Applied Economics Teaching Resources

AAEA Agricultural & Applied Economics Association

Case Study

Market Power in the U.S. Beef Packing Industry

Yuliya V. Bolotova[a]
[a]Iowa State University

JEL Codes: L1, L2, L4, L13
Keywords: Beef packing industry, marketing margins, oligopoly, oligopsony, price-fixing

Abstract
This case study is motivated by recent developments in the U.S. beef packing industry involving allegations of an illegal exercise of buyer and seller market power by the four largest beef packers in the markets for fed cattle and beef products, respectively. In 2019, fed cattle producers and beef buyers filed class action antitrust lawsuits against these companies alleging that they engaged in an unlawful conspiracy with the purpose of decreasing fed cattle prices and increasing wholesale and retail prices of beef as early as January 2015 and violated Section 1 of the Sherman Act. The case study focuses on applications of economic models that may explain conduct and performance of the beef packing industry using the perspectives of plaintiffs and defendants in the ongoing cattle and beef antitrust litigation. The case study also introduces a basic empirical analysis of beef production, beef values, and marketing margins in the beef supply chain based on publicly available data reported by the U.S. Department of Agriculture. The intended audiences are undergraduate and graduate students. The teaching note summarizes student learning objectives and teaching strategies. It also includes multiple-choice questions, as well as suggested answers and guidance to analytical, discussion, and multiple-choice questions.

1 Introduction

The U.S. fed cattle price dynamics beginning in 2010 attracted increased attention of industry participants and policy decision makers (U.S. Government Accountability Office 2018).[1] In the period of 2010–2015, fed cattle prices, while volatile, increased steadily from approximately $90 per hundredweight (cwt) in early 2010 to approximately $170 per cwt by the end of 2014. Fed cattle prices then collapsed in 2015, falling to approximately $125 per cwt by the end of 2015 and to $100 per cwt by the end of 2016 (U.S. Government Accountability Office 2018; Figure A1 included in Appendix 1).[2]

In 2019, fed cattle producers and beef buyers filed class action antitrust lawsuits against the four largest beef packers in the country: Tyson Foods, JBS USA, Cargill Meat Solutions, and National Beef Packing Company. The plaintiffs alleged that these companies engaged in an unlawful conspiracy with the purpose of decreasing fed cattle prices and increasing wholesale and retail prices of beef as early as January 2015 and thus violated Section 1 of the Sherman Act (1890) (Brown 2019; Douglas 2019). The coordinated supply restraints (reduced slaughter rates, plant capacity underutilization, plant closures, and reduced purchases of fed cattle in the spot market) were claimed to be the primary method of

[1] Fed cattle are heifers and steers raised to produce high-quality beef products. Beef packers purchase fed cattle to slaughter and process them into boxed beef and various beef cuts sold to wholesalers, retailers, and final consumers (U.S. Government Accountability Office 2018).

[2] Fed cattle prices, as many agricultural commodity prices, fluctuate due to a natural agricultural (fed cattle) price cycle (Kohls and Uhl 2002). Fed cattle prices respond to expansion and contraction in the production of fed cattle (U.S. Government Accountability Office 2018; Figure A1 included in Appendix 1). Fed cattle prices typically increase in the periods of decreasing fed cattle inventory (decreasing fed cattle quantity produced). Fed cattle prices typically decrease in the periods of increasing fed cattle inventory (increasing fed cattle quantity produced).

implementing this price-fixing conspiracy.

The objective of the case study is to explain recent developments in the U.S. beef packing industry involving allegations of an illegal exercise of buyer and seller market power by the four largest beef packers by analyzing relevant economic, business, and legal issues. The case study focuses on applications of economic models that may explain conduct and performance of the beef packing industry (changes in beef production; farm, wholesale, and retail values of beef; farm sector share; and marketing margins) using the perspectives of plaintiffs and defendants in the ongoing cattle and beef antitrust litigation. The case study also introduces a basic empirical analysis of beef production, beef values, farm sector share, and marketing margins in the beef supply chain based on publicly available data reported by the U.S. Department of Agriculture. Table 1 summarizes student learning objectives.

Table 1: Student Learning Objectives

	Student Learning Objectives (SLOs)
SLO #1	Students should be able to explain the U.S. beef packing industry structure and alternative marketing arrangements for fed cattle.
SLO #2	Students should be able to discuss competition issues related to market power of the four largest beef packers raised during the ongoing antitrust litigation, using the perspectives of plaintiffs (fed cattle producers and beef buyers) and defendants (the four largest beef packers).
SLO #3	Using a graphical analysis, students should be able to explain two theoretical frameworks, which may describe conduct and performance of the beef packing industry (changes in input and output quantities and prices, and marketing margins) in the two situations. In the first situation, the beef packing industry behaves as an imperfectly competitive industry (oligopsony/oligopoly forming an input and output price-fixing cartel). In the second situation, the beef packing industry behaves as a competitive industry adjusting input and output quantities in response to increasing marginal cost (increasing fed cattle prices).
SLO #4	Students should be able to perform a basic empirical analysis to evaluate changes in the market and price behavior in the beef supply chain between the period of the alleged price-fixing cartel and a prior, more competitive period.
SLO #5	Students should be able to discuss legal (antitrust) issues involved and explain the role of the Sherman Act in regulating conduct of beef packers in the analyzed industry setting.

2 U.S. Beef Packing Industry Background

This section discusses the beef packing industry's structure and fed cattle marketing arrangements used by fed cattle producers and beef packers.

2.1 U.S. Beef Packing Industry: Structure

The U.S. beef packing industry is a highly concentrated industry.[3] The combined market share of the four largest firms (beef packers) in fed cattle slaughtering and beef sales is in the range of 80 to 85 percent (Greene 2016, Figure 1; Pollard 2021; U.S. Department of Agriculture, Agricultural Marketing Service

[3] A commonly used measure of market concentration is the combined market share of N largest firms in the industry, which is also referred to as the N-firm concentration ratio (Besanko et al. 2006). CR4 (N = 4) is the most frequently used measure. It is considered that if CR4 exceeds 75 percent, industries are conducive to collusion and present competition concerns (Hovenkamp 2005). If CR4 is smaller than 40 percent, industries are not likely to present competition concerns.

2022; MacDonald, Dong, and Fuglie 2023).[4] While several economically significant acquisitions took place in the industry in the two recent decades, these acquisitions did not alter the number of the largest beef packers. Some of these acquisitions affected the ownership of the largest beef packers.

In 2001, Tyson Foods (now the largest U.S. meat processor) acquired Iowa Beef Processors, then the largest U.S. beef packer (Ward 2010). In 2007, JBS S.A. (a Brazilian company, the world's largest meat processor) acquired Colorado-based Swift Foods Company (then the third largest U.S. beef processor). As of 2007, the four largest beef packers in the United States were Tyson Foods (market share of 23.6 percent), Cargill Meat Solutions (market share of 22.0 percent), JBS USA (market share of 14.6 percent), and National Beef Packing Company (market share of 11.4 percent). Smithfield Beef Group was the fifth largest beef packer (market share of 6.5 percent; Congressional Research Service 2009, Table 1). In 2008, JBS S.A. acquired Smithfield Beef Group (Johnson 2009). In 2018, Marfrig (a Brazilian company) purchased the controlling ownership interest in National Beef Packing Company (National Beef Newsroom 2018).

2.2 U.S. Beef Packing Industry: Fed Cattle Marketing Arrangements

The U.S. beef packing industry has a high degree of vertical coordination (Adjemian et al. 2016; Greene 2016). Fed cattle producers and beef packers use a variety of fed cattle marketing arrangements (Greene 2019). While the spot (cash) market for fed cattle had been the dominant marketing arrangement in the industry prior to the 2000s, the use of alternative marketing arrangements, and in particular the use of forward and formula contracts, increased in the two recent decades (Greene 2019; Peel et al. 2020).[5] For example, the share of fed cattle sold in a traditional negotiated spot market setting decreased from approximately 55 percent in 2004 to 23 percent in 2019 (Greene 2019, Figure 1). In contrast, the share of fed cattle sold using forward and formula contracts increased from approximately 31 percent in 2004 to 70 percent in 2019 (Greene 2019, Figure 1).

Forward and formula contracts are essential for business planning: output (fed cattle) marketing for fed cattle producers and input (fed cattle) procurement for beef packers (Bolotova 2022b). Forward and formula contracts are also a form of risk management for fed cattle producers and beef packers, as compared with traditional spot markets. Beef packers benefit from using forward and formula contracts because they can secure the constant flow of the required quantity of fed cattle with the essential quality characteristics to their meat processing plants. Fed cattle producers also benefit from using forward and formula contracts because they can secure in advance a marketing outlet for their fed cattle and reduce marketing and price risks.

Both forward and formula contracts establish a price determination method for the price to be determined later, when fed cattle are delivered to the beef packing plants (Adjemian et al. 2016; Greene 2016, 2019).[6] Forward contracts use the Chicago Mercantile Exchange live cattle futures contract prices

[4] For comparison, the combined market shares of the four largest broiler chicken processors and the four largest pork processors in 2020 were 52.7 percent and 64.2 percent, respectively (Bolotova 2022a). The combined market shares of the ten largest broiler chicken processors and the ten largest pork processors in 2020 were 79.7 percent and 85.9 percent, respectively (Bolotova 2022a). A comprehensive discussion of concentration and competition in U.S. agribusiness, including crop seeds, meatpacking, and food retailing, is presented in MacDonald, Dong, and Fuglie (2023).

[5] A local livestock auction is an example of the spot market for fed cattle. Alternative marketing arrangements for fed cattle are the alternatives to the spot market: forward contracts, formula contracts, packer-owned fed cattle (vertical integration), and fed cattle sold using a negotiated grid method (Adjemian et al. 2016; Greene 2016, 2019; Peel et al. 2020).

[6] In contrast, a negotiated spot price for fed cattle is determined by interaction (negotiation) between seller and buyer; discounts and premiums are applied to the base price by taking into account directly observed quality of fed cattle (Rhinehart 2009; Parish, Rhinehart, and Anderson 2009; Ward, Schroeder, and Feuz 2017). In the case of a negotiated grid method, a base price for fed cattle is determined by interaction (negotiation) between seller and buyer; the base price includes premiums and discounts specified in a grid (Rhinehart 2009; Parish, Rhinehart, and Anderson 2009; Ward, Schroeder, and Feuz 2017). The grid with fed cattle quality premiums and discounts is either developed using data reported by the U.S. Department of Agriculture or data collected at the processing plant. The actual price for fed cattle is determined based on the quality of

as a base (or a reference price) to determine the actual price paid to fed cattle producers. Formula contracts use spot market prices as a base (or a reference price) to determine the actual price paid to fed cattle producers. The spot market prices used in the formula contracts are typically spot market prices reported by the U.S. Department of Agriculture, Agricultural Marketing Service.

3 Alleged Beef Packer Input and Output Price-Fixing Cartel

This section discusses competition (business conduct) issues raised in the ongoing cattle and beef antitrust litigation (2019–present).

3.1 The Perspective of Fed Cattle Producers and Beef Buyers

The perspective of fed cattle producers and beef buyers is that a price-fixing conspiracy of the four largest beef packers affected the fed cattle and beef price dynamics beginning in 2015 (*In Re Cattle Antitrust Litigation: Ranchers Cattlemen Action Legal Fund United Stockgrowers of America et al. v Tyson Foods, Inc. et al. 2019* [cattle producers' complaint]; *Pacific Agri-Products v. JBS USA Food Company Holdings et al. 2019* [direct beef buyers' complaint]; *Peterson et al. v. Agri Stats, Inc. et al. 2019* [indirect beef buyers' complaint]; *In Re Cattle and Beef Antitrust Litigation* 2022).[7]

First, the complaints state that the following structural characteristics of the beef packing industry facilitated collusion (a price-fixing conspiracy) of the four largest beef packers and contributed to its continuous success.

- The beef packing industry is a highly concentrated industry in the input (fed cattle) and output (beef) markets. The combined market share of the four largest beef packers in fed cattle slaughtering is in the range of 81 to 85 percent. The combined market share of the next largest beef packers is in the range of 2 to 3 percent. The combined market share of the four largest beef packers in beef sales is approximately 80 percent.
- The beef packing industry has high barriers to entry. At least $250 million is required to construct a new beef processing plant. In addition, it takes about two years to obtain the permits, get the plan and design approved, and build a new plant.
- Beef is a homogenous product, which means that it is indistinguishable among beef packers. Buyers are practically indifferent from which beef packer to buy beef. Demand for homogenous products mostly depends on price, rather than on product quality characteristics and/or customer service. The homogeneous nature of beef products makes it easier for beef packers to coordinate on price and effectively enforce their price-fixing agreement.
- Supply for fed cattle and demand for beef are inelastic. The quantity of cattle supplied is insensitive to short-term cattle price changes, due to a long cattle lifecycle, cattle perishability, and the lack of alternative uses for cattle. The quantity of beef demanded is relatively insensitive to changes in beef prices. While chicken and pork are product-substitutes to beef, according to the existing study, the relative effect of changing chicken and pork prices on the quantity of beef demanded is economically small.[8] Because of inelastic supply for fed cattle and inelastic demand for beef, the farm-to-wholesale margin (the "meat margin") is very sensitive to changes in the aggregate quantity of fed cattle slaughtered. The profitability of beef packers is driven by the "meat margin."

delivered and slaughtered fed cattle, which is used to determine actual premiums and discounts. The negotiated grid pricing method rewards cattle producers producing high-quality cattle and penalizes fed cattle producers producing low-quality cattle.

[7] The complaints against the four largest beef packers were filed in the U.S. District Court, District of Minnesota.

[8] The existing study cited in the complaints is Tonsor, Lusk, and Schroeder (2018). For example, see *In Re Cattle and Beef Antitrust Litigation* 2022.

- There are frequent opportunities to collude in the beef packing industry.
  For example, employees of the four largest beef packers on a regular basis participate in the industry meetings, such as trade association conferences and forums. During these industry meetings, some employees of the four largest beef packers have opportunities to exchange competitor sensitive information and the companies' plans and strategies, and to develop relationships.

Second, the complaints state that the four largest beef packers implemented several allegedly anticompetitive and coordinated supply restraints. The alleged market effects of these supply restraints were to decrease the quantity of fed cattle purchased and slaughtered and consequently the quantity of beef produced, which ultimately decreased fed cattle prices and increased wholesale and retail prices of beef. The allegedly anticompetitive and coordinated supply restraints are summarized below.

- The four largest beef packers periodically reduced fed cattle slaughter volumes to reduce the demand for fed cattle.
- The four largest beef packers periodically decreased the purchase and slaughter of cash cattle (fed cattle purchased in the spot market).
- The four largest beef packers coordinated their procurement (purchasing) practices for cash cattle.
- A decrease in the quantity of cash cattle purchased and coordinated cash cattle procurement decreased the spot price for fed cattle, which consequently caused formula contract prices to decrease (formula contracts use spot prices as reference prices).
- The four largest beef packers simultaneously closed and/or idled plants to further decrease the slaughter capacity, refrained from expanding the plant capacity, and operated some of their plants at a reduced processing capacity (reduced hours, scheduling maintenance shutdowns, etc.).
- The four largest beef packers imported foreign cattle at a loss to reduce domestic demand.

The complaints discuss a significant change in price dynamics throughout the beef supply chain beginning in 2015, which affected the profitability of beef packers. For example, the beef buyers' complaints mention that fed cattle prices steadily increased between 2009 and 2014, and wholesale prices of beef moved in tandem. As a result, profit margins of the beef packers were very small, in the range of 1 to 4 percent. The beef buyers argued that the beef packers implemented coordinated supply restraints to increase their profit.

In 2015, while fed cattle prices began to decrease, wholesale and retail prices of beef were increasing, causing marketing margins to increase. Tyson and JBS (both are public companies) discussed in the Earning Calls with their investors increased profit margins, in the range of 4 to 8 percent, obtained due to their visibility into the beef supply chain and their ability to balance fed cattle supply and beef demand. Tyson and JBS emphasized that their goal was to operate a "margin business," rather than a "market share business."

3.2 The Perspective of the Four Largest Beef Packers

The perspective of the four largest beef packers is that agricultural supply and demand conditions, not a price-fixing conspiracy, affected fed cattle price dynamics (*In Re Cattle Antitrust Litigation: Memorandum of Law in Support of Defendants' Joint Motion to Dismiss the Consolidated Amended Class Action Complaint* 2019).

Prior to 2015, fed cattle prices increased in response to a decrease in the fed cattle supply due to a drought. In response to increasing fed cattle prices, fed cattle producers increased the supply of fed

cattle, which caused fed cattle prices to decrease beginning in 2015. The beef packers quoted the U.S. Government Accountability Office (2018) explaining fed cattle price dynamics in the period of 2013–2016 based on an extensive investigation. The U.S. Government Accountability Office (2018) concludes that several interrelated supply and demand factors affected the national changes in fed cattle prices in this period: a drought, increasing feed costs, and a decreasing beef demand. In addition, the U.S. Government Accountability Office (2018) informs that the competition level among beef packers did not seem to affect the national fed cattle price changes. However, fed cattle prices tended to be lower in the geographic areas with less competition among beef packers.

The beef packers argued that the allegedly anticompetitive practices described in the complaints filed by fed cattle producers and beef buyers in the court were the elements of a lawful independent competitive behavior. The arguments of the four largest beef packers explaining their conduct are summarized below.

- Periodic slaughter reductions took place in the period of a declining fed cattle supply, which was prior to 2015, the beginning of the alleged price-fixing conspiracy. The slaughter volumes increased beginning in 2015. Figure 1 depicts yearly beef production in the United States for the period of 2000–2019, which reflects changes in the annual slaughter volumes (U.S. Department of Agriculture, Economic Research Service 2022a).

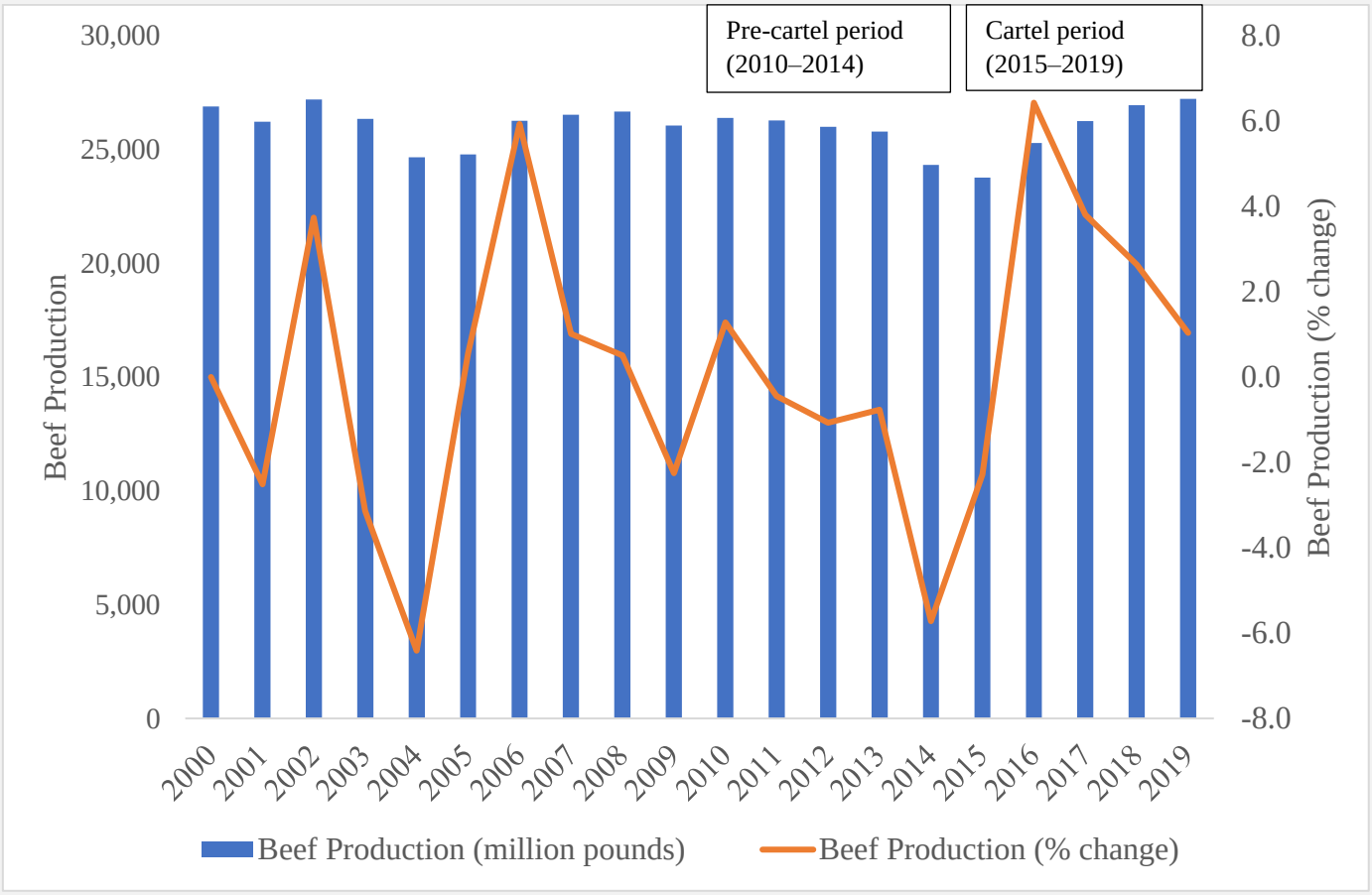

Figure 1: U.S. Yearly Beef Production, 2000–2019

Source: U.S. Department of Agriculture, Economic Research Service (2022a)

- Reduced purchases of cash cattle also took place in the period of a declining fed cattle supply, which was prior to 2015. Given that approximately 70 percent of fed cattle are purchased using forward and formula contracts, it is economically rational for beef packers to decrease purchases of fed cattle in the cash market in the period of a declining fed cattle supply.
- The types of allegedly coordinated fed cattle procurement practices used in the spot market were consistent with lawful competition, based on the past court analysis and economically rational behavior of beef packers.
- Three out of the four alleged plant closures took place before the beginning of the alleged price-fixing conspiracy. These plant closures were not simultaneous.
- A slight increase in the import of fed cattle from Canada and Mexico was observed since 2015, because it was economically rational for the beef packing plants located near the borders with Canada and Mexico to import foreign cattle rather than domestic cattle from distant geographic areas.

4 Theoretical Frameworks

This section presents a graphical analysis of two alternative economic models, which may explain conduct and performance of the beef packing industry (changes in input and output quantities, prices, and margins) using the perspectives of plaintiffs (fed cattle producers and beef buyers) and defendants (the four largest beef packers) in the ongoing cattle and beef antitrust litigation.

4.1 Beef Packing Industry Is an Imperfectly Competitive Industry

Given a high concentration level, the beef packing industry is oligopsony in the input (fed cattle) market and oligopoly in the output (beef) market. The perspective of fed cattle producers and beef buyers is that the beef packing industry behaves as an imperfectly competitive industry illegally exercising buyer and seller market power. Figure 2 is a graphical representation of an economic model incorporating a marketing margin framework, which is used to demonstrate market and price effects of buyer and seller market power of the beef packers in the beef supply chain.[9] The beef supply chain structure corresponding to Figure 2 is presented in Appendix 2 (Figure A2.2).

Figure 2 depicts three curves: farm fed cattle supply, wholesale beef demand, and retail beef demand. These curves are graphical representations of the price-dependent supply and demand functions. The fed cattle price is a function of the fed cattle quantity (the fed cattle quantity determines the fed cattle price). The beef price is a function of the beef quantity (beef quantity determines wholesale and retail prices of beef).

Figure 2 also depicts quantities, prices, and margins for two scenarios. The first scenario is a competitive industry scenario, in which beef packers do not have any market power. The second scenario is a generic market power scenario referred to as the beef packer cartel, in which beef packers exercise buyer and seller market power.

[9] Graphically, this economic model is a simplified version of the economic models explaining the profit-maximizing behavior of industries with seller market power (oligopoly and monopoly) and industries with buyer market power (oligopsony and monopsony). These economic models are discussed in standard microeconomics and industrial organization textbooks (Besanko and Braeutigam 2002; Carlton and Perloff 2004). For simplicity, the marginal revenue curve for monopoly and the marginal expenditure curve for monopsony are not shown in Figure 2 (Figure A2.1, presented in Appendix 2, reproduces Figure 2 with these two curves depicted in it). Blair and Angerhofer (2021) apply economic models of monopoly and monopsony to explain market power of beef packers under different collusion scenarios in light of the ongoing cattle and beef antitrust litigation. Kohls and Uhl (2002) and Tomek and Kaiser (2014) discuss marketing margin frameworks, as applied to agricultural and food industries. MacDonald (2009) uses a simplified version of the economic model depicted in Figure 2 to demonstrate quantity and price effects of market power in the food system in light of antitrust issues.

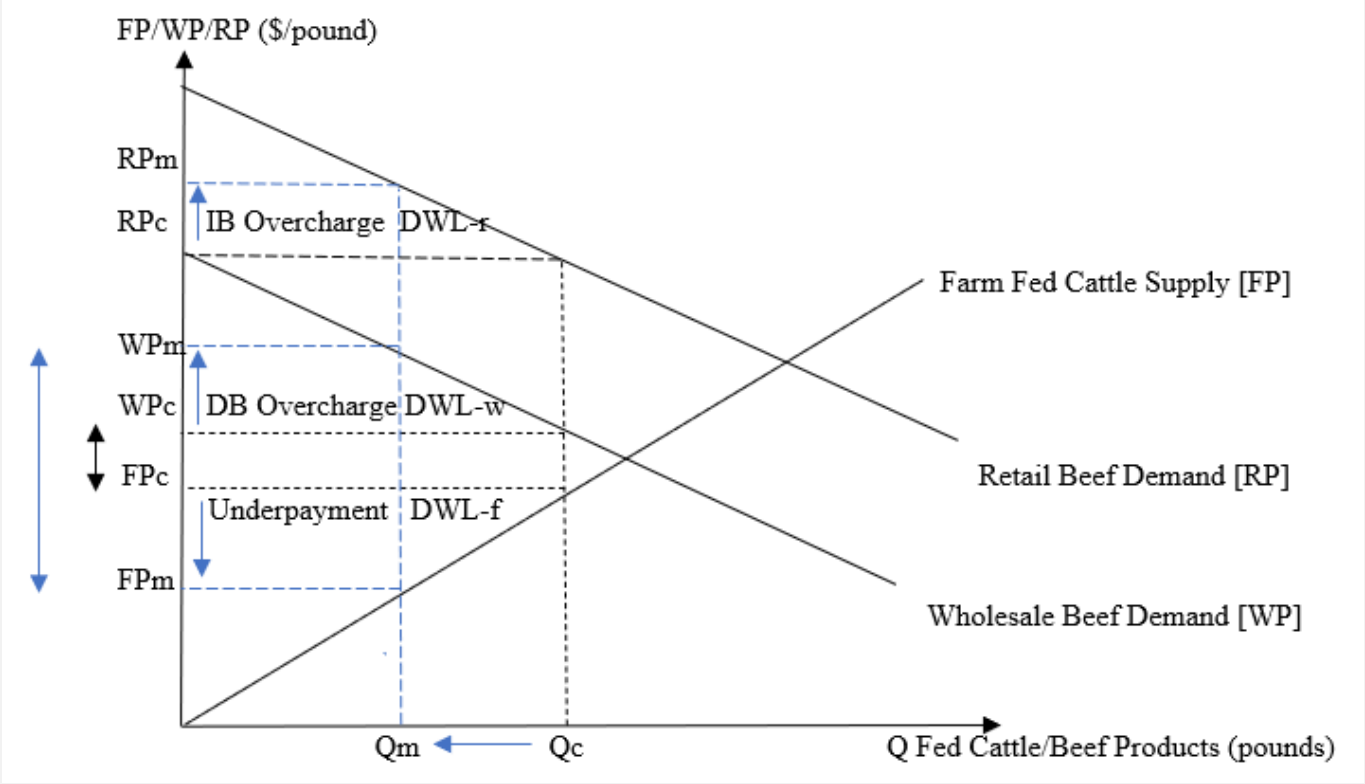

Figure 2: The Beef Packing Industry Is an Imperfectly Competitive Industry: The Buyer and Seller Market Power Effects on Quantities, Prices, and Margins

As compared with a competitive industry, to maximize *joint* profit, the beef packer cartel decreases the quantity of fed cattle purchased and the quantity of beef produced and sold from Qc to Qm.[10] This quantity reduction causes the fed cattle price (farm price) to decrease from FPc to FPm (buyer market power of beef packers affecting inverse supply for fed cattle) and wholesale and retail prices of beef to increase from WPc to WPm and from RPc to RPm, respectively (seller market power of beef packers affecting inverse demand for beef products).[11] Consequently, farm-to-wholesale margin (the "meat margin"), measured in $ per pound, increases from (WPc - FPc) to (WPm - FPm), and farm-to-retail margin, measured in $ per pound, increases from (RPc - FPc) to (RPm - FPm). Figure 3 depicts monthly farm, wholesale, and retail values for beef for the period of 2000–2019, which are proxies for prices depicted in Figure 2 (Hahn 1991, 2004; U.S. Department of Agriculture, Economic Research Service 2022b).

[10] The fed cattle quantity can be thought of as a retail equivalent of the beef quantity. This is the reason the same Q is used to denote fed cattle quantity and beef quantity in Figure 2. Qc is not at the intersection of the farm fed cattle supply and wholesale beef demand curves because the farm supply is for fed cattle, and the wholesale demand is for beef. The vertical distance between these two curves is the farm-to-wholesale margin (the "meat margin") measured in $ per unit.

[11] Note that the retail price is also affected by output (beef) pricing strategies of food (beef) retailers and their seller market power.

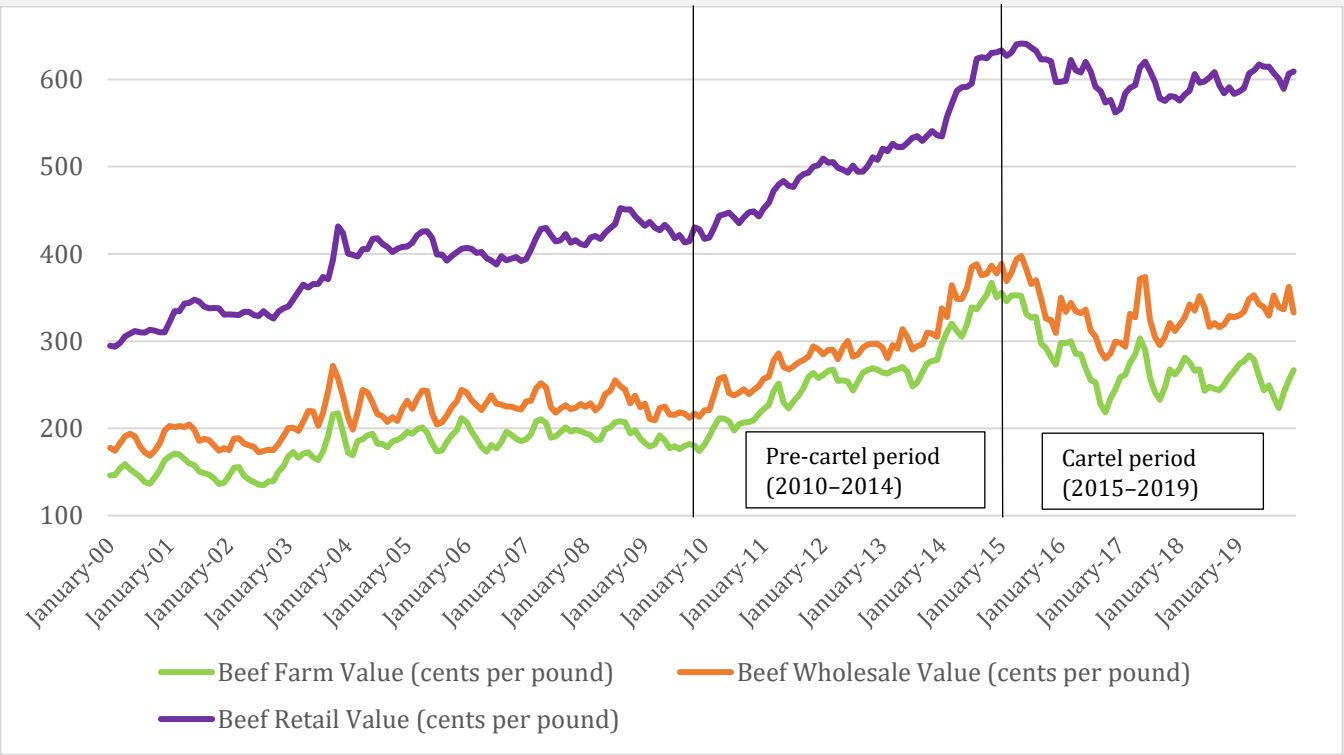

Figure 3: U.S. Monthly Farm, Wholesale, and Retail Values of Beef, 2000–2019

Source: U.S. Department of Agriculture, Economic Research Service (2022b)

The farm-to-wholesale margin includes slaughtering, processing, and packing costs, and profit of beef packers. The farm-to-retail margin is the sum of farm-to-wholesale margin and wholesale-to-retail margin. The latter includes retailing costs and profit of beef retailers. The farm-to-wholesale margins measured in $ per unit are indicated with double-sided arrows in Figure 2. Figure 4 depicts yearly farm sector share, farm-to-wholesale margin (the "meat margin"), and wholesale-to-retail margin expressed as a percentage of the retail value of beef for the period of 2000–2019 (U.S. Department of Agriculture, Economic Research Service 2022b).

The buyer market power increases profit of beef packers by the amount of underpayment to fed cattle producers. The seller market power increases profit of beef packers by the amount of overcharge attributed to beef buyers. The total $ underpayment and overcharge are the basis for damages that fed cattle producers and beef buyers, respectively, aim to recover during the ongoing cattle and beef antitrust litigation.

The underpayment measured in $ per pound is the input (fed cattle) price decrease due to the input (fed cattle) quantity decrease, due to the exercise of buyer market power by the beef packer cartel. The underpayment to fed cattle producers measured in $ per pound is (FPc - FPm) in Figure 2. The total $ underpayment to all fed cattle producers is the "Underpayment" rectangle in Figure 2, which is the underpayment measured in $ per pound times the quantity of fed cattle purchased by beef packers (Qm). Fed cattle producers, who sell fed cattle to beef packers, sell a smaller fed cattle quantity and receive lower fed cattle prices. There are also fed cattle producers who do not sell fed cattle due to reduction in the fed cattle quantity purchased by the beef packing industry. These fed cattle producers are represented by the deadweight loss attributed to the fed cattle sector (DWL-f triangle in Figure 2).

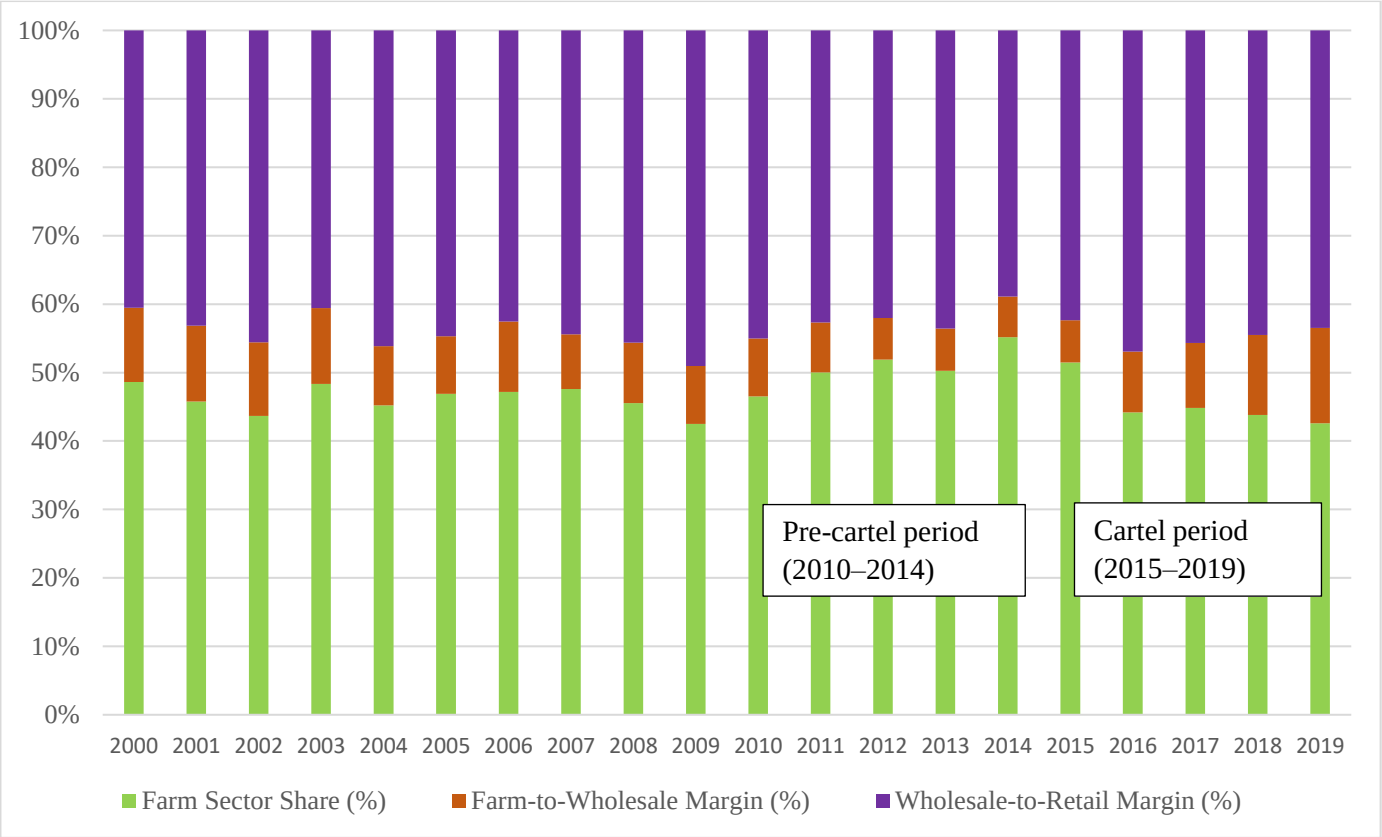

Figure 4: U.S. Yearly Farm Sector Share, Farm-to-Wholesale Margin, and Wholesale-to-Retail Margin Expressed as a Percentage of the Retail Value of Beef, 2000–2019

Source: U.S. Department of Agriculture, Economic Research Service (2022b)
Note: The measures depicted in the figure are calculated by the author using farm, wholesale, and retail values of beef reported in this source.

The overcharge measured in $ per pound is the output (beef) price increase due to the output (beef) quantity decrease, due to the exercise of seller market power by the beef packer cartel. The overcharge attributed to direct buyers of beef (for example, beef retailers purchasing beef directly from beef packers) measured in $ per pound is (WPm - WPc) in Figure 2.[12] The total $ overcharge attributed to all direct buyers is the "DB Overcharge" rectangle in Figure 2, which is the overcharge measured in $ per pound times the quantity of beef sold by beef packers (Qm).

The overcharge attributed to indirect buyers (for example, final consumers) measured in $ per pound is (RPm - RPc) in Figure 2.[13] The total $ overcharge attributed to all indirect buyers is the "IB Overcharge" rectangle in Figure 2, which is the overcharge measured in $ per pound times the quantity of beef sold by beef packers (Qm).

Direct and indirect buyers of beef, who purchase beef, purchase a smaller beef quantity and pay higher beef prices. There are also direct and indirect buyers who do not purchase beef due to reduction in the beef quantity produced and sold by beef packers. These direct and indirect buyers are represented

[12] Direct buyers (purchases) are buyers who purchase a cartelized product directly from defendants in the lawsuit (Hovenkamp 2005).

[13] Indirect buyers (purchasers) are buyers who purchase a cartelized product indirectly from defendants (Hovenkamp 2005). For example, indirect buyers are those who purchase the cartelized product from a firm, who is not a defendant in the lawsuit, but who purchased the cartelized product from defendants in the lawsuit to resell this product.

by the deadweight loss attributed to these buyers (DWL-w and DWL-r triangles, respectively, in Figure 2).

The economic model explained in this section reflects the reasoning of the U.S. Department of Justice explaining the effects of buyer and seller market power of beef packers (*U.S. and Plaintiff States v. JBS S.A. and National Beef Packing Company, LLC.,* 2008).

> *"With the price of fed cattle representing most of the cost of beef production,* ***packer profitability is determined largely by the 'meat margin,'*** *or the spread between the price packers pay for fed cattle and the price packers charge for beef, including USDA-graded boxed beef.*
>
> *This meat margin is highly sensitive to changes in the aggregate output levels of fed cattle packers. All else being equal,* ***when the meat packing industry reduces production levels, feedlots and cattle producers are paid less for fed cattle because fewer fed cattle are demanded and customers pay more for USDA-graded boxed beef because less is available for purchase.***
>
> ***Because the supply of fed cattle and the demand for USDA-graded boxed beef are relatively insensitive to short-term changes in price, even small changes in industry production levels can significantly affect packer profits****." [emphasis added]*

4.2 Beef Packing Industry Is a Competitive Industry

The perspective of the four largest beef packers is that the beef packing industry behaves as a competitive industry adjusting fed cattle quantities purchased and beef quantities produced in response to changing fed cattle prices. Figure 5 depicts a competitive industry scenario from Figure 2 as the original scenario. The fed cattle price is a major variable cost component for beef packers. Prior to 2015, fed cattle prices were increasing. An increase in the fed cattle price is equivalent to an inward (left) parallel shift of the fed cattle supply curve in Figure 5; this is Scenario 1. The fed cattle price increases from FPc to FP_1.

To pass the cost increase on the buyers of beef to maintain the same profitability level (the one of the original competitive industry scenario), the beef packing industry decreases the quantity of fed cattle purchased and the quantity of beef produced from Qc to Q_1. Consequently, wholesale and retail prices of beef increase from WPc to WP_1 and from RPc to RP_1, respectively. The farm-to-wholesale margin (the "meat margin") does not change. The farm-to-wholesale margins measured in $ per pound are indicated with double-sided arrows in Figure 5.

Fed cattle prices started decreasing in 2015. A decrease in the fed cattle price is equivalent to an outward (right) parallel shift of the fed cattle supply curve back to the original scenario in Figure 5. To pass the cost decrease onto the buyers of beef to maintain the same profitability level as in Scenario 1, the beef packing industry increases the quantity of fed cattle purchased and the quantity of beef produced. Consequently, wholesale and retail prices of beef decrease. The farm-to-wholesale margin (the "meat margin") does not change.

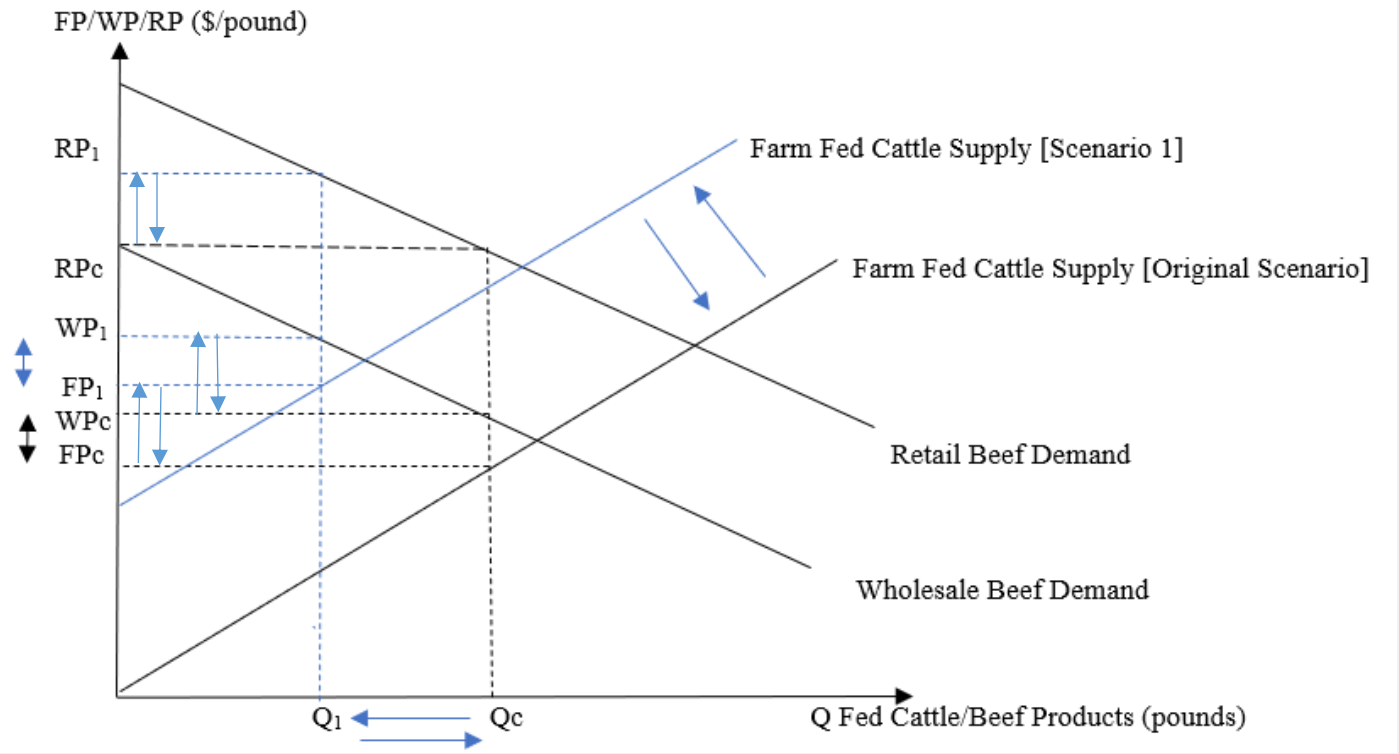

Figure 5: The Beef Packing Industry Is a Competitive Industry: The Effects of Increasing and Decreasing Fed Cattle Prices (Costs) on Quantities, Prices, and Margins

5 Antitrust (Competition) Issues

In their complaints filed in the court beginning in 2019, fed cattle producers and beef buyers claimed that the alleged input and output price-fixing cartel of the four largest beef packers violated Section 1 of the Sherman Act (1890). This section declares illegal contracts, combinations, and conspiracies in restraint of trade in interstate commerce. Price-fixing agreements (cartels or conspiracies) aim to increase, decrease, or fix (stabilize) product prices, and can be verbal, written, or inferred from the conduct of firms (Federal Trade Commission 2022). Section 1 equally applies to output price-fixing cartels (which participants illegally exercise seller market power) and input price-fixing cartels (which participants illegally exercise buyer market power).

Private parties (individuals and firms) pursue violations of the Sherman Act by filing civil (private) lawsuits. Private parties who sell products to cartel members and private parties who purchase products directly from cartel members file private lawsuits under the Clayton Act (a federal law), according to which they are entitled to recover treble damages. In seller-cartel cases, the damage is the overcharge imposed on buyers of the cartelized product. In buyer-cartel cases, the damage is the underpayment to sellers of the cartelized product.

Fed cattle producers, who sold fed cattle to the beef packers (*In Re Cattle Antitrust Litigation: Ranchers Cattlemen Action Legal Fund United Stockgrowers of America et al. v Tyson Foods, Inc. et al. 2019*), and direct buyers of beef, who purchased beef directly from the beef packers (*In Re Cattle and Beef Antitrust Litigation* 2022), aim to recover treble damages under Section 4 of the Clayton Act. The $ value of the underpayment rectangle in Figure 2 is the basis for damages incurred by fed cattle producers, who aim to recover three times the underpayment. The $ value of the DB Overcharge rectangle in Figure 2 is the basis for damages incurred by direct buyers of beef, who aim to recover three times the overcharge.

Private parties who purchase products indirectly from cartel members (indirect purchasers) file private lawsuits in selected states, where state-level consumer protection laws, antitrust laws, or unjust enrichment laws allowing indirect buyers of the cartelized products to recover damages exist. The size of damages that indirect buyers can recover depends on a particular state. Typically, these damages range from one to three times the overcharge (Ewing 2006/2007). The indirect buyers of beef, who purchased beef indirectly from the beef packers (for example, final consumers purchased beef products from beef retailers; *Peterson et al. v. Agri Stats, Inc. et al.* 2019), aim to recover damages in selected states. The $ value of the IB Overcharge rectangle in Figure 2 is the basis for damages incurred by indirect buyers of beef.

In September 2020, the lawsuits filed by fed cattle producers and beef buyers were dismissed (Tovar 2020). However, the plaintiffs were given three months to amend their complaints. The Judge stated that the originally filed complaints did not present direct evidence or a parallel conduct evidence with sufficient detail necessary to support an inference of a price-fixing conspiracy (an *agreement* among the four largest beef packers) violating Section 1 of the Sherman Act (*In Re Cattle Antitrust Litigation: Memorandum Opinion and Order Granting Defendants' Motions to Dismiss* 2020).

Proving an agreement among competitors violating Section 1 of the Sherman Act represents the main challenge for plaintiffs during antitrust litigations (Baker 1993; Hovenkamp 2005). Direct evidence of this agreement is usually not available, and the agreement must be established using circumstantial evidence. The circumstantial evidence includes the presence of a parallel conduct of the defendants and additional plus factors. The examples of parallel conduct are parallel pricing and parallel output reductions. The examples of plus factors are market structures and business practices facilitating collusion.

The plaintiffs filed amended complaints in the court in December 2020. During the subsequent court hearings, the defendants' motions to dismiss these lawsuits permanently was denied (Henderson 2021; *In Re Cattle Antitrust Litigation: Memorandum Opinion and Order* 2021). The Judge stated that in their revised complaints the plaintiffs included sufficiently detailed direct evidence (information provided by the two witnesses) to plausibly allege that the defendants engaged in a price-fixing agreement violating Section 1 of the Sherman Act.[14] In addition, the plaintiffs strengthened the evidence on plus factors (market structural characteristics and information on the investigations conducted by the U.S. Department of Justice and the U.S. Department of Agriculture) and parallel conduct of the four largest beef packers to coordinate slaughter reductions and reductions of purchases of fed cattle in the spot market with the purpose of decreasing fed cattle prices and increasing beef prices.[15] The cattle and beef antitrust litigation is ongoing and may end up with either large settlements or continue to trial.

At the beginning of 2022, JBS reached a $52.5 million settlement agreement with buyers, who had purchased beef products (boxed or case-ready beef) directly from JBS (Beef Direct Purchaser Class Action 2023). At the beginning of 2023, JBS reached a $25 million settlement agreement with commercial and institutional buyers, who had purchased beef products (boxed or case-ready beef) indirectly from JBS (Beef Antitrust Litigation Settlement 2023). In the settlement agreements JBS denied any wrongdoing.

[14] In their revised complaints, the plaintiffs provided more details about the two witnesses, in particular about their job responsibilities, positions in their companies' hierarchy, and job interactions that may have allowed them to acquire knowledge of alleged agreement among the defendants to reduce fed cattle slaughter volumes and purchases of fed cattle in the spot market (*In Re Cattle Antitrust Litigation: Memorandum Opinion and Order* 2021).

[15] In their revised complaints, the plaintiffs provided defendant-specific data (in contrast to the aggregate industry data provided in the original complaints) to demonstrate that the defendants slaughter reductions moved in tandem reflecting their coordinated conduct beginning in January 2015 (*In Re Cattle Antitrust Litigation: Memorandum Opinion and Order 2021*). These data were provided on a quarterly basis for the period of 2012–2019.

6 Discussion and Analytical Questions

The teaching note provides additional guidance for selected discussion and analytical questions, and suggested answers to all questions. The teaching note also includes multiple-choice questions that can be used as in-class assignments, quizzes, and exam questions.

1. Discuss the U.S. beef packing industry's structure and fed cattle marketing arrangements used by fed cattle producers and beef packers.

2. Discuss competition (business conduct) issues related to allegedly illegal exercise of buyer and seller market power by the four largest beef packers in the markets for fed cattle and beef, respectively, which are raised during the ongoing cattle and beef antitrust litigation.
- **2.1.** Discuss these competition issues using the perspective of fed cattle producers and beef buyers (plaintiffs).
- **2.2.** Discuss these competition issues using the perspective of the four largest beef packers (defendants).

3. Using a graphical analysis, explain economic models that describe conduct and performance of the beef packing industry (changes in input and output quantities and prices, and marketing margins) in the three market situations (note that fed cattle are "input" and beef products are "output").
- **3.1.** In the first situation, assume that the beef packing industry behaves as an imperfectly competitive industry (oligopsony/oligopoly) exercising buyer market power in the market for fed cattle and seller market power in the market for beef. Explain changes in the beef quantity; farm, wholesale, and retail prices; and marketing margins in the beef supply chain in the market power scenario, as compared to a competitive industry scenario.
- **3.2.** In the second situation, assume that the beef packing industry behaves as a competitive industry facing *increasing* cost represented by *increasing* fed cattle prices. Explain changes in the beef quantity, wholesale and retail prices of beef, and industry profit as the industry responds to this cost *increase*.
- **3.3.** In the third situation, assume that the beef packing industry behaves as a competitive industry facing *decreasing* cost represented by *decreasing* fed cattle prices. Explain changes in the beef quantity, wholesale and retail prices of beef, and industry profit as the industry responds to this cost *decrease*.

4. Familiarize yourself with the U.S. Department of Agriculture, Economic Research Service data sources used to collect economic variables utilized in the empirical analysis presented in the case study: Figures 1, 3, and 4, and Table A2 included in Appendix 2. The data used to generate these figures and table are included in the teaching note Excel file. The teaching note provides additional guidance.
- **4.1.** Use the U.S. Department of Agriculture, Economic Research Service, Food Availability Data System (Red Meat) to download yearly beef production for the period of 2000–2019, depicted in Figure 1 (U.S. Department of Agriculture, Economic Research Service 2022a).
- **4.2.** Use the U.S. Department of Agriculture, Economic Research Service, Historical Price Spread Data for Beef, Pork, Broilers to download monthly farm, wholesale, and retail values of beef for the period of 2000–2019, depicted in Figure 3 (U.S. Department of Agriculture, Economic Research Service 2022b).

5. Evaluate the U.S. beef industry dynamics in the period of 2010–2019 by analyzing data presented in Table A2, included in Appendix 2 and depicted in Figures 1, 3, and 4 (U.S. Department of Agriculture, Economic Research Service 2022a, 2022b). Table A2 summarizes yearly averages for beef production and monthly averages for farm, wholesale, and retail values of beef; farm-to-wholesale margin, wholesale-to-retail margin, and farm sector share for the cartel period (2015–2019; the period of the alleged price-fixing cartel), and the pre-cartel period (2010–2014; a prior, more competitive period).[16]

5.1. Use the monthly average farm, wholesale, and retail values of beef reported for the pre-cartel and cartel periods in Table A2 and the formulas reported in this table, to reproduce calculations of the monthly average farm-to-wholesale margin, wholesale-to-retail margin, and farm sector share for the two analyzed periods.

5.1.1. Reproduce calculations of the monthly average farm-to-wholesale margin and wholesale-to-retail margin measured in cents per pound.

5.1.2. Reproduce calculations of the monthly average farm-to-wholesale margin, wholesale-to-retail margin, and farm sector share expressed as a percentage of the retail value of beef.

5.1.3. Reproduce calculations of the monthly average farm-to-wholesale margin (the "meat margin") expressed as a percentage of the wholesale value of beef.

5.2. Calculate changes in the averages in the cartel period, relative to the pre-cartel period, for the economic variables reported in Table A2 and record them in this table.

5.3. Describe the results of your analysis. Are changes in beef production; farm, wholesale, and retail values of beef; and farm sector share, farm-to-wholesale margin, and wholesale-to-retail margin in the cartel period, relative to the pre-cartel period, consistent with a market power scenario (alleged input and output price-fixing cartel of the four largest beef packers) or a competitive industry scenario? Explain your reasoning.

6. Explain the reasons that fed cattle producers and beef buyers filed antitrust lawsuits against the four largest beef packers in the United States. Discuss the role of Section 1 of the Sherman Act in regulating conduct of beef packers in the analyzed industry situation.

About the Authors: Yuliya V. Bolotova is an Assistant Teaching Professor with the Department of Economics at Iowa State University (yuliya@iastate.edu)

Acknowledgments: The author acknowledges constructive comments provided by AETR Editor, Jason Bergtold, and two anonymous reviewers.

[16] The period of 2015–2019 is selected as the cartel period. According to the complaints filed in the court, allegedly anticompetitive conduct of the four largest beef packers began in 2015 and continued until "present" (the moment the complaints were filed in 2019). Therefore, January 2015 and December 2019 are selected as the beginning and ending dates of the cartel period. The period of 2010–2014 is selected as the pre-cartel period because it has the same length as the cartel period.

Appendix 1

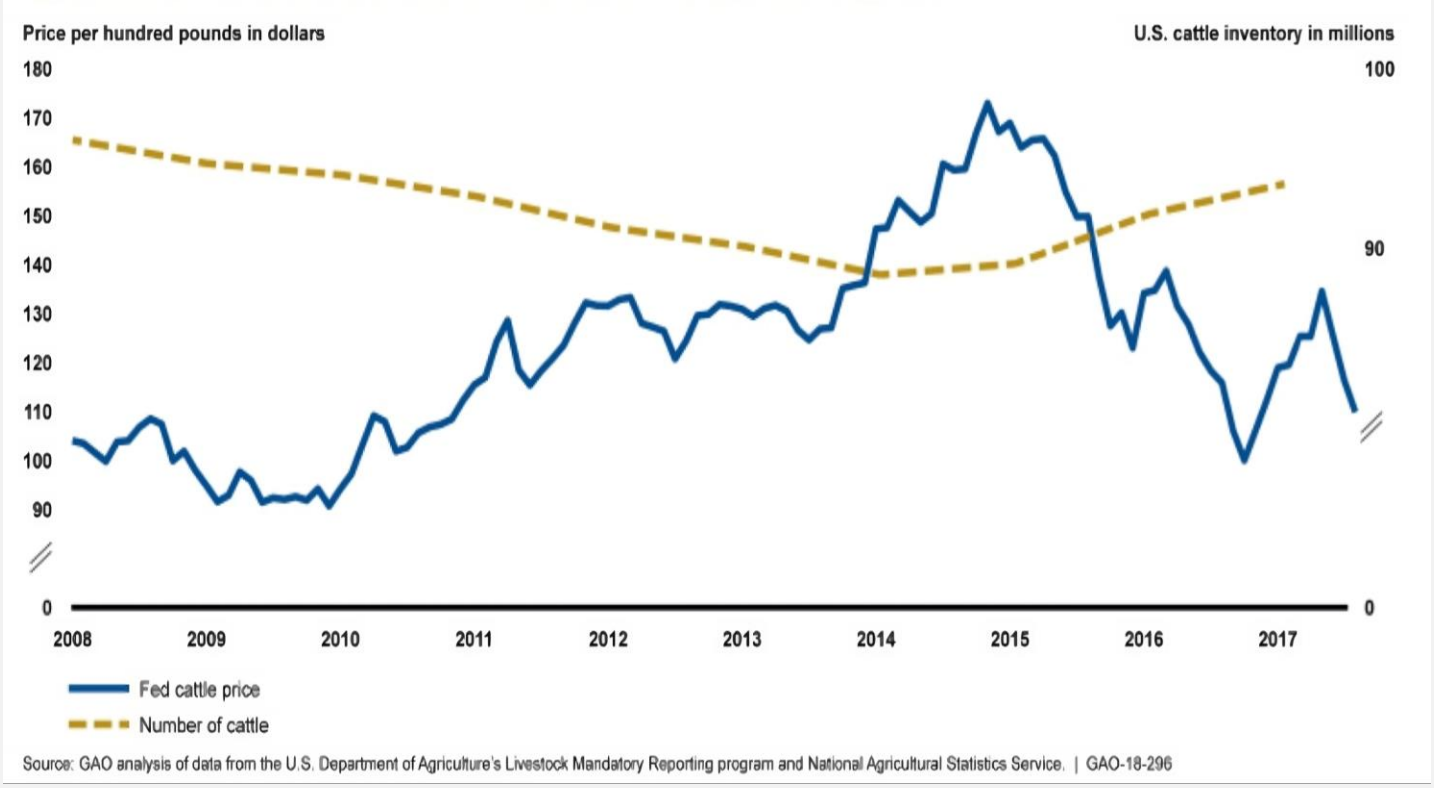

Figure A1: U.S. Fed Cattle Prices and Cattle Inventory, 2008–2017

Note: This chart is copied from the U.S. Government Accountability Office Report (2018).

Appendix 2

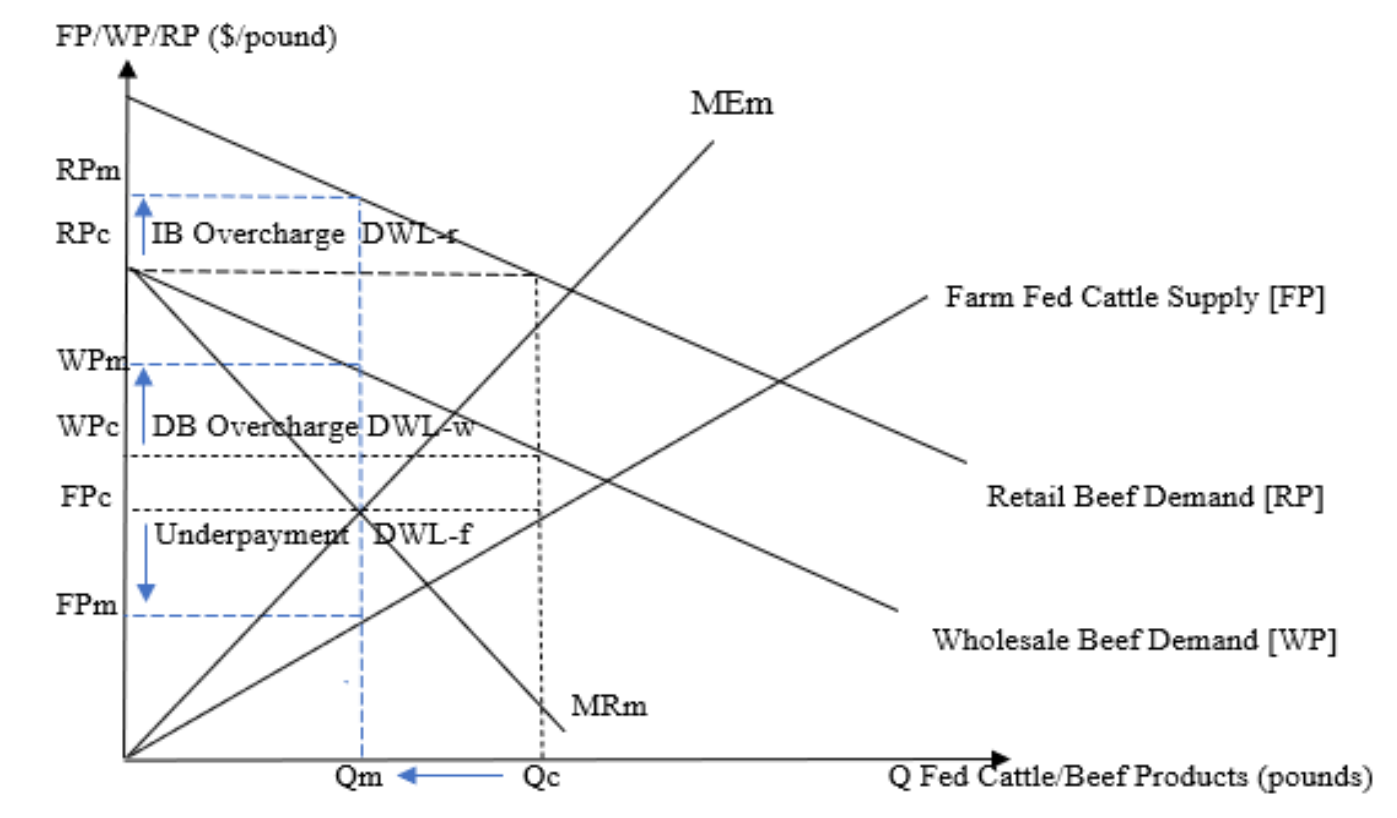

Figure A2.1: The Beef Packing Industry Is a Monopsony/Monopoly: The Buyer and Seller Market Power Effects on Quantities, Prices, and Margins

Note: Subscripts "c" and "m" indicate a competitive industry scenario and a monopsony/monopoly scenario, respectively. MRm and MEm are marginal revenue for monopoly and marginal expenditures for monopsony.

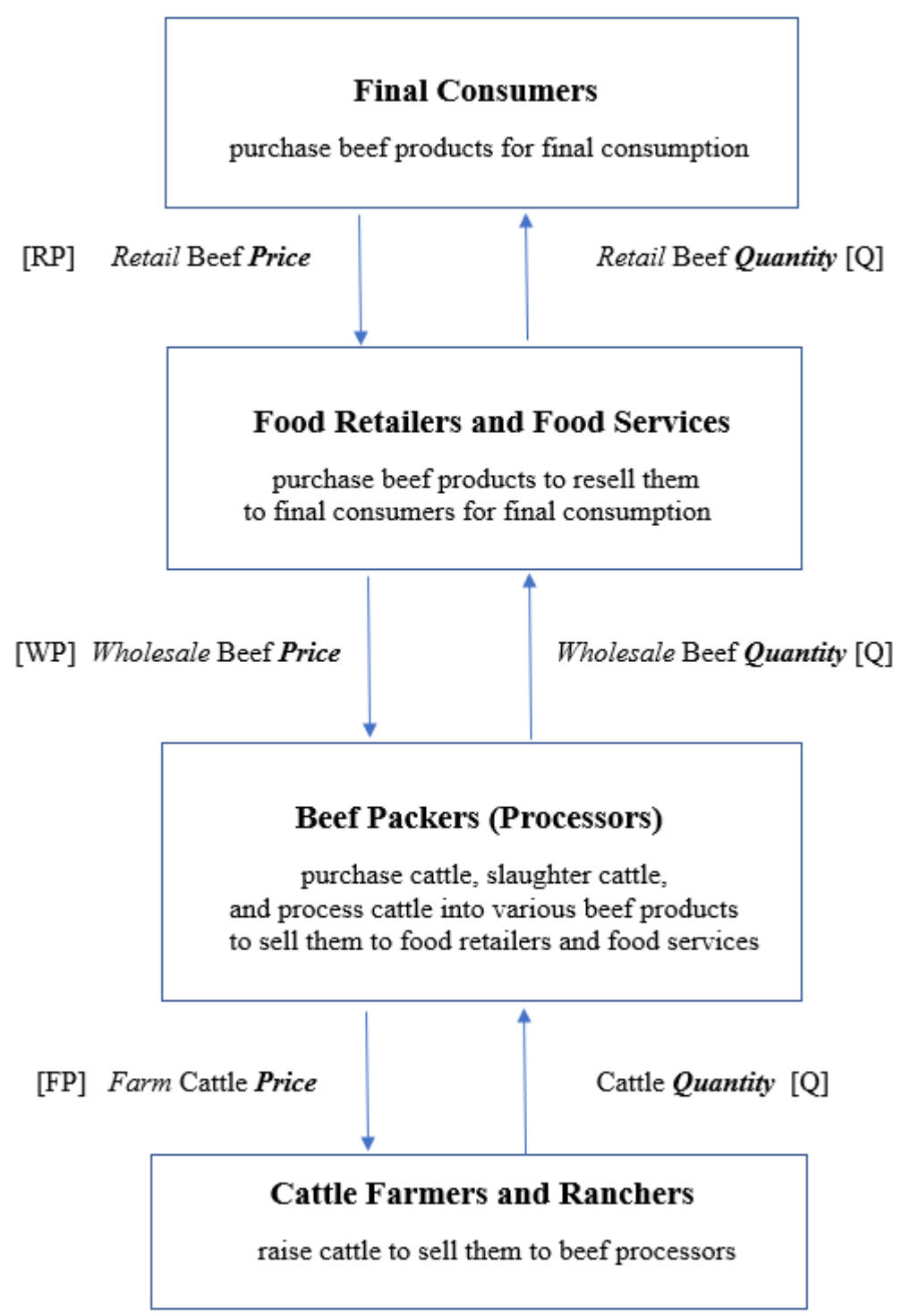

Figure A2.2: The Beef Supply Chain Structure

Note: Farm cattle price and cattle quantity: Farm fed cattle supply in Figure 2. Wholesale beef price and wholesale beef quantity: Wholesale beef demand in Figure 2. Retail beef price and retail beef quantity: Retail beef demand in Figure 2.

Table A2: U.S. Beef Industry Quantity; Farm, Wholesale, and Retail Values; Farm Sector Share; and Margins: Descriptive Statistics for the Pre-Cartel Period (2010–2014) and the Cartel Period (2015–2019)

Variable	Notation	Formula	Pre-cartel Period (2010–2014) Average	Cartel Period (2015–2019) Average	Change in the Average in the Cartel Period, Relative to the Pre-cartel Period	
					Units	Percent
			1	2	2 - 1	[(2-1)/1]*100
Quantity of beef (million pounds)			25,750.74	25,892.20	_____	_____
Farm value of beef (cents per pound)	FP		260.06	273.99	_____	_____
Wholesale value of beef (cents per pound)	WP		294.12	334.21	_____	_____
Retail value of beef (cents per pound)	RP		509.38	602.56	_____	_____
Farm-to-wholesale margin (cents per pound)	FWM	WP-FP	34.07	60.22	_____	_____
Farm-to-wholesale margin (% of wholesale value)	FWM	([WP-FP]/WP)*100	11.82	18.12	_____	_____
Farm-to-wholesale margin (% of retail value)	FWM	([WP-FP]/RP)*100	6.78	10.02	_____	_____
Wholesale-to-retail margin (cents per pound)	WRM	RP-WP	215.25	268.36	_____	_____
Wholesale-to-retail margin (% of retail value)	WRM	([RP-WP]/RP)*100	42.44	44.59	_____	_____
Farm sector share (% of retail value)	FSS	(FP/RP)*100	50.77	45.39	_____	_____

Note: The yearly averages are calculated for beef quantity, and the monthly averages are calculated for the rest of the economic variables.
Source: U.S. Department of Agriculture, Economic Research Service (2022a, 2022b)
Farm sector share, marketing margins, and descriptive statistics are calculated by the author.

References

Adjemian, M.K., B.W. Brorsen, W. Hahn, T.L. Saitone, and R.J. Sexton. 2016. *Thinning Markets in U.S. Agriculture: What Are the Implications for Producers and Processors?* Washington DC: U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin Number 148.

Baker, J.B. 1993. "Two Sherman Act Section 1 Dilemmas: Parallel Pricing, the Oligopoly Problem and Contemporary Economic Theory." *The Antitrust Bulletin* 38:143–219.

Besanko, D., and R.R. Braeutigam. 2002. *Microeconomics: An Integrated Approach*. New York: John Wiley & Sons, Inc.

Besanko, D., D. Dranove, M. Shanley, and S. Schaefer. 2006. *Economics of Strategy*, 4th ed. Hoboken NJ: John Wiley & Sons.

Blair, R.D., and T.J. Angerhofer. 2021. "Monopoly and Monopsony: Antitrust Standing, Injury, and Damages." *University of Cincinnati Law Review* 89:256–285.

Bolotova, Y.V. 2022a. "Price-Fixing in the U.S. Broiler Chicken and Pork Industries." *Applied Economics Teaching Resources* 4:51–91.

Bolotova, Y.V. 2022b. "Teaching Forward Contracts in Undergraduate Courses in Agribusiness and Agricultural Economics Programs." *Applied Economics Teaching Resources* 4:22–33.

Brown, C. 2019. "Yet Another Lawsuit Filed Against Beef Packers." Northern Ag Network, October 30. https://www.northernag.net/yet-another-lawsuit-filed-against-beef-packers/

Carlton, D.W., and J.M. Perloff. 2004. *Modern Industrial Organization*. Boston: Pearson.

Congressional Research Service. 2009. *Livestock Marketing and Competition Issues.* Washington DC, Report RL33325.

Douglas, L. 2019. "Multiple Lawsuits Allege Price-Fixing by Big Beef Companies." FERN (Food & Environment Reporting Network), October 28. https://thefern.org/ag_insider/multiple-lawsuits-allege-price-fixing-by-big-beef-companies/

Ewing, K. 2006/2007. "Private Anti-Trust Remedies under U.S. Law." *Competition* (1). https://www.steptoe.com/a/web/1731/2804.pdf

Federal Trade Commission. 2022. Price Fixing. https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/dealings-competitors/price-fixing

Greene, J.L. 2016. *USDA's "GIPSA Rule" on Livestock and Poultry Marketing Practices.* Washington DC: Congressional Research Service, Report R41673.

Greene, J.L. 2019. *Livestock Mandatory Reporting Act: Overview for Reauthorization in the 116th Congress.* Washington DC: Congressional Research Service, Report R45777.

Hahn, W. 1991. "Meat Price Spreads Are Not Proof of Price Gouging." *Food Review: Livestock Production and Marketing,* October–December.

Hahn, W. 2004. *Beef and Pork Values and Price Spreads Explained.* Washington DC: U.S. Department of Agriculture, Economic Research Service, LDP-M-118-01.

Hendersen, G. 2021. "Antitrust Lawsuit Against Packers to Move Forward." AGWEB, September 15. https://www.agweb.com/news/livestock/beef/antitrust-lawsuit-against-packers-move-forward

Hovenkamp, H. 2005. *Federal Antitrust Policy: The Law of Competition and Its Practice*, 3rd ed. Eagan MN: Thomson West.

Johnson, R. 2009. *Recent Acquisitions of U.S. Meat Companies*. Washington DC: Congressional Research Service, Report RS22980.

Kohls, R.L., and J.N. Uhl. 2002. *Marketing of Agricultural Products*, 9th ed. Upper Saddle River NJ: Prentice Hall.

MacDonald, J.M. 2009. *Food, Agriculture, and Antitrust: Looking at the Recent Past.* Washington DC: U.S. Department of Agriculture, Economic Research Service, Economists Group Talk, PPT Presentation. https://ageconsearch.umn.edu/record/56161?ln=en

MacDonald, J.M., X. Dong, and K.O. Fuglie. 2023. *Concentration and Competition in U.S. Agribusiness.* Washington DC: U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin Number 256.

National Beef Newsroom. 2018. "Marfrig Purchases National Beef Ownership Interest," April 9. https://www.nationalbeef.com/news/marfrig-purchases-national-beef-ownership-interest

Parish, J.A., J.D. Rhinehart, and J.D. Anderson. 2009. "Marketing Fed Cattle." Mississippi State University Extension Service, Publication 2556. https://extension.msstate.edu/sites/default/files/publications/publications/p2556.pdf

Peel, D.S., D. Anderson, J. Anderson, C. Bastian, S. Brown, S.R. Koontz, and J. Maples. 2020. "Fed Cattle Price Discovery Issues and Considerations." Stillwater: Oklahoma State University Extension, Division of Agricultural Sciences and Natural Resources, Id: E-1053. https://extension.okstate.edu/fact-sheets/fed-cattle-price-discovery-issues-and-considerations.html

Pollard, A. 2021. "'Big Four' Meatpackers Are Crushing Small Ranchers." *The American Prospect*, June 9. https://prospect.org/power/big-four-meatpackers-crushing-small-ranchers/

Rhinehart, J. 2009. "Pricing Options for Cattle." Mississippi State University Extension Service. https://extension.msstate.edu/sites/default/files/topic-files/cattle-business-mississippi-articles/cattle-business-mississippi-articles-landing-page/stocker_apr2009.pdf

Tomek, W.G., and H.M. Kaiser. 2014. *Agricultural Product Prices*. 5th ed. Ithaca NY: Cornell University.

Tonsor, G., J. Lusk, and T. Schroeder. 2018. "Assessing Beef Demand Determinants." Cattlemen's Beef Board. https://www.beefboard.org/wp-content/uploads/2019/06/Assessing-Beef-Demand-Determinants_FullReport.pdf

Tovar, K. 2020. "Antitrust and the Meatpacking Industry." Ames: Iowa State University, Center for Agricultural Law and Taxation. https://www.calt.iastate.edu/article/antitrust-and-meatpacking-industry

U.S. Department of Agriculture, Agricultural Marketing Service. 2022. *Agricultural Competition: A Plan in Support of Fair and Competitive Markets. USDA's Report to the White House Competition Council.* Washington DC. https://www.ams.usda.gov/sites/default/files/media/USDAPlan_EO_COMPETITION.pdf

U.S. Department of Agriculture, Economic Research Service. 2022a. *Food Availability Data System: Red Meat.* https://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/

U.S. Department of Agriculture, Economic Research Service. 2022b. *Meat Price Spreads: Historical Monthly Price Spread Data for Beef, Pork, Broilers.* https://www.ers.usda.gov/data-products/meat-price-spreads/

U.S. Government Accountability Office. 2018. *U.S. Department of Agriculture: Additional Data Analysis Could Enhance Monitoring of U.S. Cattle Market.* GAO-18-296. https://www.gao.gov/assets/gao-18-296.pdf

Ward, C. 2010. "Assessing Competition in the U.S. Beef Packing Industry." *Choices* 25(2):1–14.

Ward, C.E., T.C. Schroeder, and D.M. Feuz. 2017. "Grid Pricing of Fed Cattle: Base Prices and Premiums-Discounts." Stillwater: Oklahoma State University Extension, Division of Agricultural Sciences and Natural Resources, Id: AGEC-560. https://extension.okstate.edu/fact-sheets/print-publications/agec/grid-pricing-of-fed-cattle-base-prices-and-premiums-discounts-agec-560.pdf

Court Documents

Beef Antitrust Litigation Settlement. 2023. https://www.beefcommercialcase.com/

Beef Direct Purchaser Class Action. 2023. https://beefdirectpurchasersettlement.com/

In Re Cattle and Beef Antitrust Litigation. Case No. 20-cv-01319 JRT-HB. Direct Purchaser Plaintiffs' Third Consolidated Amended Class Action Complaint (Redacted Public Version) filed on January 18, 2022. https://beefdirectpurchasersettlement.com/assets/Documents/Operative%20Complaint.pdf

In Re Cattle Antitrust Litigation: Memorandum Opinion and Order Granting Defendants' Motions to Dismiss dated September 28, 2020. https://www.calt.iastate.edu/files/files-article/in_re_antitrust_order_granting_motion_to_dismiss.pdf

In Re Cattle Antitrust Litigation: Memorandum Opinion and Order dated September 14, 2021. https://aglaw.psu.edu/wp-content/uploads/2022/09/In-re-DPP-Beef-Memo-Opinion-9.14.21.pdf

In Re Cattle Antitrust Litigation: Memorandum of Law in Support of Defendants' Joint Motion to Dismiss the Consolidated Amended Class Action Complaint dated September 13, 2019. http://oklahomafarmreport.com/wire/news/2019/09/media/04832_BeefPackerAntitrustResponseSept2019.pdf

In Re Cattle Antitrust Litigation: Ranchers Cattlemen Action Legal Fund United Stockgrowers of America et al. v Tyson Foods, Inc. et al. 2019. Class action complaint filed by fed cattle producers on May 7, 2019. https://aglaw.psu.edu/wp-content/uploads/2022/09/In-re-Cattle-Complaint-5.7.19.pdf

Pacific Agri-Products v. JBS USA Food Company Holdings et al. 2019. Class action complaint filed by a direct buyer on October 16, 2019. https://www.courtlistener.com/recap/gov.uscourts.mnd.183132/gov.uscourts.mnd.183132.1.0.pdf

Peterson et al. v. Agri Stats, Inc. et al. 2019. Class action complaint filed by indirect buyers on April 26, 2019. https://www.hbsslaw.com/uploads/case_downloads/beef-antitrust/2019-04-26-hagens-berman-beef-antirust-class-action-lawsuit-complaint.pdf

U.S. and Plaintiff States v. JBS S.A. and National Beef Packing Company, LLC. 2008. https://www.justice.gov/atr/case-document/complaint-137