A Microeconomic Assessment of the US Retail Beef Market: Beef Demand Matters

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Much attention has been given to the US cattle and beef supply chain over the past few years. We've seen pronounced liquidation of the breeding beef cow herd, historically high cattle prices, and elevated retail beef prices. Much attention, from the media and other sources, has been given to the decrease in the cow herd and the resulting "tight supplies." Indeed, the dramatic national-level herd liquidation since 2019 has been a key factor in supporting prices for cattle all along the supply chain and all types of beef. However, a look at the data readily reveals that the market changes observed in past few years are anything but one-dimensional. One factor that has received less attention than others is the role of consumer demand for beef. This factsheet applies microeconomic theory of markets using available price and consumption data to clarify the substantial role of demand in supporting retail beef prices. For those interested in more details behind the use of economic terminology and microeconomic theory, there is an appendix to this factsheet with definitions and resources for further reading.

US Retail Beef Market in 2023

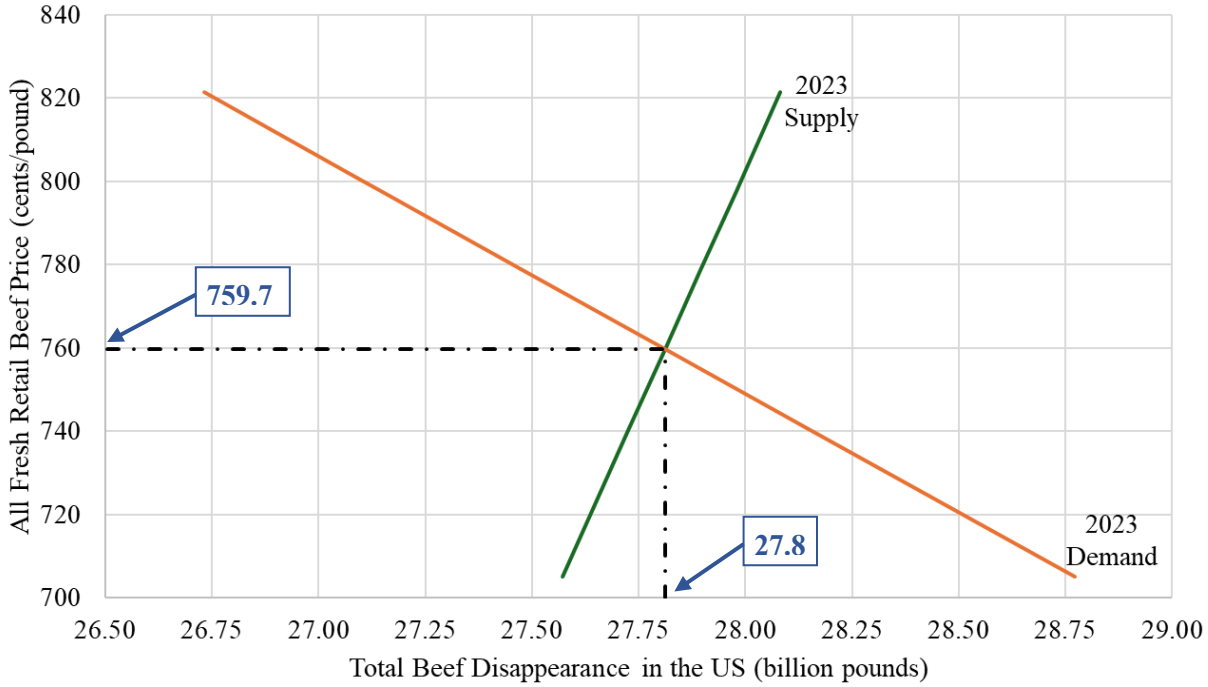
In 2023, Americans consumed 27.81 billion retail-equivalent pounds of beef[1]. This number is the so-called disappearance of beef and is the most commonly used measure of aggregate consumption. To calculate disappearance of beef, we add the beef obtained from all sources (beginning stocks, production, and imports) and then subtract its uses (exports and ending stocks). Over 2023, the average All-Fresh retail price was 759.7 cents per pound[1]. The All-Fresh beef price is a composite, national average price of retail beef products in the US and is calculated by USDA Economic Research Service.

To concisely examine the US retail beef market, we must make some simplifying assumptions. First, we assume that the 2023 US retail beef market was in equilibrium. In other words, 27.81 billion pounds is the amount supplied to retail outlets and the amount consumers purchased from those outlets. Second, we assume that the demand and supply curves can be represented as linear functions. Third, we assume own-price elasticity of

[1] USDA Economic Research Service Cattle & Beef Statistics, data for years up to 2024 available at: https://www.ers.usda.gov/topics/animal-products/cattle-beef/statistics-information

demand for retail beef in the US is -0.479[2] implying that if offer price increases by 1%, the volume of beef purchased by consumers will decrease by 0.479%. Fourth, we assume the own-price elasticity of supply for retail beef is 0.12[3] suggesting that if offer price increases by 1%, the industry will supply 0.12% more beef at the retail level. With these assumptions in place, we can represent the US retail beef market conditions for 2023, as shown in Figure 1. See the appendix for details in the derivation of the demand and supply curves.

Figure 1. US Retail Beef Market in 2023



Market Changes from 2023 to 2024

Next, we consider the market change between 2023 and 2024 and compare it to the supply and demand curves derived for Figure 1[4]. In 2024, consumption of retail beef was 28.72 billion pounds and the All-Fresh price was 801.3 cents per pound[1]. The fact that consumption increased is worth spending a bit of time further discussing.

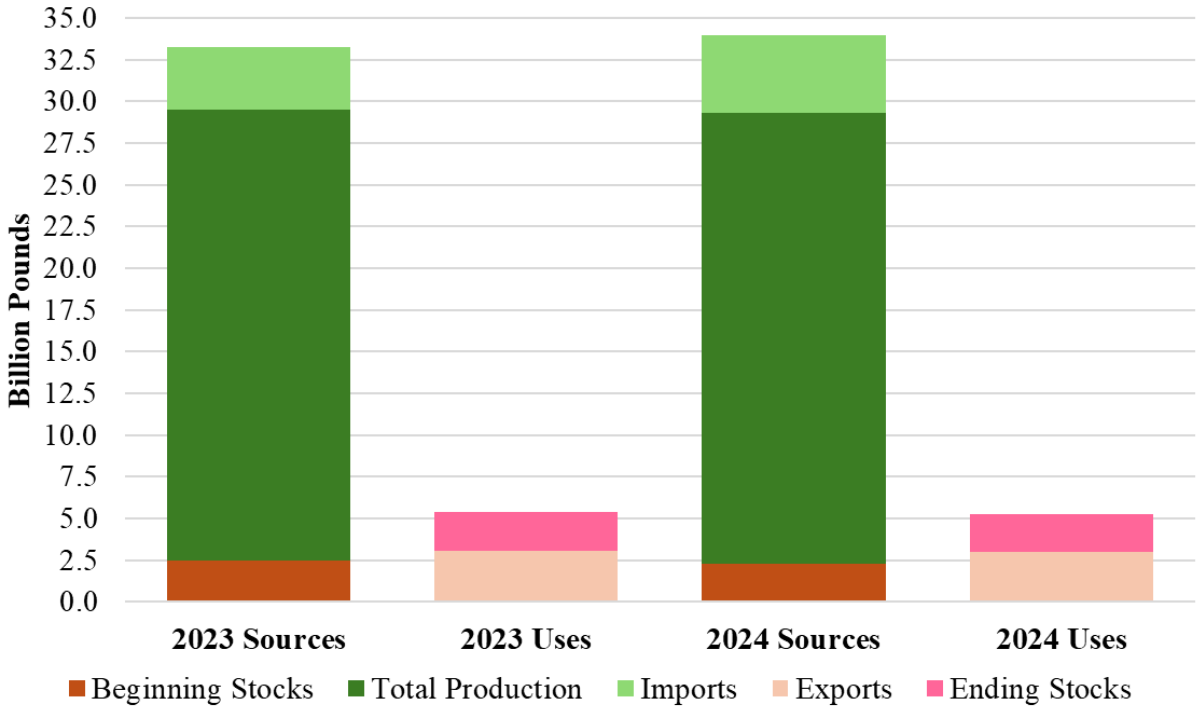
[2] The rationale for this demand elasticity can be found in: Bekkerman, A., Brester, G. W., & Tonsor, G. T. (2019). An alternative approach to measuring demand changes in meat markets. International Food and Agribusiness Management Review, 22(3), 397-412. https://doi.org/10.22434/IFAMR2018.0120

[3] This supply elasticity is used and explained in this recent research: Jayson L Lusk, Glynn T Tonsor, Supply and demand indices and their welfare implications, Q Open, Volume 1, Issue 1, January 2021, qoaa008, https://doi.org/10.1093/qopen/qoaa008

[4] All figures depicting supply and demand relationships are scaled to show only the relevant intersections of the curves. Carefully note units used on the axes to determine the magnitude of the shifts.

Between 2022 and 2023, the US beef cow herd decreased from 30 million head to 28.9 million head. Therefore, there were over a million fewer beef cows to produce the 2024 calf crop than the 2023 calf crop. However, there was more beef supplied and consumed at the retail level than in 2024 than in 2023 due to two major factors: 1) cattle feeders adapted and produced heavier finished cattle and 2) imports increased slightly. As a result, the total pounds of beef produced in the US was almost unchanged between 2023 and 2024 and the slight increase in imports facilitated a net increase in retail beef supplied. Figure 2 shows the quantity differences in the sources and uses of beef in 2024 compared to 2023.

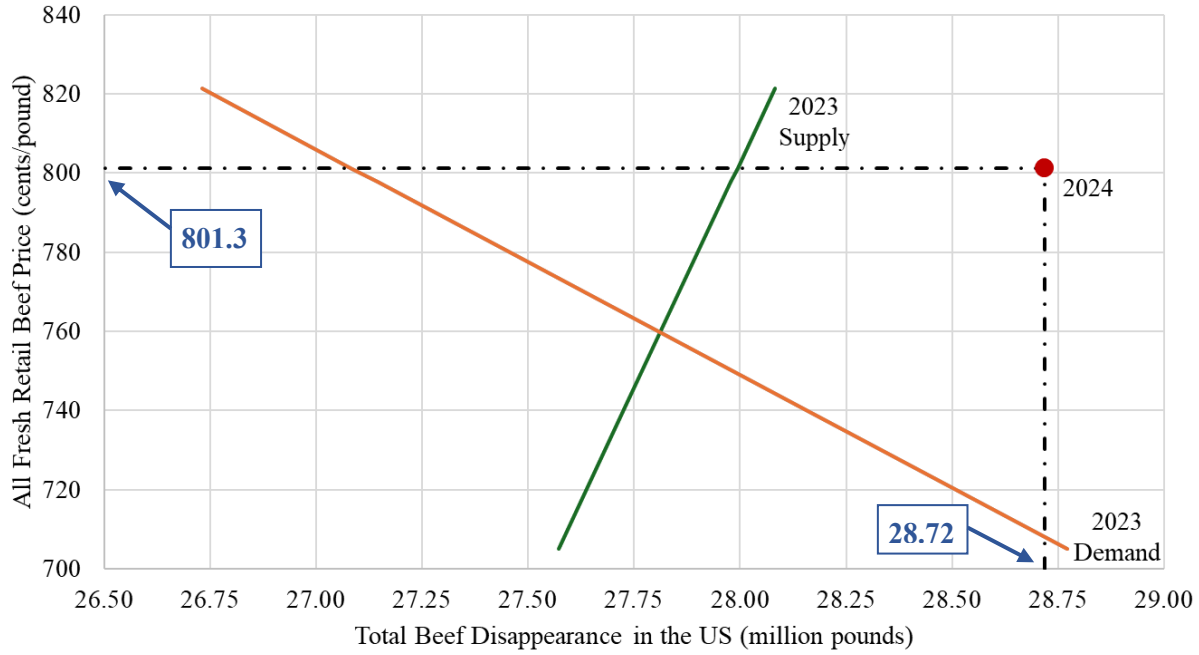
Figure 2. Sources and Uses of US Beef in 2023 and 2024



Data Source: USDA data, as archived by LMIC
Note that the difference between the two columns for a given year represents Total Disappearance.

In Figure 3 we plot the 2024 price and consumption combination as an addition to the graph from Figure 1. It is obvious some structural adjustment occurred in 2024 as both volume and price increased.

Figure 3. 2024 Consumption and Price Compared to 2023 Market Outcome



Regardless of the exact nature of how total beef consumption changed between 2023 and 2024, there was a 3% net increase in beef available to US consumers. One way to graphically demonstrate this would be to assume supply elasticity remained the same but that producers of beef were willing to supply more beef at the new, higher prices. This translates into an outward shift of the supply curve, which we would describe as an increase in supply. If this were the case, there would be a new supply curve which contains the red dot in Figure 3 representing the 2024 combination of observed consumption and price. Figure 4 shows the parallel supply shift necessary to reach the new price and quantity.

Figure 4. Beef Supply Shift 2023 to 2024: Quantity and Price Predictions

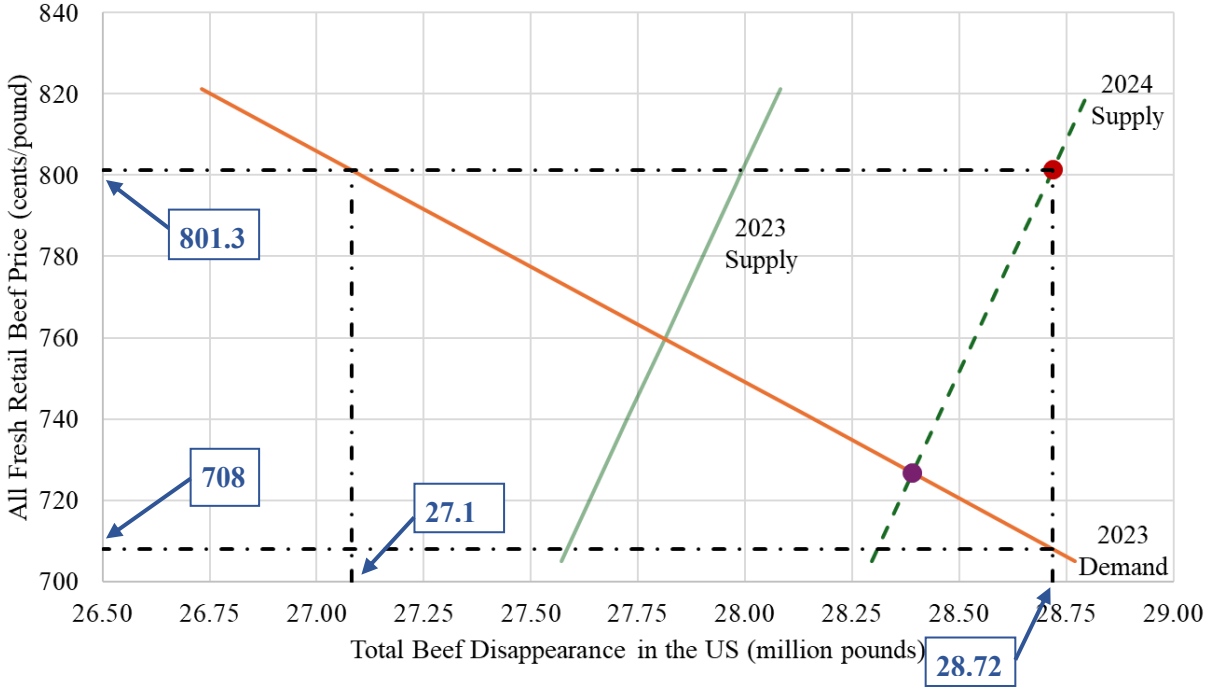
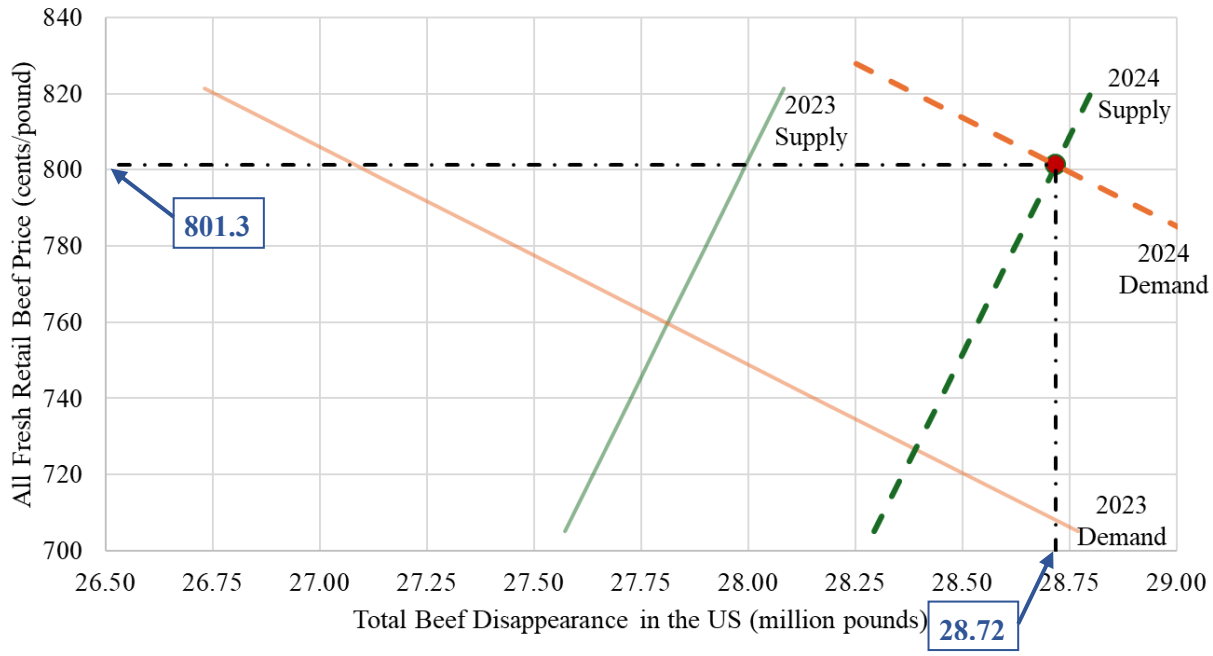


Figure 4 allows consideration of how the market would have responded if demand were unchanged. At quantity of 28.72 billion pounds, price would initially be about 708 cents per pound and, given some time, the market would clear at 726.7 cents per pound (the intersection of 2024 Supply and 2023 Demand which is indicated by a purple dot) versus the observed price of 801.3 cents per pound. The fact that consumers were willing to pay this price reflects substantial demand growth.

We can also quantify the demand shift in terms of quantity. At a price of 801.3, the 2023 demand curve predicts a consumption of 27.1 billion pounds but consumption was 6% more than that, at 28.72 billion pounds.

Figure 5 shows the 2024 market equilibrium outcome assuming both supply and demand elasticities remained the same and that both supply and demand shifted outward between 2023 and 2024.

Figure 5. US Retail Beef Market in 2024, Assuming Constant Supply and Demand Elasticities



Like any economic model, this one involves simplifying assumptions and is not perfect. However, the exercise is instructive regarding why 2024 beef prices were elevated. The herd contraction since 2019 has played a major role and will continue to impact market dynamics for several years. However, cattle herd size has not been the only factor. The industry adapted to utilize feeding technology and imports to increase the amount beef in retail cases between 2023 and 2024 while prices increased. That could only happen with substantial increase in consumer demand and absent the elevated harvest weights and imports, US consumers would have faced less beef being available at a higher offer price than was realized in 2024.

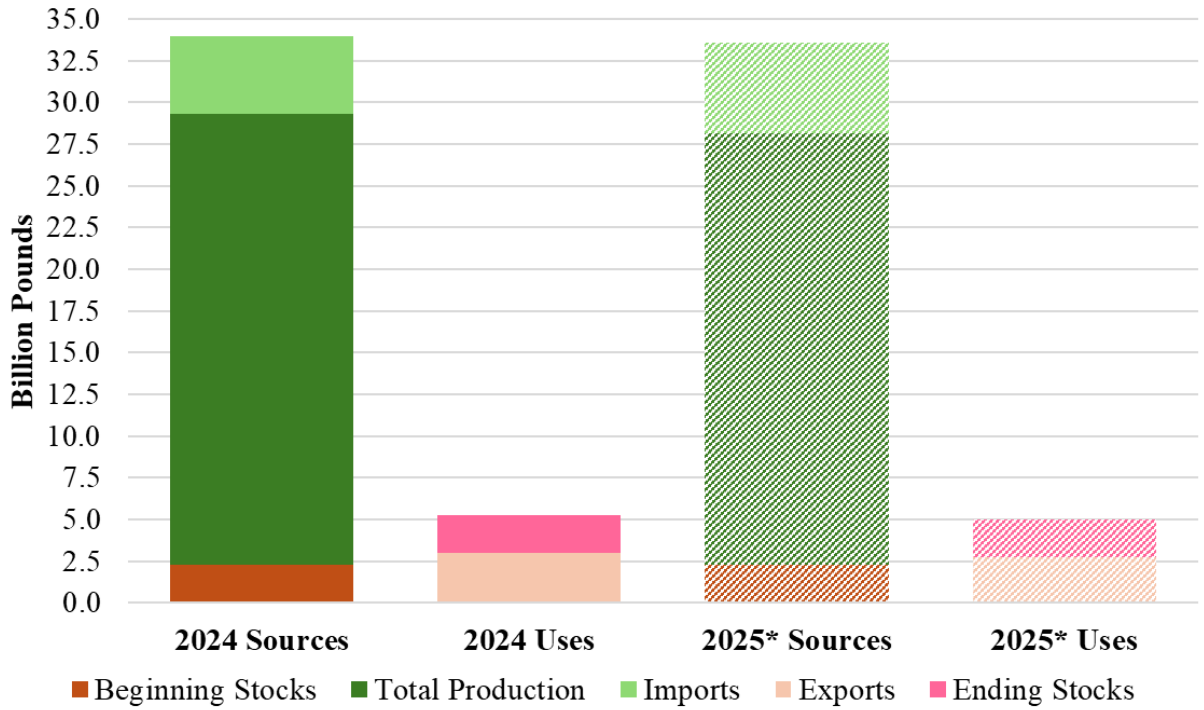
Projections for 2025

Repeating this exercise for 2025 versus 2024 is complicated by a lack of data both reflecting federal government shutdown and the calendar year not being fully complete yet. However, USDA ERS projects supply and use data for beef so we use those projections, knowing that they will likely be revised[5]. Total domestic beef production for

[5] USDA Economic Research Service Livestock, Dairy, and Poultry Outlook: September 2025,available at: https://www.ers.usda.gov/publications/pub-details?pubid=113405. We the Livestock Marketing Information Center archived data that are based on the referenced USDA ERS Outlook.

2025 is expected to be lower than 2024 with heavier carcass weights no longer completely offsetting the smaller numbers of animals on feed. While 2025 imports are higher, the forecasted net result is a consumption of 28.55 billion pounds of beef. This is down slightly from 28.72 billion pounds in 2024. Figure 6 shows the comparison between 2024 and 2025 projections.

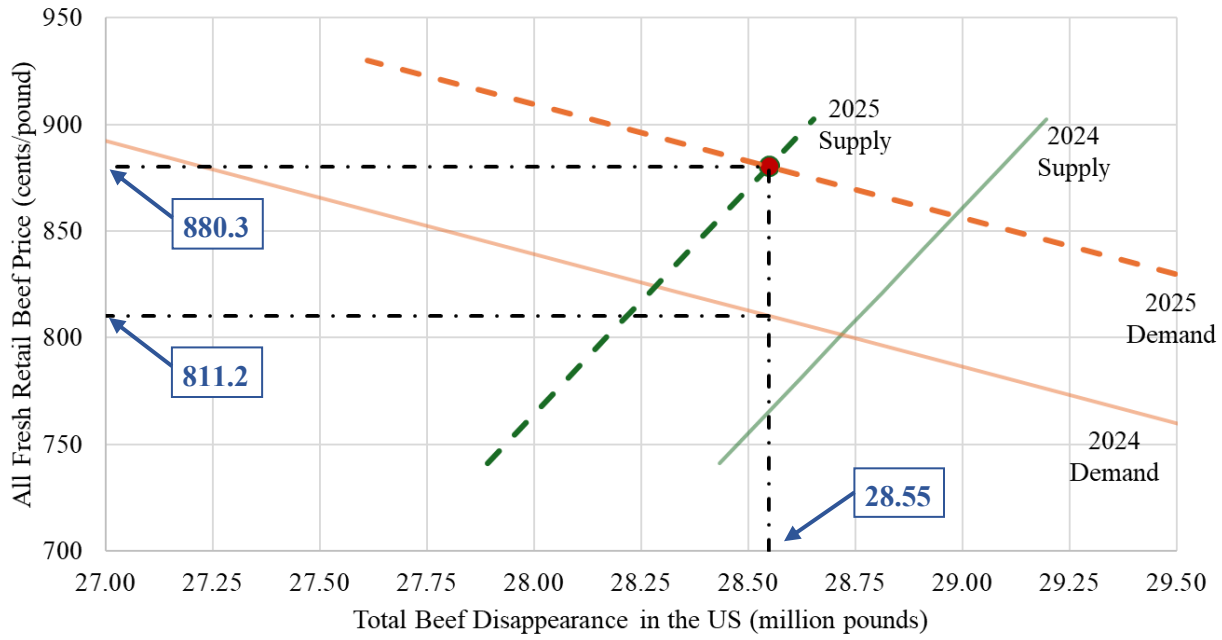
Figure 6. Sources and Uses of US Beef in 2024 and 2025*



Data Source: USDA data, as archived by LMIC; *2025 Values are projections
Note that the difference between the two columns for a given year represents Total Disappearance.

Annual average All-Fresh beef price is also unknown for 2025. The observed prices in the first two quarters of the year averaged 880.3 cents per pound. There is no indication that prices in the third and fourth quarters will decrease, on the contrary evidence suggests they will be higher. For the purposes of this exercise, we will use 880.3 cents per pound as the 2025 price, suspecting that this is likely biased downward (leading to less of a concluded demand increase). If we use the same assumptions as earlier, and begin with the 2024 market being in equilibrium, we can compare the predicted changes to market outcomes. Figure 8 shows the changes in supply and demand necessary to produce 2025 market outcomes of a price of 880.3 cents per pound and 28.72 billion pounds of consumption.

Figure 7. US Retail Beef Market in 2025, Assuming Constant Supply and Demand Elasticities



In this case, a decrease in supply is expected to increase market price. If demand remained unchanged from 2024, a market quantity of 28.72 billion pounds would have the short-term result increasing price by 9.87 cents, up to 811.2 cents per pound in 2025. However, there was an observed price change of 79 cents per pound. The difference between those two values, 68.02 cents per pound, is due to a demand increase (shift up and to the right in Figure 8). ***Our demonstrative analysis attributes 14% of the 2024 to 2025 price increase to a supply decrease and 87% to an increase in consumer demand.***

Limitations of the Analysis

The microeconomic supply and demand framework for competitive markets used in this exercise is an incredibly useful "back-of-the-envelope" approach for understanding and predicting market outcomes. Here the clear role of both supply and demand changes is illustrated in hope this increases awareness of market functions and associated adjustments. However, as with any analytical tool, there are limitations. It is appropriate to mention some of the more important limitations, as they relate to the US beef sector.

Aggregating all beef into one product

Beef is sold in many forms at the retail level with associated differentiation growing notably in recent decades. Products vary in price per pound and appeal to different consumer groups. We aggregate all of these products to arrive at one price and one quantity for aggregate, base conclusions. This ignores the marked differences between different beef products. For example, ground beef and steaks are very different products with varying supply and demand responses. Using an aggregate measure masks these differences.

Treating beef as an aggregate good also masks shifts in product mix available to consumers that is likely dynamic given the changes of the past few years. The increase in US imports have likely been more heavily lean trimmings to supplement domestic trimmings (which are up in concert with higher domestic harvest weights) to produce ground beef products. It is possible that, given the decrease in animals on feed and increase in imports, ground product represents a higher percentage of pounds available than it did in 2024 and further the relative percentage lean in the ground beef market is varying over time. The larger the difference between the actual retail product mixes in two years, the less comparable aggregate prices of the two years become.

Constant Elasticities

We assume supply and demand elasticities are unchanged between 2023 and 2025. If the demand changes have also included a change in price sensitivity among consumers, our project demand shifts are incorrect. In terms of the graphical model, the slope of the curves would also change instead of showing a shift with a constant slope. In the short time frame we considered, this is likely not a major issue (and would impact magnitude but not directional conclusions) but should be considered.

Linear Demand Curves

Linear demand curves have been widely used by agricultural economists due to their simplicity. We realize actual demand relationships are more complex. However, especially when considering changes in price and quantity that are not relatively large, linear demand functions are accepted as a reliable method of analysis and are often best suited to data available for analyses.

Appendix: Microeconomic Background

Economic Terminology

Economists make a distinction between ***consumption***[6] and ***demand***. Consumption is how much of a good consumers purchase and is generally negatively correlated with price. All else equal, when a desired good becomes cheaper, consumers buy more of it and they buy less of it when the good becomes more expensive. The key in this definition is that consumption is price sensitive but does not reflect a fundamental shift in how consumers value a good.

Economists call the relationship between consumption and price the law of demand and it holds for all products. ***Demand*** is different in that consumer preferences, consumer income, population, prices of other goods, and other factors are taken into account. If price of a good changes, demand does not change but rather a move along a demand curve occurs with consumption changing. In order for demand to change, something must change that alters the fundamental way consumers value a product. For example, if consumers become convinced that a certain food has proven health benefits, then demand for that food may increase. That means that consumers will now buy more of it than before, *at any market price.*

Stated another way, demand is the quantity of a good that consumers will buy at varying market prices, assuming that consumer preferences, consumer income, population, and other factors remain unchanged. Graphically, economists show demand as a single line on a graph that spans many price and quantity combinations. On the same graph, economists show a change quantity demanded as a move along that curve from one price quantity combination to another. Economists show a change in demand by moving the entire curve.[7]

Own-price elasticity of demand [8] is a measure of how responsive consumers are to price change for a given product. Elasticity measures the percent change in quantity given a one-percent change in price. A larger elasticity, in terms of absolute value, indicates more consumer price sensitivity for a good.

[6] Consumption is also referred to as quantity demanded.
[7] The K-State Agricultural Economics AgManager.info website has several useful resources for understanding meat demand and tracking it over time: https://www.agmanager.info/livestock-meat/meat-demand.
[8] Often economists and others will shorten this to simply "elasticity". However, elasticity can be calculated relative to many variables and does not just apply to demand.

Economists use a similar convention to differentiate between ***supply and quantity supplied***. A change in the price of a good, with no other factors changing, leads to an increase in production but does not change the producers' cost structure or willingness to sell. This is a change in ***quantity supplied***. If there is a fundamental change, such as a change in technology, cost of inputs, or relevant weather/seasonal variables, the result is a change in ***supply***. In the case of a change in ***supply***, producers are willing to produce more of a good *at any market price*. Graphically, a change in ***quantity supplied*** is shown as a move along the supply curve and a change in ***supply*** is demonstrated by shifting the entire supply curve.

Own-price elasticity of supply is a measure of how responsive sellers/producers are to price change for a given product. Elasticity measures the percent change in quantity supplied given a one-percent change in price. A larger elasticity, in terms of absolute value, indicates more seller/producer price sensitivity for a good.

Market equilibrium or ***market clearing*** is a condition where the amount of a product produced exactly equals the amount sold. In competitive markets, potential buyers and sellers will behave in self-beneficial ways such that market equilibrium price and quantity are determined.

Deriving Demand and Supply Curves

Deriving linear demand and supply curves from a price and quantity observation involves some assumptions[9]. First, it is necessary to assume the market begins in equilibrium at the observed price and quantity. Second, a functional form must be chosen. In our case we assume demand can be represented as:

$$Q^D = a + bP_B$$

Where Q^D is quantity demanded billion pounds, P_B is price of All-Fresh retail beef in cents per pound, b is the negative coefficient on price, and a is an intercept term representing the static quantity demanded resulting from all other relevant variables. Similarly, quantity supplied (Q^S)is assumed to have the form:

$$Q^S = c + dP_B.$$

[9] A more detailed explanation of this approach can be found in Pindyck, R.S. and D.L. Rubinfeld. *Microeconomics, 8th Edition*. Pearson, 2013, Section 2.6 Understanding and Predicting the Effects of Changing Market Conditions, pp. 48-52.

The next step requires assuming own-price elasticities of demand (E^D) and supply (E^S). E^D relates to the quantity demanded and price in the following way:

$$E^D = \frac{\%\Delta Q^D}{\%\Delta P_B}$$

This equation involves taking the difference between two price and quantity combinations. If the demand function is known, the equation can be rewritten to estimate elasticity at a single price and quantity combination.

$$E^D = \frac{\partial Q^D}{\partial P_B}\frac{P_B}{Q^D}$$

In this case, the first term on the right-hand side of the equation is the partial derivative of the demand function. If we assume that demand function is linear, as shown earlier, the partial derivative equals b. Substituting, we are left with:

$$E^D = b\frac{P_B}{Q^D}$$

If we know E^D, P_B, and Q^D, solving for b is straightforward. In the calculations for the 2023-2024 example, we used the following 2023 values for beginning conditions: E^D = -0.479 P_B= 759.7 and Q^D = 27.81. This yields a result of b = -0.0175. Substituting b, P_B, and Q^D back into the demand function implies that a = 41.13. This approach allows the approximation of the 2023 linear demand curve for US retail beef:

$$Q^D = 41.13 - 0.479P_B$$

This equation allows the prediction of Q^D given P_B or vice versa. The process for deriving the 2023 supply curve followed the same steps using the supply curve and E^S = 0.12. That calculation yielded the following:

$$Q^S = 24.47 + 0.0043P_B.$$

These equations were used to define the beginning market equilibrium for 2023, as show in Figure 1. The process was repeated arrive at 2024 demand and supply functions (Figure 7) using a price of 801.3 cents per pound, a consumption of 27.1 billion pounds, and the same elasticity estimates.

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