Testimony on

Examining Markets, Transparency, and Prices from Cattle Producer to Consumer

to

The Committee on Agriculture, Nutrition, and Forestry of the United States Senate

Dustin Aherin, PhD

Vice President, RaboResearch Animal Protein Analyst

Rabobank

June 23, 2021

Chairwoman Stabenow, Ranking Member Boozman, and members of the committee, thank you for inviting me to join the discussion today. As an animal protein analyst for Rabobank, which is engaged across the entire beef supply chain, I assist in strategic decision making for both the bank and the bank's clients by offering a research-based perspective on fundamental market dynamics and future trends.

Summary

Major US beef supply chain disruptions over the past two years have sent the cattle and beef industry into uncharted, but explainable territory. The imbalance of excess market-ready cattle supplies in the face of reduced operational packing capacity has put downward pressure on cattle prices. Meanwhile, consumer demand for beef and all animal proteins has reached record levels, fueled by pandemic stockpiling, increased and reallocated consumer income, and more recently, restaurant re-openings, not to mention export demand. These dynamics, combined with elevated processing costs, have increased the spread between beef price and cattle price, just as economic principles, past research, and historical market relationships would suggest. Both the direction and magnitude of the price spread are well within the range of expectation.

Like many businesses, the pandemic has created enormous challenges for cattle producers. Seeing the price difference between cattle and beef has only added to the emotional strain. I understand the frustration. I've owned and bred cattle most of my life, and I have friends and family that make a living ranching and feeding cattle. However, with stakeholders that are invested throughout the entire supply chain, from rancher to packer to retailer, I have to look at the beef industry from an objective, analysis-based perspective.

First, cattle are not beef. Cattle are one of several inputs into beef production. Other major inputs include labor, physical capital, and technology. These inputs are always seeking, but never finding, the perfect balance between one another. This creates cycles. Input imbalances are communicated

through prices, whether that's cattle prices, wages, or investments. Over the past several years, extreme and unexpected events have severely restricted several of these inputs. For example, facilities in the August 2019 Tyson plant fire and labor during the pandemic. A working market sends price signals to adjust. These same price signals created record high cattle prices and packer losses in 2014 and 2015.

The biology and natural time-delays of the beef industry make it slow moving and capital intensive. Adjustments take years. While recent, unforeseen events have exacerbated the situation, free market signals, economic losses, drought, and the natural cattle cycle laid the foundation for today's circumstances over several decades.

Beef packing has historically been a low margin business. In the year 2000, with a total cattle population of 98 million head, the US harvested nearly 30 million head of fed cattle. By 2014 and 2015, the total cattle population was below 90 million head with 2015 fed cattle slaughter under 23 million head. Throughout this period of largely drought induced beef cow herd contraction, the most inefficient packing plants were driven out of business as competition for limited cattle supplies drove cattle prices to record highs. From 2000 to 2015, the US beef industry experienced a net decline of roughly 14,000 head per day in fed cattle processing capacity.

Even before the extremes of 2020, recent margins suggest that there is opportunity to add packing capacity. However, that opportunity does not come without significant risk. First, the upfront cost of a new or expanded plant is extremely expensive. Industry sources estimate that a new plant costs USD 100m to USD 120m for every 1,000 head of daily capacity. Increasing construction costs over the past year likely put current costs near or even above the high end of that estimate. Then, a new endeavor must meet regulatory requirements, build a labor force, and keep enough cash on hand to absorb losses. It's not just about building facilities, it's about building a business model.

In response to the described market signals, numerous plans for greenfield plants or expansions of existing facilities have been unveiled in recent months. These plans come from new entrants, minor incumbents, and major incumbents alike. If all of the announced plans for plant construction and expansion come to fruition, roughly 8,000 head of daily fed cattle capacity and nearly 2,000 head of daily non-fed capacity could be added to the US beef industry over the next five years. Recognizing current drought conditions, if the beef cow herd declines by 2% or less, there's opportunity for about 5,000 head per day of profitable packing capacity expansion.

A note of caution. There is a point where industry capacity expansion goes too far to withstand cyclical periods of tight cattle supplies. The long-term cattle cycle, drought risks, and market fundamentals must be considered.

Whether in new or existing plants, increased technology implementation will be a critical component of future success. Recently, many packers have revitalized their focus on technology development as a means to address labor challenges, manage processing costs, and reduce product waste. Enlightened by the pandemic to the long standing labor shortages in the meat industry, many startups are also bringing outside expertise and perspectives to advance technology and automation in the meat supply chain.

With any luck we will work through the long tail of 2020's cattle backlog in Q3 2021. As such, year-over-year cattle prices will rise in 2H 2021 and beyond. In conjunction with tightening cattle

supplies, capacity expansion will come online over the next several years and new technologies will reduce labor constraints, further shifting margins to the benefit of cattle producers.

In closing, the shocks to the beef industry over the last couple years have presented the entire beef supply chain with enormous challenges. The resulting price movements have been frustrating for cattle producers, to say the least. Yet, these same price movements and supply chain disruptions have also contributed to the accelerated investment in packing capacity expansion, new technologies, and new business strategies that will help the beef industry adapt and evolve to ever changing demands. That's the market at work.

Beef Production is a Balancing Act

Before advancing the conversation, it's important to note the difference between cattle and beef. In a simple equation form, a recipe if you will, beef can be represented as the output from the combined inputs of cattle, human labor, physical capital (e.g. facilities), and technology.

$$Beef = Cattle + Labor + Physical\ Capital + Technology$$

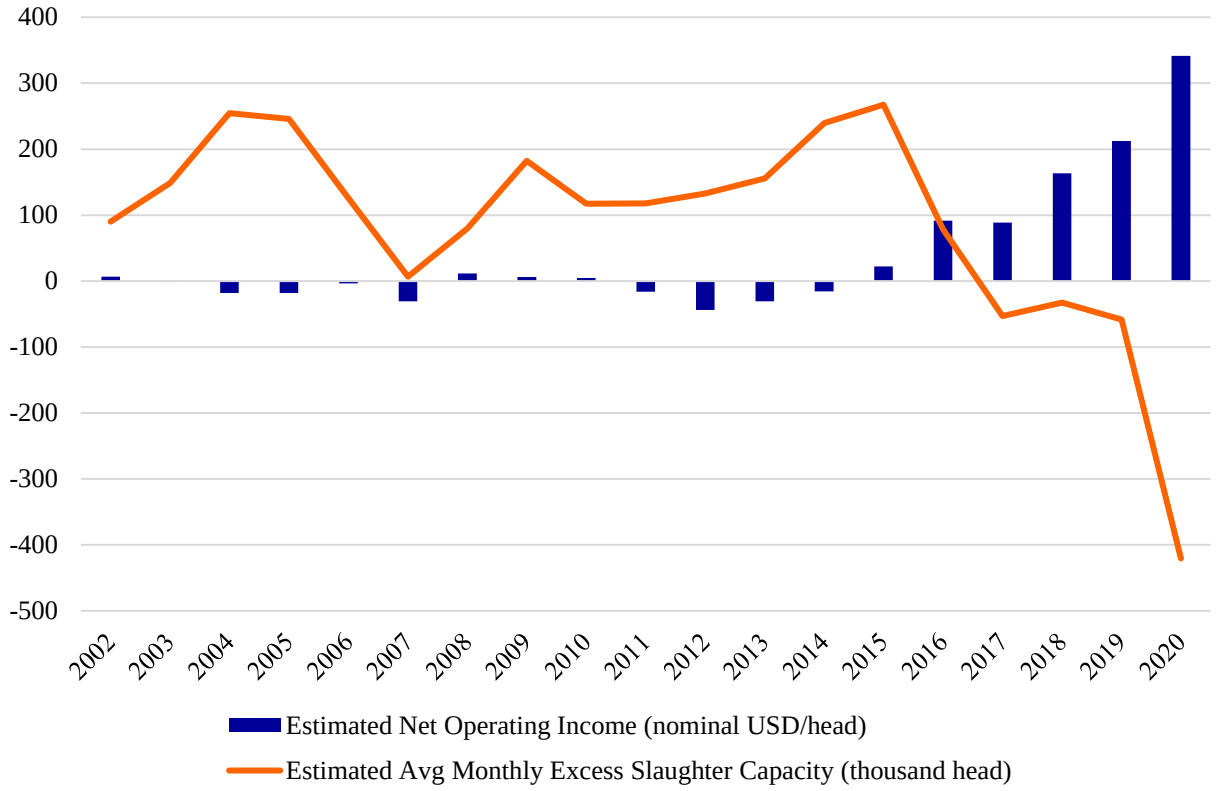
The inputs of this equation are always seeking, but never finding, the perfect balance between one another. Input imbalances are communicated through prices, whether that's cattle prices, wages, or investment/divestment in physical capital and technology. As expected in commodity markets, whether it's natural gas or cattle, the over-expansion/over-contraction and subsequent price signals responding to imbalances generate cycles (e.g. the cattle cycle). If any two inputs in the beef production equation are unbalanced, either the limiting input has to expand or the surplus input has to contract. For example, packing capacity (facilities, labor, technology) expands, or cattle numbers decline. Often, it's cattle numbers that are the most responsive to imbalance. Between the two possibilities, the decision to retain or sell a few head comes much easier for the multitude of cow-calf producers than the high-risk, capital-intensive, regulatory-complex endeavor of packing capacity expansion.

Historical Perspective

Beef packing has historically been a low margin business (*see Figure 1*). Precise estimates of individual company performance are extremely challenging with publicly available, industry average data, but estimates can get close and identify trends. Based on the estimates shown in *Figure 1*, beef packers averaged an annual loss of USD 11 per head from 2002 to 2014. In the year 2000, with a total cattle population of 98.2 million head, the US harvested 29.6 million head of fed cattle (*see Figure 2*). By 2014 and 2015, the total cattle population was below 90 million head with 2015 fed cattle slaughter at only at 22.7 million head. Throughout this period of largely drought induced beef cow herd contraction, the most inefficient packing plants were driven out of business as competition for limited cattle supplies drove cattle prices to record highs. From 2000 to 2015, the US beef industry experienced a net decline of roughly 14,000 head per day in fed cattle processing capacity. Today's *maximum* US fed cattle processing capacity (no absenteeism, no equipment breakdowns, flawless logistics, etc.) is estimated at just above 100,000 head per day.

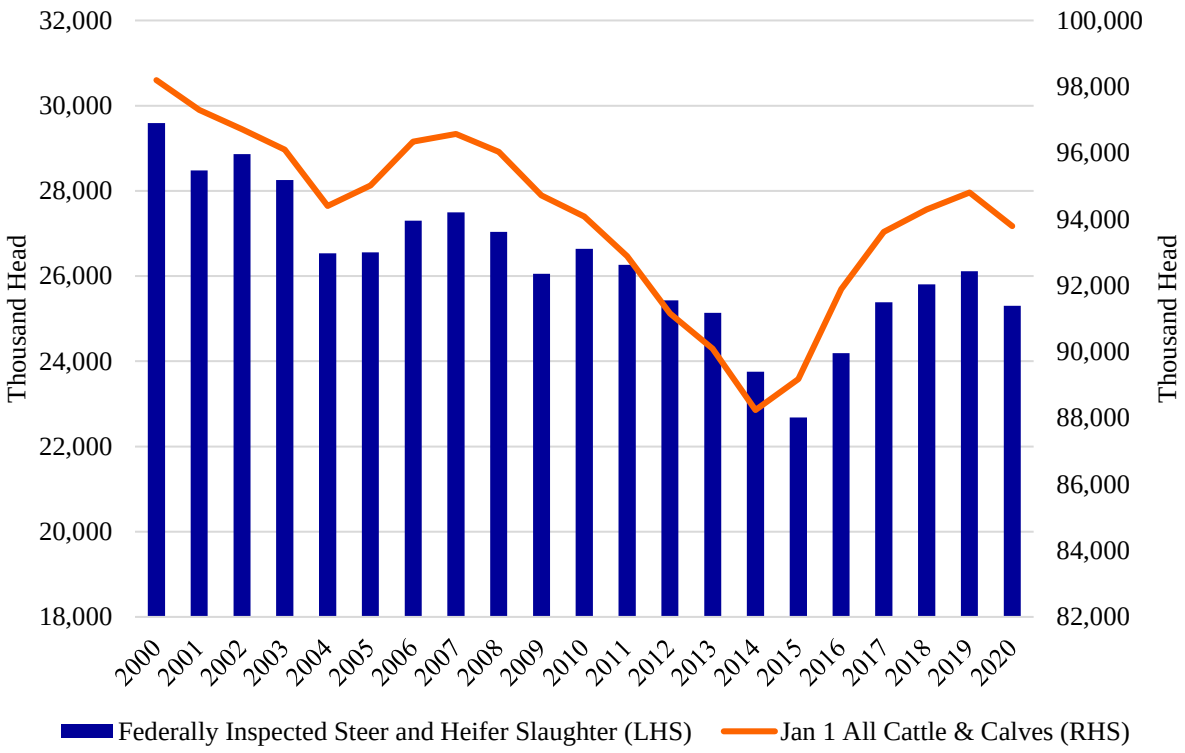
The remaining plants are those that have best managed operating costs through optimal geographic location, supply chain relationships (both suppliers and customers), and economies of scale. However, as cattle herd expansion has outpaced packing capacity and shifted the balance of the beef production equation, packers have been strategically positioned to capture record margins in recent years. This shift was well in place in the years prior to the pandemic. The Tyson-Holcomb fire and Covid-19 only magnified the shift by creating acute and unexpected massive imbalances between cattle numbers and suddenly limited availability of labor and/or facilities. As of mid-June 2021, beef packers are still struggling to utilize more than 90%-92% of daily capacity as a result of labor shortages and additional Covid-19 precautions, even in the face of ample cattle supplies.

Figure 1. Estimated annual beef packer operating income per head and estimated annual average monthly excess fed slaughter capacity, 2002-2020



Note: Operating income = (cutout value + by-product value) - (cattle purchase cost + estimated processing cost). Estimated monthly capacity is the maximum federally-inspected steer and heifer slaughter for a given month over the previous three years, except for 2020, during which Covid-19 related impacts and cattle backlogs were considered.
Source: USDA NASS, USDA AMS, LMIC, Rabobank 2021

Figure 2. Annual Fed Cattle Slaughter and Total Cattle Inventory, 2000-2020



Source: USDA NASS, LMIC, Rabobank 2021

The Relationship Between Cattle and Beef Prices

Packers are margin operators. Thus, operating costs influence the spread between cattle and beef prices, as packers attempt to capture some profit above operating costs. As operating costs increase, packers will attempt to pass some of those costs to their suppliers or customers, depending on who has the most leverage in the negotiation. This is no different than cattle feeders adjusting their feeder cattle bids based on feed prices and expected fed cattle prices.

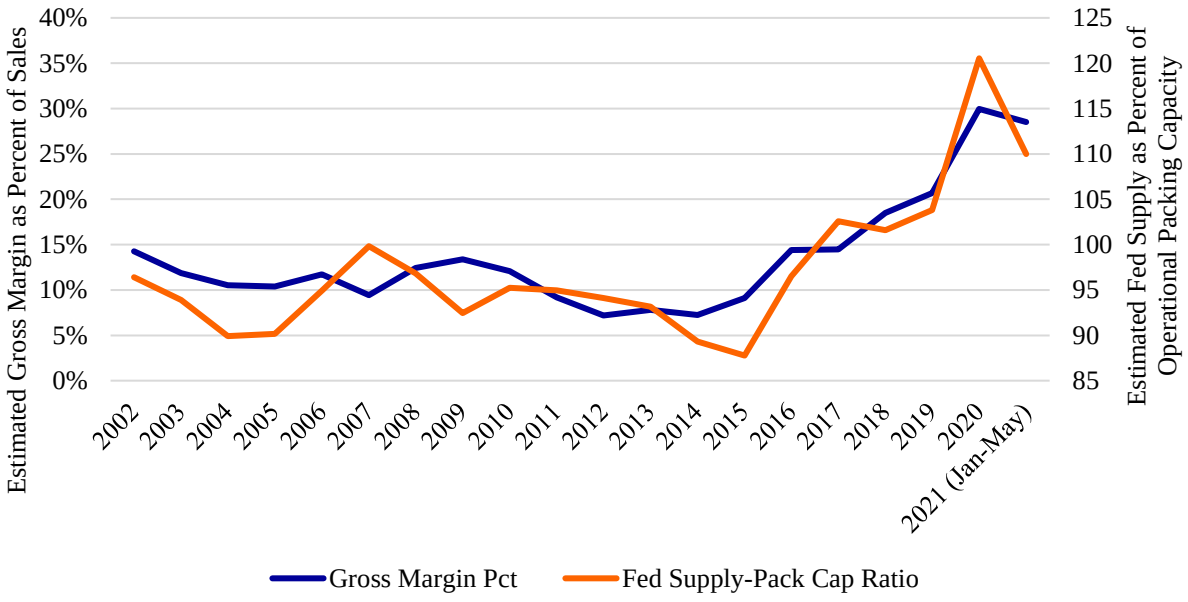
The relationship between fed cattle prices and beef prices is also driven by the relative balance between fed cattle supply and operational fed cattle processing capacity (the capacity actually achievable given labor conditions, equipment function, weather, and logistics). The greater the fed cattle supply in relation to processing capacity, the greater the spread between cattle prices and beef prices. In such a scenario, packers don't have to compete as aggressively to buy cattle and cattle feeders are more willing sellers because packers can more easily find cattle elsewhere to meet their needs.

Throughout the pandemic, packers simply haven't had the operational ability to harvest all of the cattle ready to be marketed. Under such extreme circumstances, cattle price could even be interpreted as how much cattle feeders were willing to pay (i.e., receive a lower selling price) to get an available harvest slot and clear their cattle backlog.

Increased beef demand, which translates to a higher price for the same quantity of available beef, also seems to contribute to higher packer margins. Using quarterly data from 2002 through 2019, a structural supply and demand model was developed, representing the cow-calf, cattle feeder, and packer segments, along with consumer beef demand. The results indicate that a 1% increase (decrease) in wholesale beef price (comprehensive cutout) is associated with a 0.8% increase (decrease) in live fed steer price. Upon inserting 2020's market conditions into the model, accounting for consumer beef demand, fed cattle supplies, and operational packing capacity, it was predicted that the average spread between wholesale beef price and live fed steer price would increase by 18% vs 2019. The actual price spread in 2020 increased by 20% compared to 2019. This model does not account for the increased operating costs due to Covid-19 impacts, which would be expected to further increase the predicted gross margin.

Packer gross margin as percent of sales revenue has also behaved within the realm of expectation. From 2002 to 2019, the correlation between annual estimated packer gross margin percent and annual estimated ratio of fed cattle supply to operational packing capacity was +0.73 (*see Figure 3*).

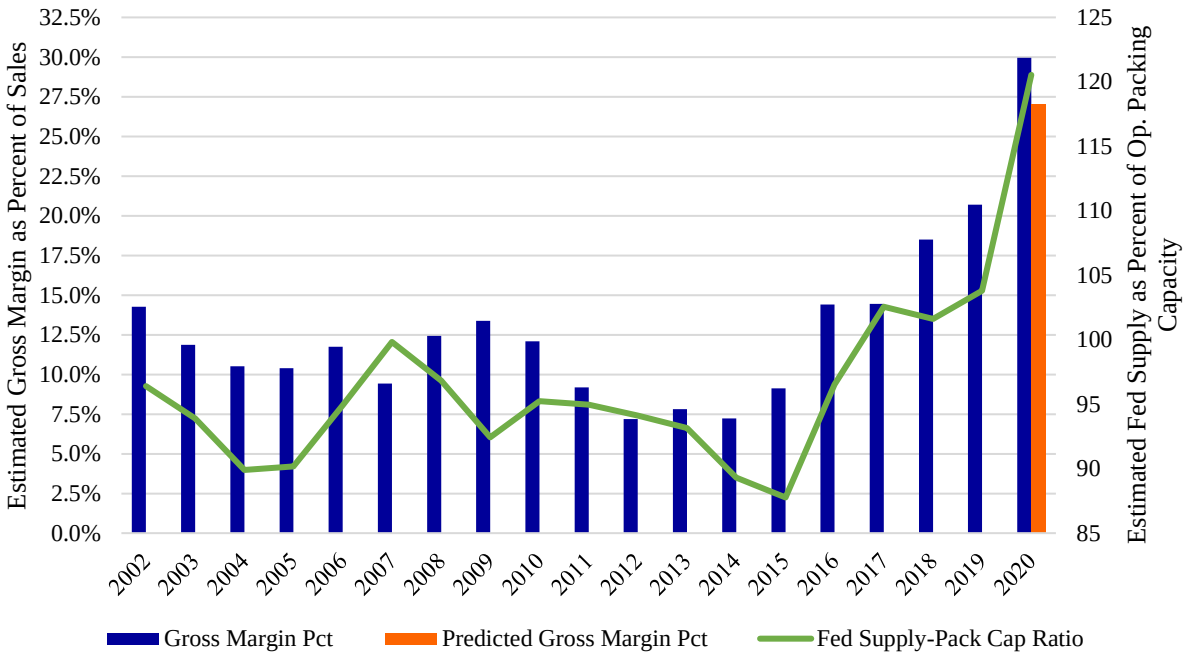
Figure 3. Estimated US beef packer gross margin as percent of sales and estimated fed cattle supply as percent of operational packing capacity.



Source: USDA NASS, USDA AMS, LMIC, Rabobank 2021

A simple linear regression model to predict packer gross margin based on the ratio of fed cattle supply and operational packing capacity using the 2002 through 2019 data was estimated. When the resulting equation is applied to the estimated ratio of fed cattle supply to operational capacity for 2020, the predicted packer gross margin for 2020 is 27% (*see Figure 4*). The calculated packer gross margin based on market data was 30%. Again, this analysis does not account for the increased operating costs due to Covid-19 impacts, which would be expected to further increase the predicted gross margin.

Figure 4. Predicted 2020 US beef packer gross margin as percent of sales



Source: USDA NASS, USDA AMS, LMIC, Rabobank 2021

In both of the exercises described above, it's important to note that 2020 data was not used to train the models. Supply and demand relationships present in the beef industry prior to 2020 were used to estimate price relationships in 2020 with very respectable accuracy. This provides evidence that the same market relationships that were in play when packers were losing money in the early 2010s were also at play during 2020. Based on the conditions of the market in 2020, the spread between beef and cattle price has responded well within the bounds of expectation in both direction and magnitude.

The Opportunity for Packing Capacity Expansion

Even before the extremes of 2020, recent margins suggest that there is opportunity to add packing capacity. However, that opportunity does not come without significant risk. Escalating drought conditions coupled with a currently contracting cow herd foretell of cyclically tighter cattle supplies over the next few years.

Several considerable hurdles must be addressed by both incumbents and new entrants to achieve success regarding new capacity. First, the upfront cost of a new or expanded plant is extremely expensive. Industry sources estimate that a new plant costs USD 100m to USD 120m for every 1,000 head of daily capacity. Increasing construction costs over the past year likely put current costs near or even above the high end of that estimate. Putting together and allocating that kind of capital is not a simple exercise, particularly for a potential newcomer.

Second, it's challenging to compete with the established supply chain networks, markets, and efficiencies of existing plants, even if a new plant were opened by one of the large incumbent packing companies. Not only have major packers achieved economy of scale, but most all have also achieved economy of scope. Packers are increasingly involved in value-added processing that

targets specific customers, such as case-ready retail cuts or ground beef products. Most existing plants already proved their competitiveness and fitness for survival when the last cattle cycle forced less-efficient plants out of business in the early and mid-2010s. It's not just about building a facility, it's about building a business model.

Third, the packing sector has been facing labor challenges for years. Building a skilled and dependable work force in what may likely be a region that already has a packing plant presence will be a formidable task.

Finally, the capital depth and longevity required to build and maintain a new plant through its first cattle cycle precludes most would-be investors from considering such a project. If a packing plant project is initiated at peak cattle numbers when packing margins look favorable, it's likely that the cattle cycle would turn over in the multiple years required to build the plant, meet regulatory requirements, and start harvesting and that the new plant would have to operate with tight cattle supplies and negative profit for its first few years of business. That's not a recipe for thin capital or weak hearts.

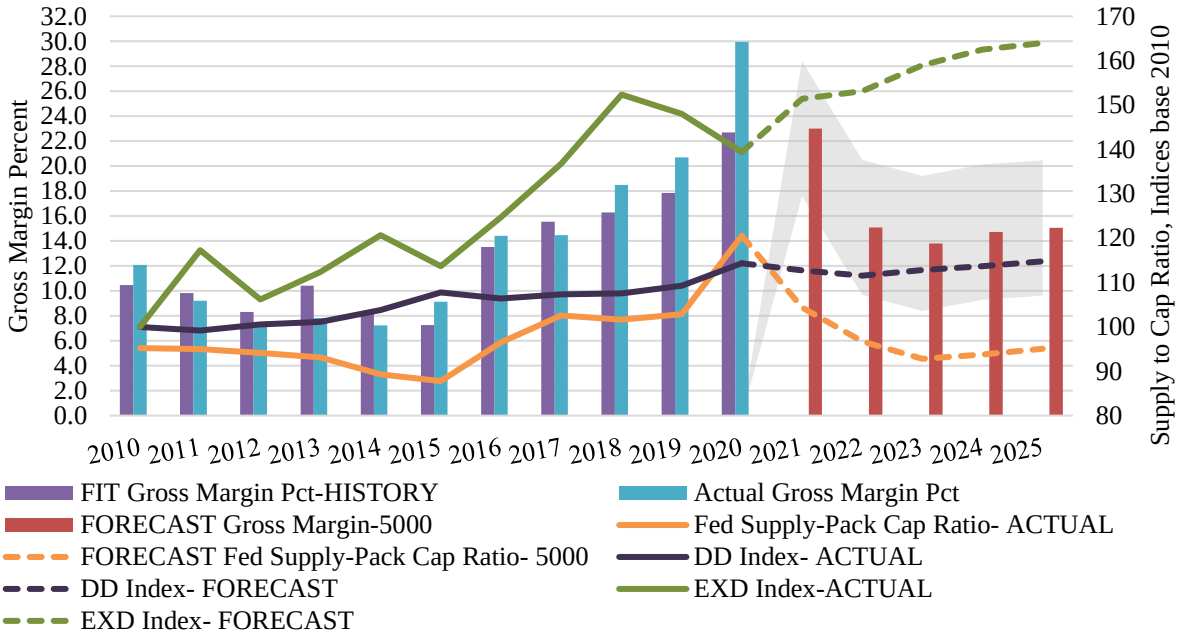
Beef Packing Plant Gross Margin Outlook

Figure 5 and *Figure 6* apply a model that includes the fed supply to operational packing capacity ratio, percent of weekly slaughter on Saturday (which accounts for the strain being put on employees and facilities), US domestic beef demand, and US export beef demand to predict beef packer gross margin as percent of sales. Both figures assume a 5,000 head per day expansion in total industry operational packing capacity by 2023. The key difference is beef cow inventory.

With the Jan 1, 2021 beef cow inventory at 31.2 million, *Figure 5* assumes that beef cow inventory bottoms at 30.5 million head in 2023. *Figure 6* assumes that beef cow inventory bottoms at 30 million head in 2023. *Figure 5* forecasts gross margin to return to levels similar to 2016 and 2017. However, the gross margin forecast for 2023 in *Figure 6* is 2.5 percentage points below the same year in *Figure 5* and dangerously close to the unprofitable early 2010s.

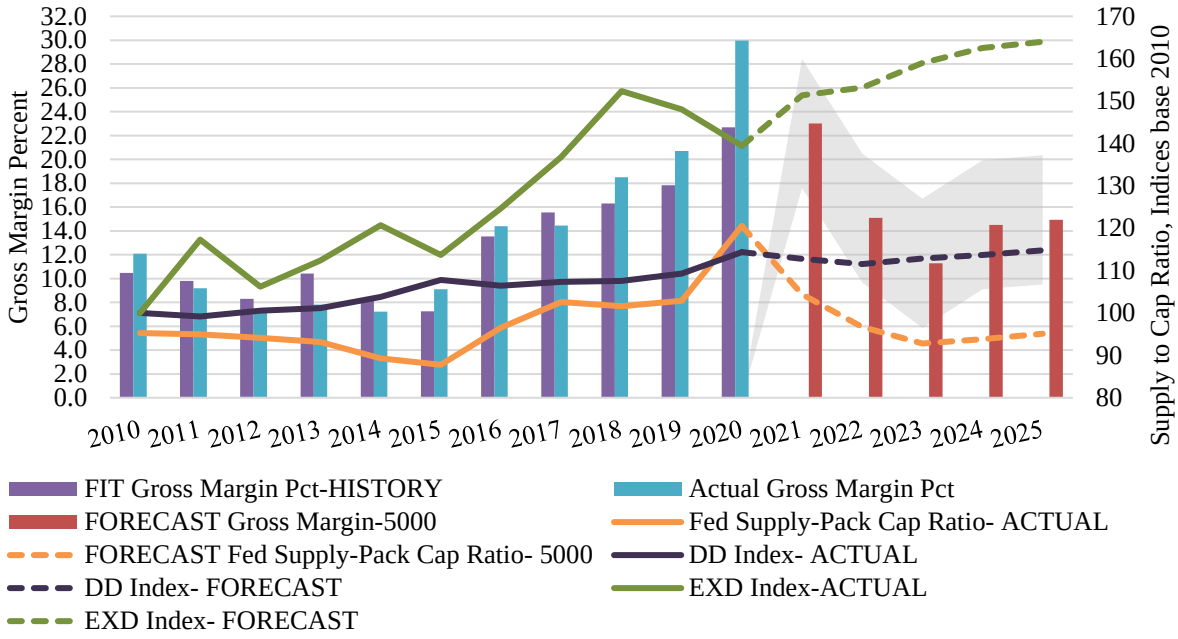
Predicting the future is hard. The point of this exercise is to illustrate that if the beef cow inventory only declines moderately, 5,000 head per day of new packing capacity should have relatively favorable conditions to initiate operations. If the beef cow inventory declines sharply, the first few years of new capacity could be incredibly challenging from a profitability perspective.

Figure 5. Forecast of US beef packing gross margin percent assuming total industry operational packing capacity expands by 5,000 head per day by 2023 and US beef **cow inventory declines to 30.5 million head in 2023**.



Note: Shaded area represents 2 times the 2010 to 2020 RMSE. DD = US beef domestic demand index, EXD=US beef export demand index.
Source: USDA NASS, USDA AMS, LMIC, Rabobank 2021

Figure 6. Forecast of US beef packing gross margin percent assuming total industry operational packing capacity expands by 5,000 head per day by 2023 and US **beef cow inventory declines to 30 million head in 2023.**



Note: Shaded area represents 2 times the 2010 to 2020 RMSE. DD = US beef domestic demand index, EXD=US beef export demand index.
Source: USDA NASS, USDA AMS, LMIC, Rabobank 2021

Industry Response

1) New construction and expansion

In response to the economic signals being sent from the imbalance of cattle supplies and operational packing capacity, numerous plans for greenfield plants or expansions of existing facilities have been unveiled in recent months. These plans come from new entrants, minor incumbents, and major incumbents alike. If all of the announced plans for plant construction and expansion come to fruition, 7,000 to 8,000 head of daily fed cattle capacity and 1,500 to 2,000 head of daily non-fed capacity could be added to the US beef industry over the next five years.

Most all of the greenfield construction or new entrant plans are small to medium sized (500 to 1500 head/day capacity), supply chain coordinated, and focused on product differentiation. If these smaller plants are going to compete with the efficiency, economic scale, and scope of the large incumbents, they will have to be successful in these supply chain relationships and product differentiation. Again, entering the meat packing space is not just about building a facility, it's about building a business model. Not only are cattle supply relationships critical, but strong relationships with buyers (for every piece, not just the high-value cuts) are critical.

Current consumer and investor trends suggest that moving forward there's real opportunity for beef companies with traceable, well-informed, coordinated supply chains that can verify

production practices and differentiate product on more than just eating quality. Thriving export markets and growing export opportunities also point to ever growing demand for US beef. Many of the current plans to build new capacity are a long way from realization with many of the previously described challenges yet to be tackled.

Local lockers and 'micro-plants' have a place in direct-to-consumer marketing and can play an important role in rural communities, however they simply don't offer enough scale to make a measurable, industry-wide impact in the balance of cattle numbers and packing capacity. That said, with the proper business model, they can offer great opportunities for some operations.

2) Technology

Whether in new or existing plants, increased technology implementation will be a critical component of future success. Recently, many packers have revitalized their focus on technology development as a means to address labor challenges, manage processing costs, and reduce product waste. Enlightened by the pandemic to the long standing labor shortages in the meat industry, many startups are also bringing outside expertise and perspectives to advance technology in the meat supply chain.

Maintaining necessary skilled labor has long been a challenge for packers. Covid-19 has magnified labor challenges and revealed the necessity of additional employee safety measures. Although hazard bonuses, additional sick leave, and other costs most directly associated with the pandemic will diminish with time, many additional labor costs associated with employee well-being, including base wages, benefits, and in-plant safety measures will persist into the future.

As the packing plants of the future gradually become more automated, efficiency will improve and throughput volatility will decrease. Operating hours may also become less restrictive, particularly if technology allows for a smaller Saturday workforce. While increased automation in carcass breakdown and fabrication is certainly a long-term goal, improved production-line data collection and machine monitoring have the most near-term promise. Increased real-time production-line monitoring will help identify choke points and inefficiencies while preventing breakdowns and the introduction of foreign material. Estimating current industry daily fed slaughter capacity at roughly 100,000 head, even a 1 percent improvement in efficiency across all existing plants could add 1,000 head daily fed cattle capacity. The final result will be an inherent increase in operational capacity at existing plants. However, these changes will take time.

A Note of Caution

As already described, current market fundamentals suggest that for those willing to take the capital risk and do the work to build a viable, competitive business, today may offer the best opportunity in decades to expand packing capacity. Yet, there is a point where industry capacity expansion goes too far to withstand cyclical periods of tight cattle supplies. Support for new packing capacity that is given too freely, without enough private risk, and with disregard to long-term market fundamentals, may invite over-expansion, putting all market participants in jeopardy, particularly new entrants.

Price Spreads Will Narrow

The biology and natural time-delays of the beef industry make it slow moving and capital intensive. Adjustments take years. Total US cattle numbers peaked in 2019 at 94.8 million head and will likely contract for another couple years. If not for the pandemic disruptions, cattle supplies and packing capacity would already be much better aligned. In such a "No-Covid" scenario, current packer gross margin percent would likely be closer to 2018 levels, 18%, rather than today's 30%.

With any luck we will work through the long tail of 2020's cattle backlog in Q3 2021. As such, year-over-year cattle prices will rise in 2H 2021 and beyond. In conjunction with tightening cattle supplies, capacity expansion projects will come online over the next several years and new technologies will reduce labor constraints, further shifting margins to the benefit of cattle producers.

Markets At Work

The shocks to the beef industry over the last couple years have presented the entire beef supply chain with enormous challenges. The resulting price movements have been frustrating for cattle producers, to say the least. Yet, these same price movements and supply chain disruptions have also contributed to the accelerated investment in packing capacity expansion, new technologies, and new business strategies that will help the beef industry adapt and evolve to ever changing demands. That's the market at work.