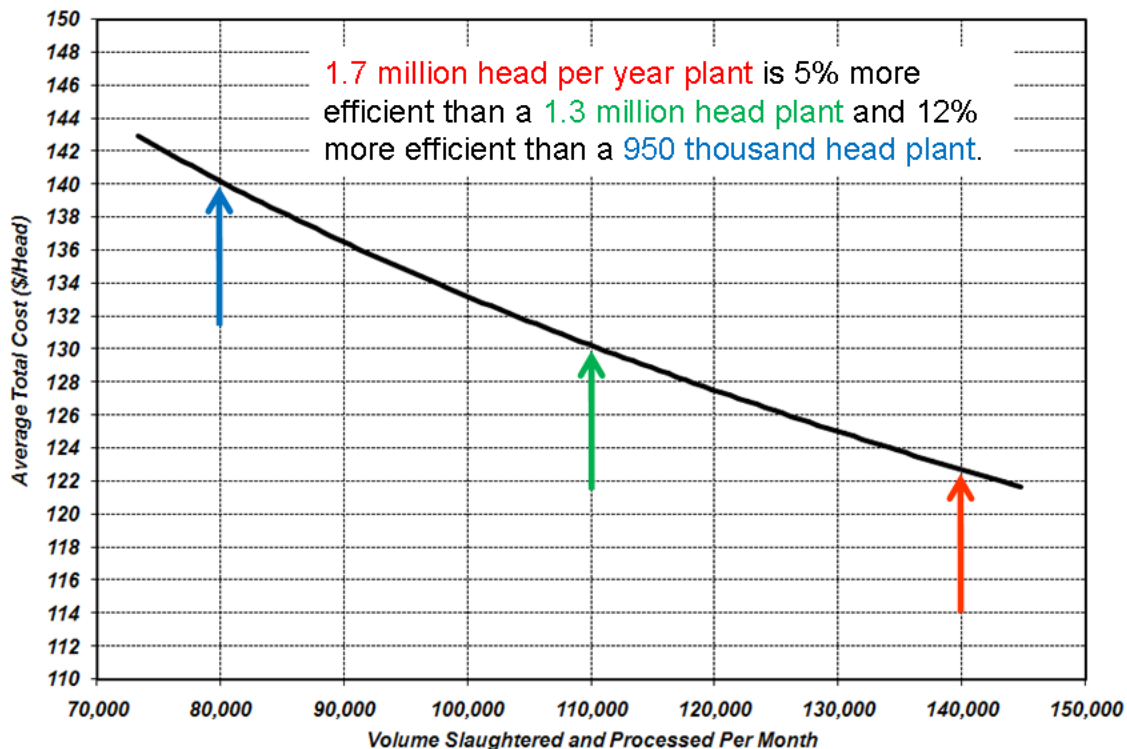
First, the variety of ways to measure market power and the negative impact of monopolies – or monopsonies in the case of meatpacking – are considerable. And there is no unifying approach or study. There are simply a multitude of measures from a multitude of

studies. What do these studies find? Everything can be found if one is selective. There are studies where substantial market power is found and this a small proportion of the research. There are studies where no market power is found and this is also a small proportion of the research but generally greater than the volume of work showing damaging market power. Far and away the largest portion of research shows significant but modest market power. What the research generally does not say is that the meatpacking industry is in need of antitrust action.

So if it's not market power then what is driving this industry to the high levels of concentration that is seen? Simply put: economies of size. Large plants and large firms can slaughter and fabricate beef far more efficiently than smaller counterparts. The large firms can pay slightly more for inputs such as cattle than their smaller counterparts, secure larger market shares, and eventually compete the smaller firms out of business. Thus, over time smaller plants and firms disappear and/or are replaced by larger plants and firms.

Figure 12 offers an example from the 2007 USDA GIPSA RTI Livestock and Meat Marketing Study.

Figure 12: Average Total Costs of Slaughter and Fabrication Per Head for a “Representative Plant” based on the RTI LMMS



The average cost curve was derived from plant level profit and loss data from the four largest packers. The dollars reported are in \$2003 terms. The largest of the plants can slaughter and fabricate close to 2 million head per year and costs were approximately \$120 per head. The smallest of the commercially viable plants slaughtered and fabricated approximately 1 million head per year and costs were approximately \$140 per head. This example is not unique. While the market power research finds a variety of different measure of market power, the cost economy research solidly finds economies of size. Further, while the 2007 LMMS had access to unique data, there is simply no other research that looks for economies of size and does not find it. Economies of size are well documented.

The logical next question is: do the cost economies offset the measure of market power? This question is much less researched but when it is done the findings clearly state the cost economies are orders or magnitude larger measures of market power. The 2007 USDA GIPSA RTI Livestock and Meat Marketing Study has this finding with respect to Alternative Marketing Agreements (AMAs) which are often called captive supplies. The cost savings and demand improvement related to AMAs is substantially larger than market power exercised through AMAs. As a further concrete example, suppose the large plant in figure 10 was replaced with two "small" plants – this requires believing a 1 million head per year plant is a small plant. The cattle feeder selling into this market would now have two bidders as opposed to one. But the bids from those bidders would both be \$20 per head higher costs and \$20 per head less money with which to bid. It is simply not the case that market power is persistently something on the order of \$20 per head. The question turns on is there sufficient competition within the regional fed cattle markets so that single buyers in any one region effectively are in competition with buyers from other regions. And even the answer to this question is affirmative. The research that attempts to define regional markets finds that all cattle markets are linked and there is no market within the US that is a separate market. The fed cattle market is effectively a national market.

### **Captive Supplies – or More Correctly Alternative Marketing Agreements**

Not only is the packing industry singled out as the problem in cattle and beef markets, there has been a

focus by numerous groups on captive supply cattle. Over the years there have been a number pieces of legislation proposed to prohibit non-cash market methods of marketing fed cattle. What are captive supply or AMA cattle? AMA cattle are animals marketed not through the cash market cattle – AMAs are packer-owned, forward contract, and formula cattle. And within the beef industry, packer-owned and forward contract cattle are relatively small in number and rather stable over time – 5-10% of total marketings within each. So AMAs are primarily formula cattle. The numbers of formula marketings are 30-60% of total.

What is the issue with AMAs? It is argued that AMAs are used by packers to reduce demand for cattle in the cash market and thereby reduce cash market prices. Interestingly, this is a very well studied question. There are a dozen published works where the largest of which are the congressionally mandated 1996 Concentration Study and the 2007 LMMS mentioned above. Both studies examined every transaction in the country during the respective study periods. For the 1996 Concentration Study that was a 13-month study period from 4/1992 to 4/1993. And for the 2007 LMMS that was a 30-month period from 10/2002 through 3/2005. Again, both studies were conducted under the authority of USDA GIPSA and both had access to all transaction by every packer during the study periods. What was found? Strategic behavior by packers in the use of captive supplies was hard to find. And there was very little of any impact on fed cattle prices which could be termed due to market power through the use of AMAs.

Why is that? The arguments against AMAs fail to recognize two important realities. First, AMAs do reduce demand. AMAs reduced the volumes that are purchased in the cash market. But AMAs also reduce supply by the exact same amount. Suppose the packers within a region of the country require 20,000 animals per week. Suppose the cattle feeders within that region routinely have 20,000 animals per week available for sale. The market is arguably in balance: the quantity needed is equal to the quantity available. Next, suppose the packers have available to them 12,000 head of AMA cattle. Demand for fed cattle by the packers is reduced 60%. But AMA cattle are also removed from the available supplies. Thus, it remains that the packers need 8,000 animals that week and there are 8,000 animals available for sale. The market remains in balance.

Second, statements that packers can use AMAs to manipulate the market fail to recognize who makes what decision with respect to the marketing of AMA cattle. The marketing agreements underlying AMAs are always the intellectual property of the cattle feeder. The cattle feeder owns the cattle and makes the decision as to when the cattle are marketed. The cattle feeder contacts the packer and lists the animals that will be marketed one to two weeks later. The packer's decision is choosing the day within the week of delivery. And the price paid is some weekly current or prior week price that is determined by formula. Further, the cattle under formulas almost always are marketed on some type of grid where there are premiums and substantial discounts for improperly marketed animals. There is a base formula price and then premiums and discounts on individual carcasses. In this setting though, where the cattle feeder makes the marketing decision, there is no such thing as captive supplies.

And not only is there strong evidence that AMAs are not used to exercise market power, there is strong evidence that AMAs are important to the beef industry. This is a major finding of the 2007 RTI LMMS.

AMAs allow the producers and packers that use them to improve efficiency. Livestock producers and especially meatpackers have high fixed costs. The larger the volumes of animals that are fed and slaughtered then the per-head costs are reduced. The LMMS found that AMAs allow packers to reduced costs. Packer P&L data showed AMAs resulted in plants operated at high capacity and more predictable volume. Both reduce costs. AMAs also allow packing plants to operate at lower costs regardless. The total increase in efficiency is \$6.50 per head on all cattle slaughtered and not simply the cattle under AMAs. In other words, this \$6.50 per head benefit is on all of the 20-25 million fed animals slaughtered annually during the study period.

Face-to-face interviews with producers also clear reveal efficiency improvements through the use of AMAs. Producers that use AMAs have higher inventory throughput and feedlot turnover. Producers that use AMAs have lower overhead and other non-feed and non-feeder-animal costs. For example, formula yards have fewer feed mills, fewer feed trucks, and fewer personnel than cash market years. The most significant efficiency improvement is from increased throughput. Formula yards simply know when pens will be emptied and can plan for refilling of those pens.

The industry average feedyard capacity utilization is in the high-70% or low-80%. The average capacity utilization for a feedyard marketing under a formula is in the low-90%.

The use of AMAs also has helped improve beef demand. There has been a substantial increase in the amount of branding associated with beef products. The beef industry has transitioned from a total commodity product to a position where close to a majority of the beef sold is branded. From the perspective of the retailer or food service firm, developing and selling a branded product requires a predictable supply. Branded or other value-added characteristics also tend to require some additional service be performed by the producer or feeder. For example, the feeding of vitamin E to cattle increases the shelf life of the beef product in the grocery store. Increasing the shelf life increases the retailer's profitability. There are many other food safety, palatability, and product identification examples. But from the perspective of the producer, providing these services incurs additional costs and requires a guaranteed market with predictable premiums. The development and use of an AMA satisfies all of these requirements.

Finally, AMAs allow for reducing the transactions costs that are associated with using the cash market. Bidding and offering in the cash market requires people and typically these are expensive personnel. Use of AMAs allows the packer to procure cattle with fewer cattle buyers. Use of AMAs allows the personnel within the feedyard enterprise that used to spend 3-4 days per week marketing cattle to perform other functions within the enterprise. Trading cattle through the cash market risks having no trade – or reduced trade – occur. In this situation, cattle may be marketed at less than idea or optimal weights and quality. Packers risk having too few or too many animals of desired quality mix purchased. Uncertainty in sales and procurement is simply a cost. These are transactions costs. And AMA use allows for the elimination of all of these transactions costs.

The economic justification for AMAs is clear as is the importance of AMAs to the cattle and beef industry – especially at the cow-calf and feeder cattle producer levels. AMAs allow for the substantial reductions in costs in the cattle and beef production and marketing system. AMAs are the preferred method of coordination cattle production and marketing so that higher

value and value added beef products can be sold to consumers that value and demand them. Reduced costs and improved demand results in higher beef prices, higher fed cattle prices, and higher feeder cattle and calf prices.

### **Summary**

The economic factors that have impacted and are impacting the beef industry are large in number and relatively complex. There are no simple policy prescriptions as to how to improve the profitability and sustainability – there is not one thing that needs done. And it is certainly not a concentration or market power issue.

The main issue which the beef industry must address and continue to address is demand. A return to persistent declining demand will result in a smaller beef industry. This is especially the case with continued and persistent improvements in productivity. Any and all institutions and innovations that improve demand will benefit the industry.

Perhaps the simplest thing that can help the beef industry is increased trade through the opening of international markets. Trade dollars are new dollars and

clearly the benefit the beef industry. The current ethanol policy that the country has implemented is also a clear big impact on the beef industry – and every meat industry. My point is not to advocate a policy change but it needs to be recognized that the new high-priced corn market that is ethanol demand drive has negatively impacted every meat industry in the country and is the main cause for higher priced meats to consumers – domestic and foreign.

The conclusion from research is that the cattle industry has benefited from the more concentrated packing industry. Improvements in efficiency are substantially larger than any measures of market power. And these improvements in efficiency result in high fed cattle, feeder cattle and calf prices.

Finally, the conclusion from research is that the cattle industry has benefited from the development and use of AMAs. These tools represent economic innovations. They reduce costs through improving efficiency. They facilitate coordination in production and marketing of high value and value added beef products. They reduce transactions costs. And, like more concentrated industry, these improvements in efficiency result in high fed cattle, feeder cattle and calf prices.