

Cow-Calf Level Supply Response: How Has the Industry Responded to Elevated Uncertainty?

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The U.S. is home to approximately 730,000 cow-calf producers who had about 30.1 million beef cows when 2022 began¹. Expansion and contraction of the U.S. cowherd is related to economic, environmental, and social conditions faced by cow-calf producers across the country. Regional differences, such as climate conditions, natural disasters, and land availability, also have considerable impacts on the decision-making process of cow-calf producers, especially related to herd size adjustment. Additionally, changes in the beef industry, such as costs, technology, producer and operation demographics, climate events, and barriers to entry, impact their herd expansion and contraction decisions. These herd adjustment decisions ultimately impact total retail beef supplies, as the number of calves sold determines feedlot inventories, and thus the amount of fed cattle sent to the processing level².

The changes the beef industry has faced over recent decades has caused some to question if the price sensitivity of cow-calf producers has decreased over time. That is, has the response of cow-calf producers to changes in feeder cattle prices in relation to herd adjustment decisions declined? The purpose of this fact sheet is to summarize recent research that examined the current relationship between feeder cattle price changes and cowherd supply response in the United States. This fact sheet is an extension of the thesis research that was published in [Essays on beef economics: an updated understanding of cowherd supply response and wholesale meat demand \(k-state.edu\)](https://www.k-state.edu/essays-on-beef-economics-an-updated-understanding-of-cowherd-supply-response-and-wholesale-meat-demand/).

Beef Cow Inventory Changes

Beef cattle inventory in the U.S. peaked in 1975, with about 48 million beef cows, and has since generally been in a state of long-term decline². Historic beef cow inventories are known to have a cyclical nature, which is due to cow-calf producers expanding or contracting their herd based on market signals and the biological nature of livestock production³. These 'cattle cycles' have historically ranged from 9 to 13 years. The current cycle began in 2014 when the last trough in inventory occurred and has been in a state of contraction since 2020. Although the industry has seen a decline in the total number of beef cows since 1976, total beef supplies have increased³. This is due to efficiency gains in

¹ NASS. 2022. Quickstats. Cattle Inventory and Operation Data. Online. <https://quickstats.nass.usda.gov/>.

² Schmitz, John. 1997. "Dynamics of Beef Cowherd Size: An Inventory Approach." American Journal of Agricultural Economics. Amer. J. Agr. Econ. 79 (May 1997): 532-542.

³ Luke, J., Anderson, A., Tonsor, G. 2022. AgManager. "An Updated Evaluation of the U.S. Cattle Cycle." https://www.agmanager.info/sites/default/files/pdf/EvaluatingCattleCycles_03-22-22.pdf.

beef production, which has allowed for a decline in beef cow inventory and an increase in beef production. To learn more about cattle cycles and how they have evolved over time, see [An Updated Evaluation of the US Cattle Cycle | AgManager.info](#).

Price Sensitivity and Supply Response Changes

Through time, the cyclical nature of cattle inventory has become less extreme. In other words, the difference between inventory highs and lows during a given cattle cycle is shrinking. This could occur if cow-calf producers are less sensitive to changes in expected feeder cattle prices (output prices), when making herd adjustment decisions, than they were in the past. Further, producers may be less likely to invest in herd expansion during times of decreased return on investment and/or increased volatility or uncertainty. Other factors that may reduce the price sensitivity of cow-calf producers are evolving producer and operation demographics; technology and efficiency gains; unexpected weather events; and barriers to entry.

Events of increased volatility and uncertainty have highlighted the dynamic nature of the U.S. beef industry and supply chain. In recent years, a global pandemic, extreme drought conditions, and other unexpected events have disrupted supply chains and created elevated periods of economic, environmental, and social uncertainty at every level of the beef supply chain. These periods of increased uncertainty in conjunction with the other industry changes discussed above have impacted cow-calf producers in the United States. Further, they may contribute to reduced price sensitivity of producers when making their herd adjustment decisions.

Analysis

An analysis was conducted to understand how the price sensitivity of cow-calf producers has changed over time in the United States and in Kansas. Data for Oklahoma City feeder steer prices and beef cow inventory from 1975 – 2021 was obtained from the United States Department of Agriculture (USDA). Additionally, data for pasture rental rates, hay prices, drought conditions, and steer slaughter weight was obtained from USDA and the National Oceanic and Atmospheric Administration (NOAA). The analysis allowed changes in producer price sensitivity and supply response to be examined for the 1987 – 2022 period. Annual supply elasticities were estimated to quantify the effect changes in feeder cattle price have on beef cow inventories. Ultimately the herd adjustment response of cow-calf producers to changes in feeder cattle prices at the national level and in Kansas is quantified and evaluated over time.

Results

A decrease in the feeder cattle price sensitivity for cow-calf producers was expected to be observed over time, reducing the impact a given percentage price change has on herd adjustment decisions. In other words, an increase (decrease) in feeder cattle price was expected to have less impact on a cow-calf producer’s decision to increase (decrease) their herd size than it had in the past. At the national level, a decrease in price sensitivity was observed over 1987 – 2022. Similarly, a decrease in price sensitivity was observed over 1987 – 2022 in Kansas. Figures 1 and 2 show the annual estimates of price sensitivity of cow-calf producers in the United States with respect to Oklahoma City feeder cattle price over time.

Figure 1. Annual estimates of price sensitivity of cow-calf producers in the United States with respect to Oklahoma City feeder cattle price, 1987-2022

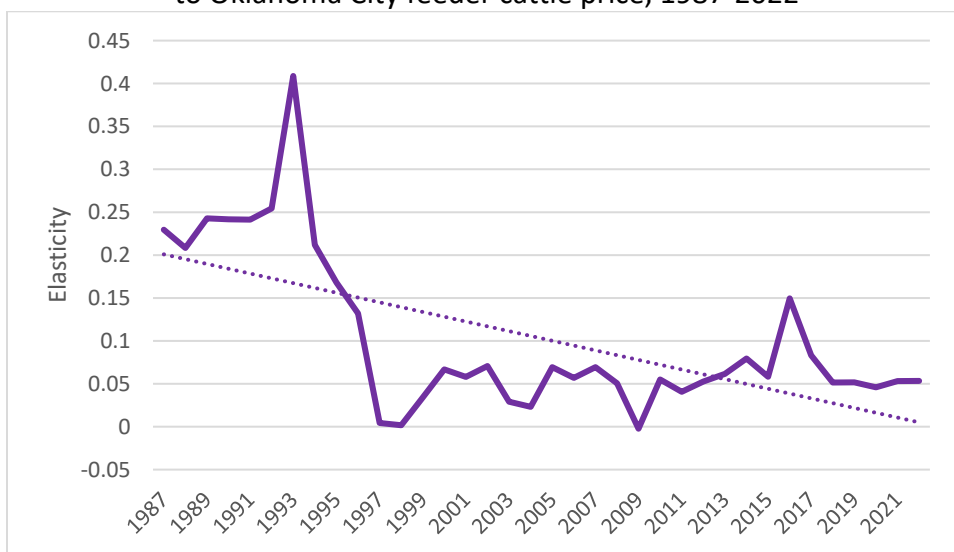
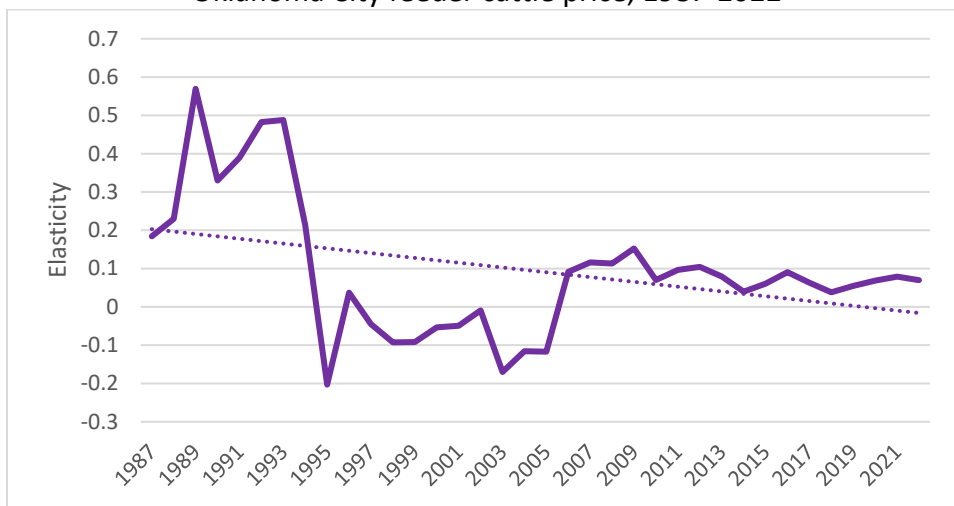


Figure 2. Annual estimates of price sensitivity of cow-calf producers in the Kansas with respect to Oklahoma City feeder cattle price, 1987-2022



Summary

The United States is home to many cow-calf producers who respond to various economic, environmental, and social factors when making herd adjustment decisions. These herd decisions ultimately impact the number of cattle in the country and therefore the amount of beef available. Given calf-cow producer demographic changes, increased efficiencies, increased volatility, and general uncertainty in the cattle industry over the past years, an updated understanding of cow-calf producer price sensitivity and beef cowherd supply response is important for industry participants.

A decrease in price sensitivity was observed over 1987 – 2022 for both the United States and Kansas. Therefore, the cowherd supply in the United States and Kansas is less responsive to price changes than in the past. Overall, this work strengthens available knowledge on cow-calf herd supply response by estimating price sensitivity and cowherd supply response at both national and Kansas levels. These estimates can be used to understand changes in cow-calf producer sensitivity to changes in feeder cattle price. For industry participants, these findings support the idea that price sensitivity has been decreasing in the cow-calf industry. While price is still an important factor for cow-calf producers when they are making their herd adjustment decisions, other factors may be influencing their decisions more than they did in the past. For industry analysts, these findings are relevant because when analysts attempt to project future inventory changes, a larger percentage change in price is needed to change inventory than in the past.

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