Market Power in the U.S. Beef Packing Industry

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*Invited Case Study Paper prepared for presentation
at the 2023 Agricultural & Applied Economics Association Annual Meeting,
Washington, D.C.; July 23-July 25*

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 country 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 thus 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 on-going 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, as well as extension and outreach communities. The teaching note[1] summarizes student learning objectives and teaching strategies, and also includes multiple-choice questions, as well as suggested answers and guidance to analytical, discussion, and multiple-choice questions.

Key words: beef packing industry, oligopoly, oligopsony, marketing margins, price-fixing.

JEL Codes: L1, L2, L4, L13.

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[1] The teaching note is available from the author upon request.

1. Introduction

The U.S. beef packing industry is a highly concentrated industry. The combined market share of the four largest beef packers in fed cattle slaughtering is approximately 85 percent (U.S. Department of Agriculture Agricultural Marketing Service 2022). The U.S. fed cattle[2] price dynamics in the last several years attracted increased attention of industry participants and policy decision makers (U.S. Government Accountability Office 2018). In the period of 2010 to 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 at 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).

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, 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 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 on-going 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.

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[2] 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. 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. The combined market share of the four largest firms[3] (beef packers) in fed cattle slaughtering increased from approximately 50 percent to 80 percent in the period of 1985 to 1993, remained at the level of 80 percent through 2008 (Greene 2016, Figure 1), and recently reached approximately 85 percent (U.S. Department of Agriculture Agricultural Marketing Service 2022). 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 U.S. 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, 2019). Fed cattle producers and beef packers use a variety of fed cattle marketing arrangements. While the spot (cash) market for fed cattle was the dominant marketing arrangement

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

in the industry prior to the 2000s, the use of alternative marketing arrangements,[4] and in particular the use of forward and formula contracts, increased in the two recent decades. For example, the share of fed cattle sold in a traditional negotiated spot (cash) market setting decreased from approximately 48 percent in 2004 to 23 percent in 2014 (Adjemian et al 2016, Box 6 Figure 6.1). In contrast, the share of fed cattle sold using forward and formula contracts increased from approximately 28 percent in 2004 to 65 percent in 2014 (Adjemian et al 2016, Box 6 Figure 6.1).

Forward and formula contracts are essential for a proper business planning: output (fed cattle) marketing for fed cattle producers and input (fed cattle) procurement for beef packers (Bolotova 2022). Forward and formula contracts are also a form of risk management for fed cattle producers and beef packers, as compared with traditional spot (cash) 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 contracts 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. Forward contracts use the Chicago Mercantile Exchange live cattle futures contract prices as a base (or a reference price) to determine the actual price paid to fed cattle producers. Formula contracts use spot (cash) market prices as a base (or a reference price) to determine the actual price paid to fed cattle producers. The spot (cash) market prices used in the formula contracts are typically spot (cash) market prices reported by the U.S. Department of Agriculture Agricultural Marketing Service.

3. Alleged Input and Output Price-Fixing Cartel of the Four Largest Beef Packers: Competition Issues

This section discusses competition (business conduct) issues raised in the antitrust lawsuits (complaints) filed by fed cattle producers and beef buyers against the four largest beef packers in the court in 2019 *(In Re Cattle Antitrust Litigation: Ranchers Cattlemen Action Legal Fund United Stockgrowers of America et al v Tyson Foods, Inc. et al 2019; Pacific Agri-Products v. JBS USA*

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[4] Alternative marketing arrangements for fed cattle are the alternatives to the spot (cash) 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).

Food Company Holdings et al 2019; Peterson et al v. Agri Stats, Inc. et al 2019; and In Re Cattle and Beef Antitrust Litigation 2022).

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. First, the complaints state that the following structural characteristics of the beef packing industry facilitated 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 cattle processing (slaughtering) is between 81 to 85 percent. The market share of the next largest beef packer is 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 the packers. Buyers are practically indifferent from which 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 products-substitutes to beef, according to the existing study the relative effect of changing chicken and pork prices on the quantity of beef demanded is small. 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".

- 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

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meetings, some employees of the four largest beef packers have opportunities to exchange competitor sensitive information, the companies' plans and strategies, and to develop relationships.

Second, the complaints state that the four largest beef packers implemented the following, allegedly anticompetitive and coordinated supply restraints to decrease a quantity of fed cattle purchased and slaughtered and consequently a quantity of beef produced, which ultimately decreased fed cattle prices and increased wholesale and retail prices of beef.

- Periodically reduced fed cattle slaughter volumes to reduce the demand for fed cattle.

- Periodically decreased the purchase and slaughter of *cash* cattle (fed cattle purchased in the spot (cash) market).

- Coordinated their procurement (purchasing) practices for *cash* cattle.

A decrease in the quantity of *cash* cattle purchased and a coordinated *cash* cattle procurement decreased the spot (cash) price for fed cattle, which consequently caused formula contract prices to decrease (formula contracts use spot (cash) prices as reference prices).

- 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.).

- 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 percent to 4 percent. The beef buyers argued that the beef packers implemented the 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 percent to 8 percent, obtained due to their visibility into the beef supply chain and their ability to balance fed cattle supply and beef product 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 demand for beef. In addition, the U.S. Government Accountability Office (2018) informs that 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.

- 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 U.S. for the period of 2000-2019, which reflects changes in the annual slaughter volumes (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 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 (cash) 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 next to the boarders 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 quantities, prices, and margins) using the perspective of fed cattle producers and beef buyers, as well as the perspective of the four largest beef packers.

4.1. Beef packing industry is an imperfectly competitive industry

The perspective of fed cattle producers and beef buyers is that the beef packing industry behaves as an imperfectly competitive industry. The industry is an oligopsony exercising buyer market power in the market for fed cattle, and it is an oligopoly exercising seller market power in the market for beef ("the beef packing cartel").

Figure 2 depicts three curves. The farm supply curve for fed cattle is a graphical representation of the inverse supply function for fed cattle at the farm level. The wholesale demand curve for beef products is a graphical representation of the inverse demand function for beef products at the wholesale level. The retail demand curve for beef products is a graphical representation of the inverse demand function for beef products at the retail level.[5] Figure 2 also depicts quantities, prices, and margins for two scenarios: a perfectly competitive industry scenario (in which beef packers do not have any market power) and a market power scenario (in which beef packers exercise buyer and seller market power: "the beef packing cartel").[6]

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[5] The inverse fed cattle supply and beef demand functions are price-dependent 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 beef quantity (beef quantity determines wholesale and retail prices of beef).

[6] Figure A2 presented in Appendix 2 depicts the beef supply chain structure corresponding to Figure 2.

As compared with a competitive industry, the beef packing cartel would decrease a quantity of fed cattle purchased and a quantity of beef produced from Qc to Qm.[7] This would cause the fed cattle price (farm price) to decrease from FPc to FPm (buyer market power affecting inverse supply for fed cattle) and the wholesale and retail prices of beef to increase from WPc to WPm and from RPc to RPm, respectively (seller market power affecting inverse demand for beef products). Consequently, the farm-to-wholesale margin (the "meat margin") measured in $ per pound increases from (WPc-FPc) to (WPm-FPm), and the 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).

The farm-to-wholesale margin includes slaughtering, packing, and processing costs and profit of beef packers. The farm-to-retail margin is the sum of the farm-to-wholesale margin and the 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 and seller market power increases profit of beef packers by the amount of underpayment to fed cattle producers and by the amount of overcharge attributed to buyers of beef products. The total $ underpayment and overcharge are the basis for damages that fed cattle producers and beef buyers, respectively, aim to recover during the on-going 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 packing industry. The underpayment to fed cattle producers measured in $ per pound is (FPc-FPm) in Figure 2. The total $ underpayment to fed cattle producers is the "Underpayment" rectangle in Figure 2, which is the underpayment measured in $ per pound times the quantity of fed cattle

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[7] 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").

sold/purchased (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 industry (DWL-f triangle) in Figure 2.

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 packing industry. 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. The total $ overcharge attributed to 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 the beef packing industry (Qm).

The overcharge attributed to indirect buyers (for example, final consumers) measured in $ per pound is (RPm-RPc) in Figure 2. The total $ overcharge attributed to 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 the beef packing industry.

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 the beef packing industry. These direct and indirect buyers are represented by the deadweight loss attributed to these buyers, DWL-w and DWL-r triangles, respectively, in Figure 2.

4.2. Beef packing industry is a perfectly 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 perfectly 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 parallel shift of the fed cattle supply curve in Figure 5: this is Scenario 1. The fed cattle price increases from FP_c 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 a quantity

of fed cattle purchased and a quantity of beef produced from Q_c to Q_1. Consequently, wholesale and retail prices of beef increase from WP_c to WP_1 and from RP_c 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 parallel shift of the fed cattle supply curve back to the original scenario in Figure 5. To pass the cost decrease on the buyers of beef to maintain the same profitability level as in Scenario 1, the beef packing industry increases a quantity of fed cattle purchased and a quantity of beef produced. Consequently, wholesale and retail prices of beef decrease. The farm-to-wholesale margin (the "meat margin") does not change.

5. Antitrust 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 makes 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).

Fed cattle producers, who sold fed cattle to the beef packers, and direct buyers of beef, who purchased beef directly from the beef packers, aim to recover treble damages under the Clayton Act (1914), a federal law. 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.

The indirect buyers of beef, who purchased beef indirectly from the beef packers (for example, final consumers purchased beef products from beef retailers), aim to recover damages in selected states, where state-level consumer protection laws, antitrust laws, or unjust enrichment laws allowing indirect buyers to recover damages exist. The $ value of the IB overcharge rectangle in Figure 2 is the basis for damages incurred by indirect buyers of beef. The size of damages that

indirect buyers aim to recover depends on a particular state. Typically, these damages range from one to three times the overcharge.

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 plus factors are market structures and business practices facilitating collusion. The examples of parallel conduct are parallel pricing and parallel output reductions.

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 violated Section 1 of the Sherman Act. In addition, the plaintiffs strengthened the evidence on plus factors (market structural characteristics) and parallel conduct of the four largest beef packers to coordinate slaughter reductions and reductions of purchases of fed cattle in the spot (cash) market with the purpose of decreasing fed cattle prices and increasing beef prices. The cattle and beef antitrust litigation is on-going and may end up with either settlements or continue to trial.

At the beginning of 2022, JBS reached a $52.5 million settlement agreement with buyers, who purchased beef products (boxed or case-ready beef) directly from JBS (Beef Direct Purchaser Class Action 2023). In this settlement agreement JBS denied any wrongdoing.

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 market for fed cattle and in the market for beef, respectively, that are raised during the on-going 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 acts 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 perfectly competitive industry scenario.

    3.2. In the second situation, assume that the beef packing industry acts as a perfectly competitive industry facing *increasing* marginal 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 a marginal cost *increase*.

    3.3. In the third situation, assume that the beef packing industry acts as a perfectly competitive industry facing *decreasing* marginal 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 a marginal 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 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 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,b).

    5.1. Table A2 summarizes 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 alleged price-fixing cartel), and the pre-cartel period (2010-2014; a prior, more competitive period).[8] 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.

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[8] 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). The period of 2010-2014 is selected as the pre-cartel period because it has the same length as the cartel period.

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. Table A2 summarizes descriptive statistics (averages and coefficients of variation) for beef production; farm, wholesale, and retail values of beef; farm sector share, farm-to-wholesale margin, and farm-to-retail margin for the cartel period (2015-2019; the period of alleged price-fixing cartel), and the pre-cartel period (2010-2014; a prior, more competitive period).

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

5.2.2. Describe the results of your analysis. Are changes in beef production; farm, wholesale, and retail values of beef; 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 perfectly 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.

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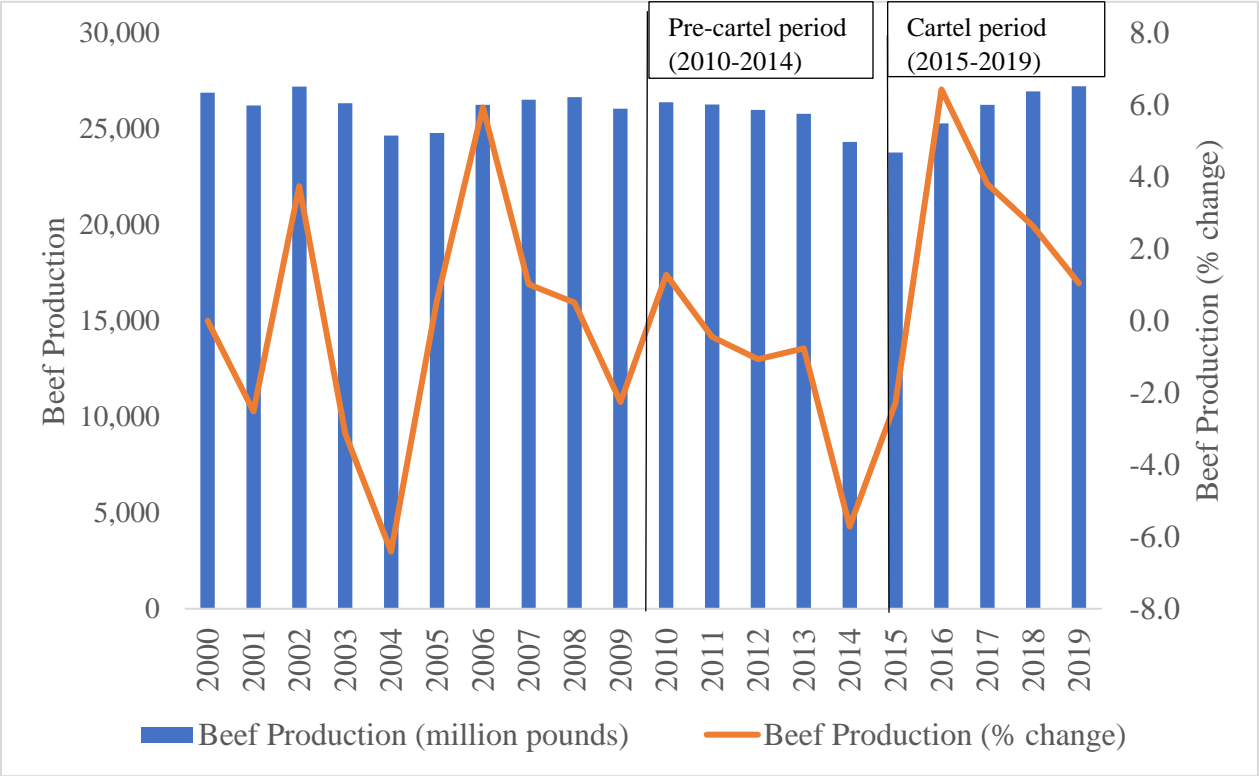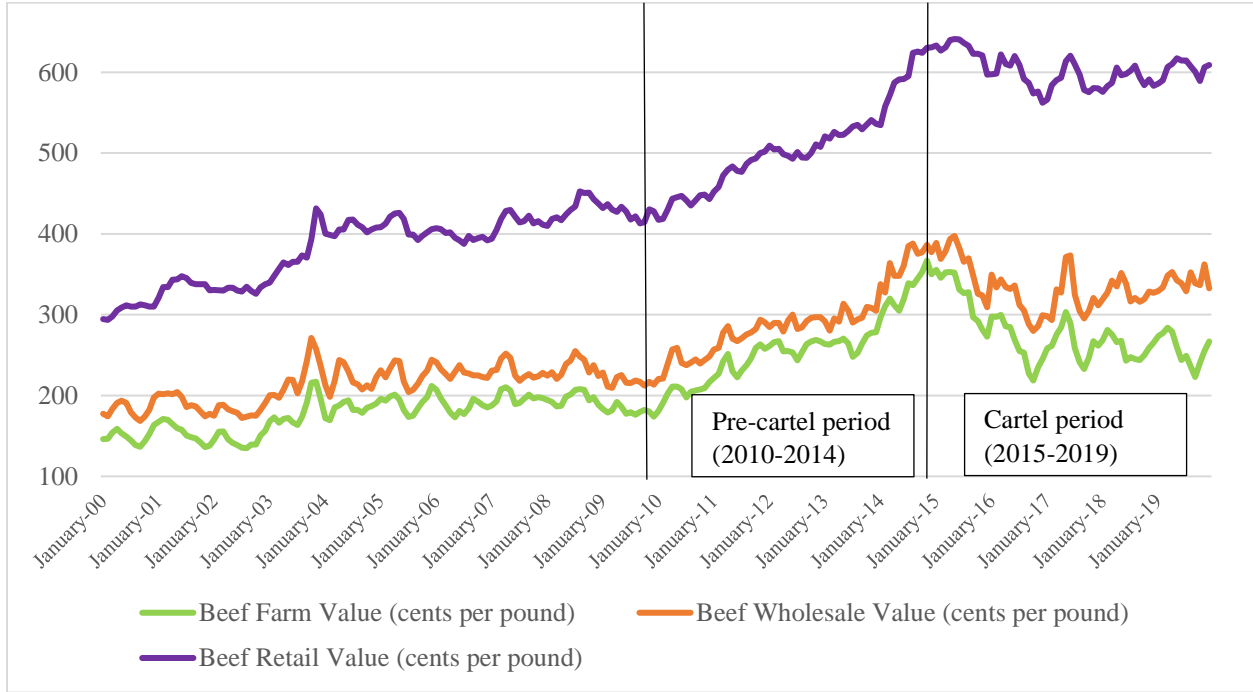
Figure 1. U.S. Yearly Beef Production, 2000-2019
Source: U.S. Department of Agriculture Economic Research Service (2022a).
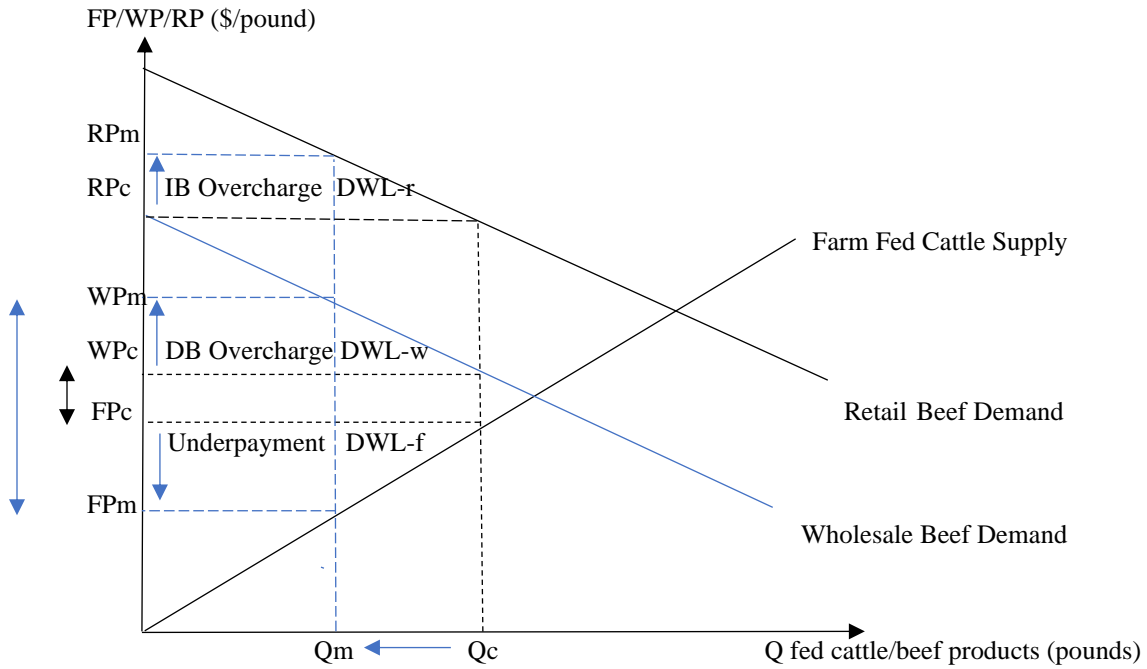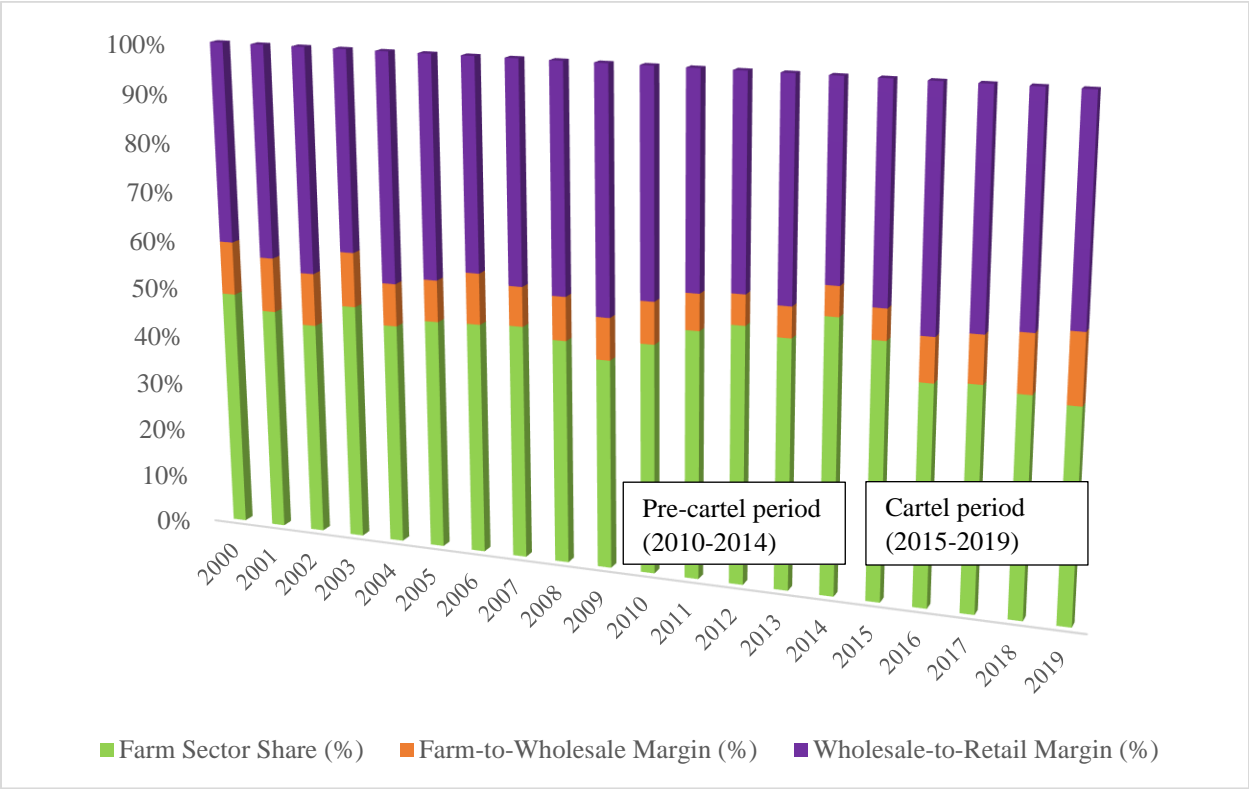
Figure 2. The Beef Packing Industry is an Imperfectly Competitive Industry: The Buyer and Seller Market Power Effects on Quantities, Prices, and Margins

Figure 3. U.S. Monthly Farm, Wholesale, and Retail Values of Beef, 2000-2019
Source: U.S. Department of Agriculture Economic Research Service (2022b).
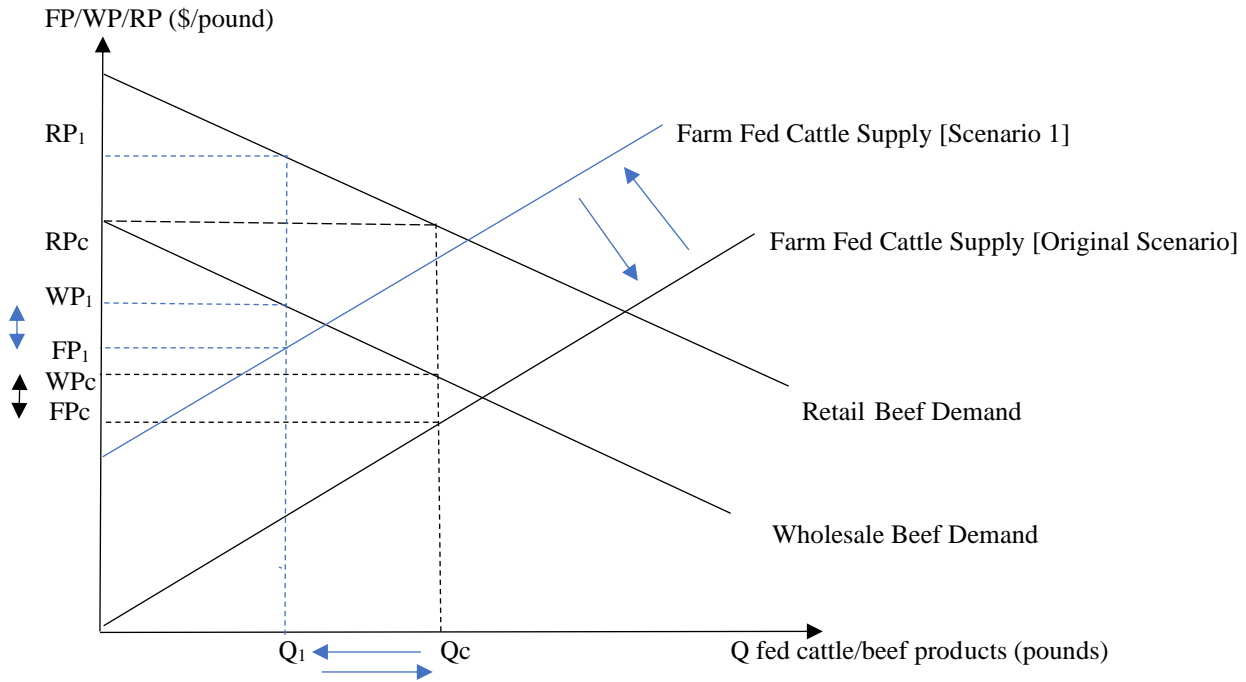
Figure 4. U.S. Yearly Farm Sector Share, Farm-to-Wholesale Margin, and Wholesale-to-Retail Margin Expressed as a Percentage of the Retail Value of Beef, 2000-2019
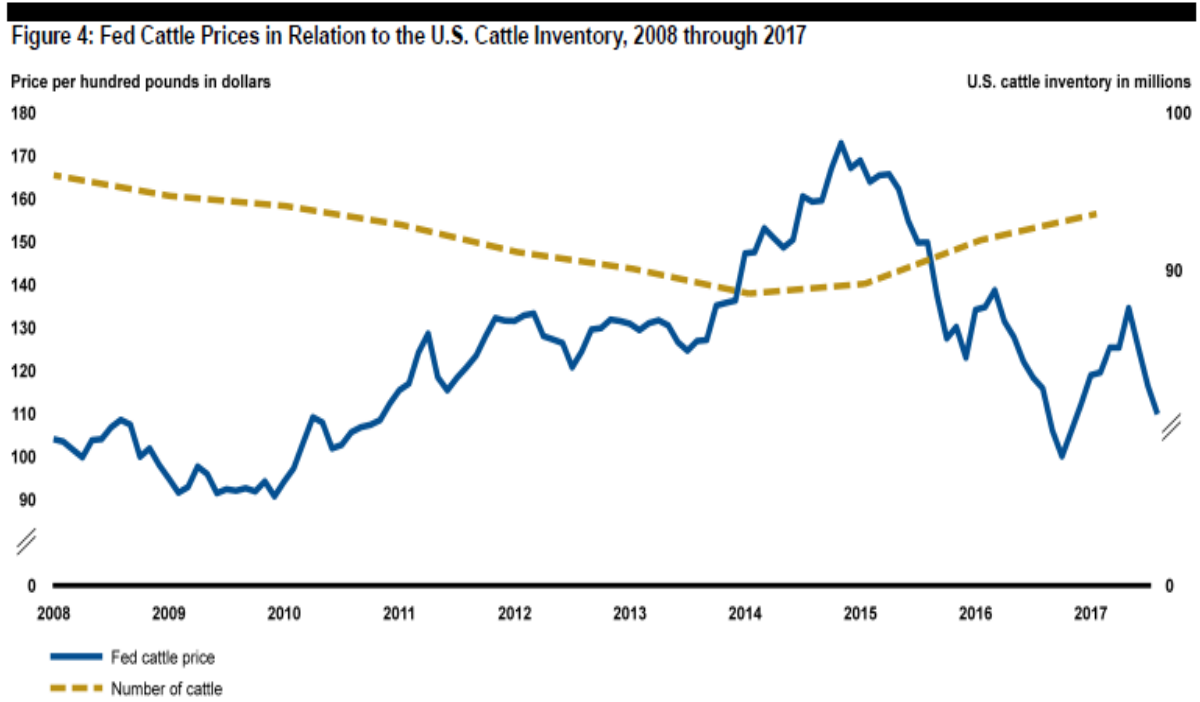*Source:* U.S. Department of Agriculture Economic Research Service (2022b).
The measures depicted in the figure are calculated by the author using farm, wholesale, and retail values of beef reported in this source.

FP/WP/RP ($/pound)

RP$_1$

RP$_c$

WP$_1$

FP$_1$

WP$_c$

FP$_c$

Farm Fed Cattle Supply [Scenario 1]

Farm Fed Cattle Supply [Original Scenario]

Retail Beef Demand

Wholesale Beef Demand

Q$_1$ Q$_c$ Q fed cattle/beef products (pounds)

Figure 5. The Beef Packing Industry is a Perfectly Competitive Industry: The Effects of Increasing and Decreasing Fed Cattle Prices on Quantities, Prices, and Margins
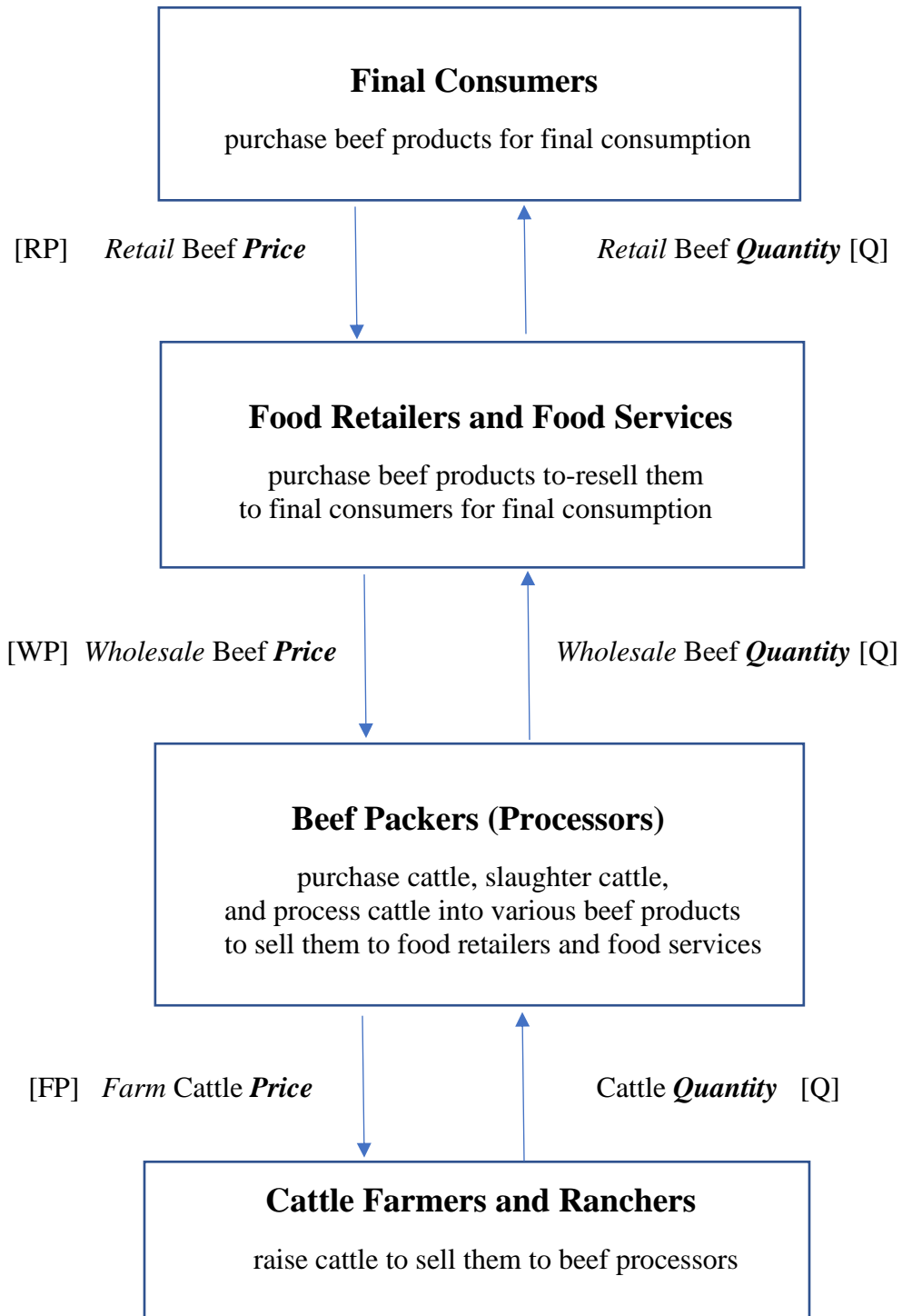
Appendix 1

Figure 4: Fed Cattle Prices in Relation to the U.S. Cattle Inventory, 2008 through 2017

Price per hundred pounds in dollars

U.S. cattle inventory in millions

Legend:
—— Fed cattle price
– – – Number of cattle

Figure A1. U.S. Fed Cattle Prices and Cattle Inventory, 2008 – 2017
This chart is copied from the U.S. Government Accountability Office Report (2018).

Appendix 2

Figure A2. The Beef Supply Chain Structure
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)		Cartel period (2015-2019)		Change in the cartel period, relative to the pre-cartel period	
			Average	CV	Average	CV	Average (%)	CV (%)
Quantity of beef (million pounds)			25,750.74	0.03	25,892.20	0.05	_____(____)	_____(____)
Farm value of beef (cents per pound)	FP		260.06	0.17	273.99	0.12	_____(____)	_____(____)
Wholesale value of beef (cents per pound)	WP		294.12	0.14	334.21	0.08	_____(____)	_____(____)
Retail value of beef (cents per pound)	RP		509.38	0.11	602.56	0.03	_____(____)	_____(____)
Farm-to-wholesale margin (cents per pound)	FWM	WP-FP	34.07	0.23	60.22	0.34	_____(____)	_____(____)
Farm-to-wholesale margin (% of wholesale value)	FWM	([WP-FP]/WP)*100	11.82	0.27	18.12	0.34	_____(____)	_____(____)
Farm-to-wholesale margin (% of retail value)	FWM	([WP-FP]/RP)*100	6.78	0.26	10.02	0.34	_____(____)	_____(____)
Wholesale-to-retail margin (cents per pound)	WRM	RP-WP	215.25	0.08	268.36	0.06	_____(____)	_____(____)
Wholesale-to-retail margin (% of retail value)	WRM	([RP-WP]/RP)*100	42.44	0.06	44.59	0.07	_____(____)	_____(____)
Farm sector share (% of retail value)	FSS	(FP/RP)*100	50.77	0.06	45.39	0.10	_____(____)	_____(____)

CV is the coefficient of variation (the ratio of the standard deviation to the average).
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 (2022 a,b).
Farm sector share, marketing margins, and descriptive statistics are calculated by the author.