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Case Study

Market Power in the Fluid Milk Industry in the Eastern United States

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Abstract
The motivations for this case study are recent developments in the fluid milk industry in the Eastern United States. These developments reflect the effects of increasing consolidation and concentration as well as emerging competition issues related to the buyer and seller market power of fluid milk processors. Using a marketing margin framework, this case study provides simple contemporary applications of the economic models of the profit-maximizing behavior of firms possessing buyer and seller market power in the fluid milk processing industry. The case study illustrates a marketing margin analysis, as applied to the fluid milk supply chain, including a basic empirical market and price analysis. The intended audiences are undergraduate and graduate students as well as extension and outreach audiences. The case study includes a teaching note with a set of discussion questions and suggested answers. In addition, the teaching note discusses teaching objectives, teaching strategies, and student background knowledge.

1 Introduction

The motivations for this case study are developments in the fluid milk industry in the Eastern United States in recent decades. These industry developments reflect the effects of increasing consolidation and concentration (structural changes) in the fluid milk supply chain, emerging competition issues related to the buyer and seller market power of fluid milk processors, and the market power effects on dairy farmers and final consumers. Using a marketing margin framework, this case study provides simple contemporary applications of the economic models of the profit-maximizing behavior of firms possessing buyer and seller market power in the fluid milk processing industry. In addition, the case study illustrates a marketing margin analysis, as applied to the fluid milk supply chain.

The fluid milk supply chain in the United States has been affected by increasing consolidation and concentration, including a series of mergers and acquisitions involving dairy cooperatives and fluid milk processors (Shields 2010). Dairy Farmers of America (DFA), the largest dairy cooperative in the country, was formed in 1998 as a result of the merger of four large regional dairy cooperatives. Dairy cooperatives have historically been involved in handling (including processing) and marketing of their farmer-members' milk and in representing dairy farmers in contract negotiations with milk processors. In 2001, Suiza Foods Corporation, then the largest fluid milk processor in the country, acquired Dean Foods Company to form a new company named Dean Foods (Dean), which became the largest fluid milk processor in the country.

In 2007 and 2009, dairy farmers (plaintiffs) in the U.S. Southeast and Northeast regions filed class action antitrust lawsuits, in which they alleged that Dean and DFA (among other defendants: fluid milk processors and milk marketing agencies) engaged in anticompetitive conduct, which restricted competition in fluid milk markets in these regions (Shields 2010; Greene and Rhee 2011; Abrams, Commins, and Foix 2014). This conduct affected the sale, purchase, marketing, and processing of Grade A milk used in fluid milk manufacturing (Class I milk) in Federal Milk Marketing Orders 5 (Appalachian), 7

(Southeast), and 1 (Northeast). Dairy farmers claimed that DFA and Dean agreed to not compete for Grade A milk used in fluid milk manufacturing and that they limited dairy farmers' access to fluid milk processing plants, which taken together substantially restricted marketing options for dairy farmers and decreased milk prices paid to dairy farmers. In summary, the lawsuits alleged a conspiracy among the defendants to restrain trade in fluid milk markets and to fix milk prices as well as a conspiracy to monopolize and monopsonize fluid milk markets in the Southeast and Northeast regions, which violated sections 1 and 2 of the Sherman Antitrust Act (1890).[1]

After several years of litigations, the lawsuits were settled. Dean and DFA agreed to pay substantial monetary penalties, and DFA agreed to change some of its business practices. Neither Dean nor DFA admitted to any wrongdoing. The payments from DFA and Dean to dairy farmers in the Southeast region totaled $158.6 million and $140 million, respectively (Foix 2013; Kick 2013; Walker 2013).[2] The payments from DFA and Dean to dairy farmers in the Northeast region totaled $50 million and $30 million, respectively (Webster 2015; Fatka 2018; Natzke 2018). The DFA's settlement agreements included changes in some of DFA's business practices, which intended to restore competition in fluid milk markets in the Southeast and Northeast regions.[3] Table 1 presents a timeline of the events relevant to these milk antitrust litigations.

This case study aims to help students understand the effects of structural changes and competition issues in the U.S. fluid milk industry—changes and issues that increase in importance in light

Table 1. U.S. Southeast and Northeast Milk Antitrust Litigations: A Timeline of Relevant Events

Date	Action
2001	Suiza Foods Corporation acquired Dean Foods Company. A new company was named Dean Foods.
2001	Anticompetitive conduct of DFA and Dean began in the Southeast region (FO5 "Appalachian" and FO7 "Southeast").
2002	Anticompetitive conduct of DFA and Dean began in the Northeast region (FO1 "Northeast").
2007-2008	Dairy farmers in the Southeast region filed class action antitrust lawsuits.
2009	Dairy farmers in the Northeast region filed class action antitrust lawsuits.
2011	Settlement agreement was reached between Dean and dairy farmers in the Northeast.
2012	Settlement agreement was reached between Dean and dairy farmers in the Southeast.
2013	Settlement agreement was reached between DFA and dairy farmers in the Southeast.
2014-2016	Settlement agreement was reached between DFA and dairy farmers in the Northeast.
2013-2016	Dairy farmers in the Southeast received payments.
2018	Dairy farmers in the Northeast received payments.

[1] The Sherman Act (1890) and the Capper-Volstead Act (1922) are discussed in Appendix 1.

[2] The Southern Marketing Agency (SMA) paid an additional $5 million. DFA agreed to put a refundable $9.3 million per year for two years in a fund to increase the Class I milk utilization rate in Federal Milk Marketing Orders 5 and 7.

[3] The changes, which directly affect the competition process, included changes to milk supply agreements and, in particular, full supply agreements. The settlement agreements include some restrictions on DFA entering into new full supply agreements and renewing existing full supply agreements during the settlement terms.

of current restructuring in the industry. Dean Foods filed for bankruptcy in fall 2019 (Lucas 2019; Valinsky 2019). Dairy Farmers of America acquired a substantial portion of Dean's assets in spring 2020 (McClain 2020; U.S. Department of Justice 2020). DFA is to become the largest supplier of raw milk used in fluid milk product manufacturing and the largest processor and marketer of fluid milk products in the country.

The case study has four student learning objectives (SLOs):

- SLO #1: Students should be able to describe recent structural changes in the fluid milk industry in the Eastern United States and the United States and competition concerns raised by dairy farmers in the most recent antitrust litigations.
- SLO #2: Using a graphical analysis, students should be able to apply a marketing margin (theoretical) framework to explain the conduct and performance of the fluid milk processing industry in two market scenarios: a competitive industry scenario and a market power scenario, which incorporates both the buyer and seller market power of fluid milk processors. They also should be able to identify the effects of market power on dairy farmers, retailers, and final consumers.
- SLO #3: Students should be able to locate sources of market and price data for the fluid milk industry on the U.S. Department of Agriculture Agricultural Marketing Service webpages.
- SLO #4: Students should be able to use data reported in the case study to conduct selected elements of market and price analysis presented in the case study. In particular, students should be able to calculate over-order premiums received by dairy farmers and farm-to-retail margins in the two periods of interest (the pre-antitrust action period and the antitrust action period) as well as calculate changes in milk prices, quantities, premiums, and margins between these two periods. Students should be able to explain the results of their analysis.

2 Federal Milk Marketing Orders and Fluid Milk Industry: United States and Eastern United States

The system of Federal Milk Marketing Orders (FMMOs) regulates marketing and pricing of Grade A milk at the farm-first handler level in the United States.[4] The two main features of FMMOs are classified pricing and pooling of milk. Grade A milk produced by dairy farmers is divided into four Classes, depending on the end-use of milk (i.e., the type of processed products). Class I milk is used to manufacture fluid (beverage) milk products (whole milk, reduced-fat milk, skim milk, and so on). Class II milk is used to manufacture soft dairy products (yogurt, sour cream, cottage cheese, ice-cream, and so on). Class III milk is used to manufacture hard dairy products (cheese and cream cheese). Class IV milk is used to manufacture butter and milk products in dry and evaporated forms.

FMMOs are used to determine minimum prices that regulated milk handlers (processors) have to pay for Grade A milk. Class I milk has the highest price. Dairy farmers do not receive Class milk prices directly; instead, these prices and the rates of milk utilization in each class determine uniform prices (blend prices) for each FMMO. The uniform price is the minimum milk price that dairy farmers within the same Order receive. Dairy cooperatives are allowed to negotiate premiums (over-order premiums), which are added to the FMMOs' minimum prices. Over-order premiums are paid based on milk quality,

[4] FMMOs are geographically defined areas based on the demand for fluid milk products. Currently there are 11 FMMOs, which regulate the marketing of approximately 75 percent of total milk production (USDA AMS 2021a). The objectives of FMMOs are to create orderly marketing conditions for fluid milk products and to ensure sufficient supplies of quality milk at reasonable prices for final consumers as well as to improve terms of trade and the bargaining process between milk producers and milk processors and to increase returns to dairy farmers. FMMOs are authorized in the Agricultural Marketing Agreement Act (1937). A comprehensive discussion of Federal Milk Marketing Orders is presented in CRS (2017). Practically, all milk produced in the United States is Grade A milk.

volume, and milk assembling services provided by dairy cooperatives. Over-order premiums are typically paid on Class I milk, so they also reflect supply and demand conditions in the local fluid milk markets. Class milk prices and uniform prices are calculated and announced on a monthly basis.

The anticompetitive conduct of DFA and Dean, analyzed in this case study, affected the purchase, sale, marketing, and processing of Grade A milk utilized as Class I (fluid milk) in Federal Milk Marketing Order 5 (FO5 Appalachian) and Federal Milk Marketing Order 7 (FO7 Southeast), collectively referred to as the Southeast, and Federal Milk Marketing Order 1 (FO1 Northeast). Figure 1 is a map of Federal Milk Marketing Orders.

Table 2 summarizes key marketing and price data for 10 FMMOs for 2013.[5] These data indicate the key differences among the 10 FMMOs in terms of total milk quantity marketed, Class I milk quantity marketed, Class I milk utilization rate (percentage of milk used as Class I milk), and Class I milk price and uniform price.[6] Dairy farmers located in the three analyzed FMMOs produced 28 percent of the FMMOs' total milk and 41 percent of the FMMOs' Class I milk. In these three FMMOs, Class I milk utilization rates were higher than those in all the other FMMOs: 37 percent in FO1 (Northeast), 67 percent in FO5 (Appalachian), and 68 percent in FO7 (Southeast). Class I milk prices and Class I milk utilization rates directly affect uniform prices. Uniform prices in the analyzed FMMOs were above the FMMOs' average uniform price, and these prices were higher than those in all other FMMOs.[7]

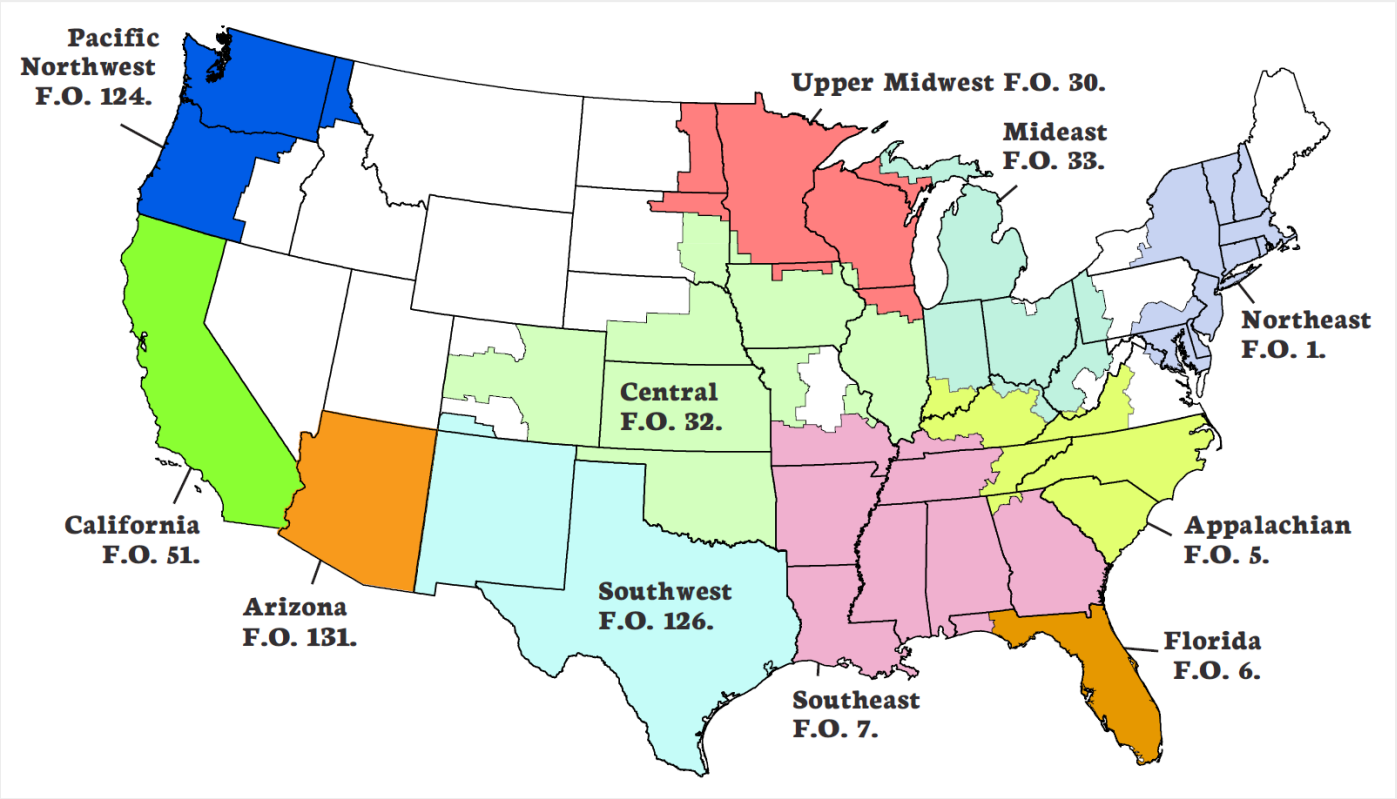

Figure 1. Map of Federal Milk Marketing Orders (USDA AMS 2021b)

[5] The earliest year for which this type of summary data is available online is 2013 (USDA AMS Dairy Program 2014).
[6] "Total milk quantity" refers to a combined quantity of Class I milk, Class II milk, Class III milk, and Class IV milk. The total milk quantity and Class I milk quantity are the quantities produced by milk producers (dairy farmers) located in a particular Order.
[7] Among FMMOs, FO6 Florida has the highest Class I milk utilization rate as well as the highest Class I milk price and uniform milk price.

Table 2. Federal Milk Marketing Orders: Market Summary (2013)

FMMO	Total milk quantity	Class I milk quantity	Class I milk utilization rate	Class I milk price	Uniform price
	millions of pounds	millions of pounds	percent	$/cwt	$/cwt
Northeast	**25,420**	**9,508**	**37**	**22.09**	**20.23**
Appalachian	**5,729**	**3,845**	**67**	**22.24**	**21.34**
Florida	2,833	2,424	86	24.24	23.53
Southeast	**6,129**	**4,163**	**68**	**22.64**	**21.74**
Upper Midwest	34, 315	3,686	11	20.64	18.29
Central	15,199	4,867	32	20.85	18.82
Mideast	16,719	6,448	39	20.85	19.17
Pacific Northwest	8,239	2,120	26	20.74	18.83
Southwest	12,901	4,324	33	21.85	19.59
Arizona	4,615	1,357	29	21.19	19.41
Market average or total	**132,100**	**42,742**	**32**	**21.70**	**19.44**

Data Source: USDA AMS Dairy Program (2014).

3 Fluid Milk Industry in the United States and Eastern United States: Structural Changes and Business Conduct of Fluid Milk Processors

This section discusses the structure of the fluid milk industry and structural changes in the industry as well as competition issues related to the business conduct of Dean Foods and Dairy Farmers of America revealed during antitrust litigations in the Southeast and Northeast regions.

3.1 Structural Changes in the U.S. Fluid Milk Industry

During the 1980s and 1990s, increasing consolidation and concentration affected the fluid milk industry in the United States. The number of firms operating at milk production and at fluid milk processing and retailing stages of the fluid milk supply chain decreased, and firm size increased. A number of firms engaged in a string of mergers, acquisitions, and joint ventures.[8]

The combined market shares of the four largest firms increased at all stages of the fluid milk supply chain and reached their highest level by the beginning of 2000.[9] For example, in 1999, the average

[8] Dobson (1992), Dobson and Christ (2000), U.S. General Accounting Office (2001) and U.S. Government Accountability Office (2004), Gould (2010), and Shields (2010) discuss structural changes in the U.S. fluid milk industry and firms' competitive strategies.

[9] The combined market share of the four largest firms in the industry is referred to as the four-firm concentration ratio (CR4). The *N*-firm concentration ratio, a commonly used measure of market concentration, represents a combined market share of

market share of the four largest dairy cooperatives reported for 11 U.S. markets was 76.5 percent, and the average market share of the four largest fluid milk processors reported for 14 U.S. markets was 75.6 percent (U.S. General Accounting Office 2001). In 2003, the average market share of the four largest fluid milk retailers reported for 15 U.S. markets was 73.9 percent (U.S. Government Accountability Office 2004).

Dairy cooperatives have historically been involved in milk marketing in the United States.[10] The economic objective of farmer-owned cooperatives is to increase returns to their farmer-members. Dairy cooperatives are obligated to accept and sell all milk of their farmer-members and to obtain the highest-possible milk prices, which dairy farmers are not able to negotiate individually. Many dairy cooperatives perform bargaining functions by representing farmer-members in contract negotiation processes with dairy processors. Dairy cooperatives negotiate over-order premiums and other terms of trade. Collective marketing activities of dairy farmers implemented through dairy cooperatives, including price negotiations with dairy processors, are possible due to the Capper-Volstead Act (1922), a limited antitrust immunity from the Sherman Act (1890).

Dairy Farmers of America (DFA) is the largest dairy cooperative in the country. It was formed in 1998 as a result of the merger of four large regional dairy cooperatives (U.S. General Accounting Office 2001; Gould 2010). DFA, a vertically integrated cooperative, owns and operates fluid milk processing plants. In 2000, DFA had net sales of $6.76 billion.

Suiza Foods Corporation and Dean Foods Company were the two largest fluid milk processors in the United States prior to Suiza's acquisition of Dean. Suiza owned and operated 67 dairy processing plants in 29 states, and in 2000 it had net sales of $5.76 billion.[11] Dean owned and operated 43 dairy processing plants in 19 states, and in 2000 it had net sales of $4.4 billion.[12]

In 2001, Suiza Foods Corporation acquired Dean Foods Company, creating a new company: Dean Foods. To protect competition for fluid milk sold through schools and retail outlets, the U.S. Department of Justice (DOJ) conditioned approval of this merger on Suiza and Dean selling 11 fluid milk processing plants (U.S. Department of Justice 2001). These plants, which were located in Alabama, Florida, Indiana, Kentucky, Ohio, South Carolina, Virginia, and Utah, were divested to National Dairy Holdings (NDH). NDH was a newly formed company, 50 percent owned by DFA. The new Dean (a publicly traded company) became the largest fluid milk processor in the United States.

3.2 Fluid Milk Industry in the Southeast: Early 2000s

In 2000, there were 4,808 dairy farmers in FO7 (Southeast) and 4,483 dairy farmers in FO5 (Appalachian).[13] In 1999, the combined market shares of the four largest dairy cooperatives were 71.5 percent in Atlanta and New Orleans and 85.2 percent in Charlotte (U.S. General Accounting Office

the *N* largest firms in the industry (Besanko et al. 2006). CR4 (*N*=4) is the most frequently used measure. The firms' market shares are typically calculated using the firms' revenue (sales). A high level of market concentration can facilitate anticompetitive conduct. An industry with a CR4 that exceeds 75 percent is thought to be prone to collusion; an industry with a CR4 lower than 40 percent likely presents no competition concerns (Hovenkamp 2005). A problem with using CR is that it does not account for the size inequality among the largest firms. The Herfindahl–Hirschman Index (HHI), another commonly used measure of market concentration, does account for this inequality. HHI is the sum of the squared market shares of the largest firms in the industry (Hovenkamp 2005; Besanko et al. 2006).

[10] The types of dairy cooperatives differ due to the scope of functions performed: bargaining, niche marketing, processing, and diversified (USDA RD 2005; Liebrand 2010; Ling 2012).

[11] During the 1990s, Suiza used an aggressive strategy of acquiring fluid milk processing plants, as a result of which Suiza became the largest fluid milk processor in the country (Siebert et al. 2000).

[12] The number of fluid milk processing plants and net sales for DFA, Suiza, and Dean are reported in U.S. Department of Justice (2001).

[13] The number of dairy farmers is reported in the annual statistics of FO5 and FO7 (USDA AMS Dairy Program 2019b, c).

2001).[14] In 1999, the combined market shares of the four largest fluid milk processors were 52.4 percent in Atlanta and New Orleans and 73.9 percent in Charlotte (U.S. General Accounting Office 2001). In 2003, the combined market shares of the four largest fluid milk retailers were 74.7 percent in New Orleans, 78.2 percent in Atlanta, and 82 percent in Charlotte (U.S. Government Accountability Office 2004).

Dean was the largest fluid milk processor (fluid milk bottler) in the Southeast.[15] It owned approximately 17 fluid milk bottling plants and controlled approximately 60 percent of the fluid milk bottling capacity in the region. National Dairy Holdings (NDH) was the second-largest fluid milk bottler in the Southeast. It owned approximately nine fluid milk bottling plants in the Southeast. DFA was the third-largest fluid milk bottler in the Southeast. It operated at least eight fluid milk bottling plants in the region. In addition, DFA controlled the supply of approximately 90 percent of Grade A milk in the region. Together, these three fluid milk processors operated at least 33 plants, which represented approximately 77 percent of the fluid milk bottling capacity in the Southeast. Dairy Marketing Services (DMS) and the Southern Marketing Agency (SMA) were the two marketing agencies involved in milk marketing in this region.

3.3 Fluid Milk Industry in the Northeast: Early 2000s

In 2000, there were 17,279 dairy farmers in FO1 (Northeast).[16] In 1999, the combined market shares of the four largest dairy cooperatives were 69.6 percent in Boston and 76.8 percent in Washington, D.C. (U.S. General Accounting Office 2001).[17] In 1999, the combined market shares of the four largest fluid milk processors were 54.5 percent in Washington, D.C. and 88.1 percent in Boston (U.S. General Accounting Office 2001). In 2003, the combined market shares of the four largest fluid milk retailers were 70.1 percent in Boston and 76.5 percent in Washington, D.C. (U.S. Government Accountability Office 2004).

Dean was the largest fluid milk bottler in the Northeast.[18] National Dairy Holdings (NDH) and HP Hood were the two other large fluid milk processors operating in this region. DFA had approximately 1,900 farmer-members in the Northeast. Dairy Marketing Services (DMS), a marketing agency, marketed milk for 9,000 dairy farmers, including independent dairy farmers and other cooperatives. DMS marketed approximately 60 percent of milk delivered to fluid milk processing plants in the Northeast. DMS was owned by DFA and two other dairy cooperatives.

3.4 Business Conduct of Dairy Farmers of America (DFA) and Dean Foods (Dean) in the Eastern United States: Competition Issues

In a competitive market environment, dairy farmers should have the following marketing options: to market their milk independently by selling it directly to fluid milk processors, to market their milk through a dairy cooperative, or to market their milk through a marketing agency. Milk prices received by dairy farmers are determined within the system of Federal (and State) Milk Marketing Orders, which guarantees the same milk price for all dairy farmers located in a given Order. Premiums are negotiated for milk quality characteristics and volume and for milk assembling services provided by dairy cooperatives.

[14] The U.S. General Accounting Office (2001) and the U.S. Government Accountability Office (2004) report concentration ratios only for selected markets. Atlanta (GA), New Orleans (LA), and Charlotte (NC) are located in the Southeast region covered by FO5 and FO7.

[15] The information presented in this paragraph is obtained from the complaint filed by dairy farmers with the court in the Southeast region: *Sweetwater Valley Farm, Inc., et al v. Dean Foods Company et al.*

[16] The number of dairy farmers is reported in the annual statistics of FO1 (USDA AMS Dairy Program 2019a).

[17] The U.S. General Accounting Office (2001) and the U.S. Government Accountability Office (2004) report concentration ratios only for selected markets. Boston (MA) and Washington D.C. are located in the Northeast region covered by FO1.

[18] The information presented in this paragraph is obtained from the complaint filed by dairy farmers with the court in the Northeast region: *Allen et al v. Dairy Farmers of America, Inc. et al.*

In their complaints filed with the courts, dairy farmers claimed that the following activities of DFA, Dean, other fluid milk processors, and milk marketing agencies restricted competition in the fluid milk industry in the Southeast and Northeast regions:[19]

- Entered full-supply agreements and used long-term full supply agreements between them to control dairy farmers' access to fluid milk bottling plants.[20]
- Decreased and stabilized prices paid to dairy farmers for Grade A milk used as Class I milk and in particular, decreased and fixed the amount of over-order premiums paid for Class I milk.
- Required dairy farmers (independent dairy farmers and independent cooperatives) to market their milk only through DFA or DFA-controlled entities (marketing agencies controlled by DFA) to gain access to fluid milk bottling plants.
- Foreclosed (precluded) the access of independent dairy farmers and independent dairy cooperatives to fluid milk bottling plants—access required for dairy farmers to qualify for the FMMOs' minimum prices.
- Threatened, punished, and boycotted independent dairy farmers, independent cooperatives, and fluid milk bottlers who did not comply with the efforts to control these entities.
- Used DFA-controlled entities (marketing agencies controlled by DFA) to monitor prices paid to independent dairy farmers and independent cooperatives.
- Purchased fluid milk bottling plants, closed fluid milk bottling plants, and refused to operate fluid milk bottling plants.
- "Flooded" Southeast with Grade A milk from other regions, allegedly decreasing Class I milk utilization rate in FO5 and FO7, which consequently decreased milk prices paid to dairy farmers.

In addition, dairy farmers claimed that DFA, instead of maximizing returns to dairy farmer-members, acted in the manner of a profit-maximizing fluid milk processor—one that benefited from decreasing its costs by decreasing milk quantity purchased from dairy farmers and by decreasing milk prices paid to dairy farmers, in particular, over-order premiums paid for raw milk used as Class I milk.

In summary, dairy farmers argued that the above-noted conduct of DFA and Dean considerably restricted marketing options for dairy farmers and limited their access to fluid milk processing (bottling) plants. This conduct might have decreased the quantity of raw milk (used as Class I milk) sold by dairy farmers and purchased by fluid milk processors in the analyzed regions, which in turn might have decreased over-order premiums and milk prices paid by fluid milk processors to dairy farmers.

4 Theoretical Framework: Market Power of Fluid Milk Processors

Figure 2 presents a theoretical framework for explaining the conduct and performance of the fluid milk industry in light of structural changes (increasing consolidation and concentration) and competition

[19] Complete lists of allegedly anticompetitive practices are presented in the complaints filed by dairy farmers with the courts: *Sweetwater Valley Farm, Inc., et al v. Dean Foods Company et al. (Southeast)* and *Allen et al v. Dairy Farmers of America, Inc. et al. (Northeast).*

[20] A full supply agreement between a fluid milk processor, for example, Dean, and DFA means that DFA is the only supplier of milk for Dean's fluid milk bottling plants. Independent dairy farmers and independent dairy cooperatives do not have access to these fluid milk bottling plants. Their options are either to join DFA or DFA-controlled entities or to exit the industry.

issues raised by dairy farmers.[21] This framework is a marketing margin framework.[22] It includes (as applied to the fluid milk supply chain) the dairy farm level represented by dairy farmers producing raw milk and the fluid milk processing level represented by fluid milk processors purchasing raw milk from dairy farmers and processing it into fluid milk products.[23] It also includes the retail level represented by retailers purchasing fluid milk products from fluid milk processors and selling them to final consumers.[24] The farm supply curve represents the inverse supply function for raw milk at the farm level. The wholesale demand curve represents the inverse demand function for fluid milk products at the wholesale level. The retail demand curve represents the inverse demand function for fluid milk products at the retail level.

The two market scenarios are introduced below. The first is a competitive industry scenario in which there are many fluid milk processors, none of which possess any market power. The second is a market power scenario in which there is a small number of large fluid milk processors that possess buyer and seller market power.

Scenario #1: The fluid milk processing industry is a competitive industry.

Assume that the fluid milk processing industry is a competitive industry with many fluid milk processors. These processors purchase a quantity of raw milk (Class I milk quantity) denoted as Qc in Figure 2. They pay to dairy farmers the raw milk price (Class I milk price) denoted as FPc. Fluid milk processors process raw milk into fluid milk products and sell a quantity of fluid milk products denoted as Qc to retailers.[25] Fluid milk processors charge the wholesale price for fluid milk products denoted as WPc. Retailers sell a quantity of fluid milk products denoted as Qc to final consumers and charge the retail price denoted as RPc.[26] In a competitive industry scenario, the marketing margin attributed to fluid milk processors is WPc – FPc in $ per unit and (WPc – FPc)*Qc in total $. This marketing margin (farm-to-wholesale margin) includes the fluid milk processing costs and profit of fluid milk processors. The two additional marketing margins shown in Figure 2 are the wholesale-to-retail margin, RPc - WPc in $ per unit and (RPc - WPc)*Qc in total $, and the farm-to-retail margin, RPc-FPc in $ per unit and (RPc-FPc)*Qc in total $.[27]

[21] The competition concerns raised by dairy farmers were related to buyer market power of fluid milk processors. The competition issues related to seller market power of fluid milk processors were raised by dairy retailers in their lawsuit filed against Dean and DFA, among other defendants (Goldfein and Keyte 2014; Hurley 2017). After complex legal proceedings, the lawsuit was settled.

[22] Graphically, this framework is a simplified version of a graphical representation 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 textbooks (for example, see Besanko and Braeutigam 2002). For simplicity, the marginal revenue curve for monopoly and the marginal expenditure curve for monoposony are not shown in Figure 2. The marketing margin framework, as applied to agricultural and food industries, is discussed in Kohls and Uhl (2002), Hudson (2007), and Tomek and Kaiser (2014).

[23] Fluid milk products include whole milk, reduced-fat milk, low-fat milk, flavored milk, and other types of fluid milk products considered to be "beverage" milk.

[24] The structure of the fluid milk supply chain is shown in Figure A2.1.

[25] Qc does not occur at the intersection of farm supply and wholesale demand because inverse farm supply is for raw milk used in fluid milk manufacturing and wholesale demand is for fluid milk products. At Qc, the distance between WPc and FPc in Figure 2 is the farm-to-wholesale margin measured in $ per unit.

[26] In fluid milk processing, one unit of input (raw milk) is required to produce one unit of output (fluid milk products). Fluid milk processing (manufacturing) is also referred to as a fluid milk bottling business. Therefore, Q is used to denote milk quantity corresponding to the dairy farm, wholesale, and retail levels of the fluid milk supply chain.

[27] The wholesale-to-retail margin includes the retailing costs and profit of food retailers. The farm-to-retail margin is the sum of the farm-to-wholesale margin and the wholesale-to-retail margin.

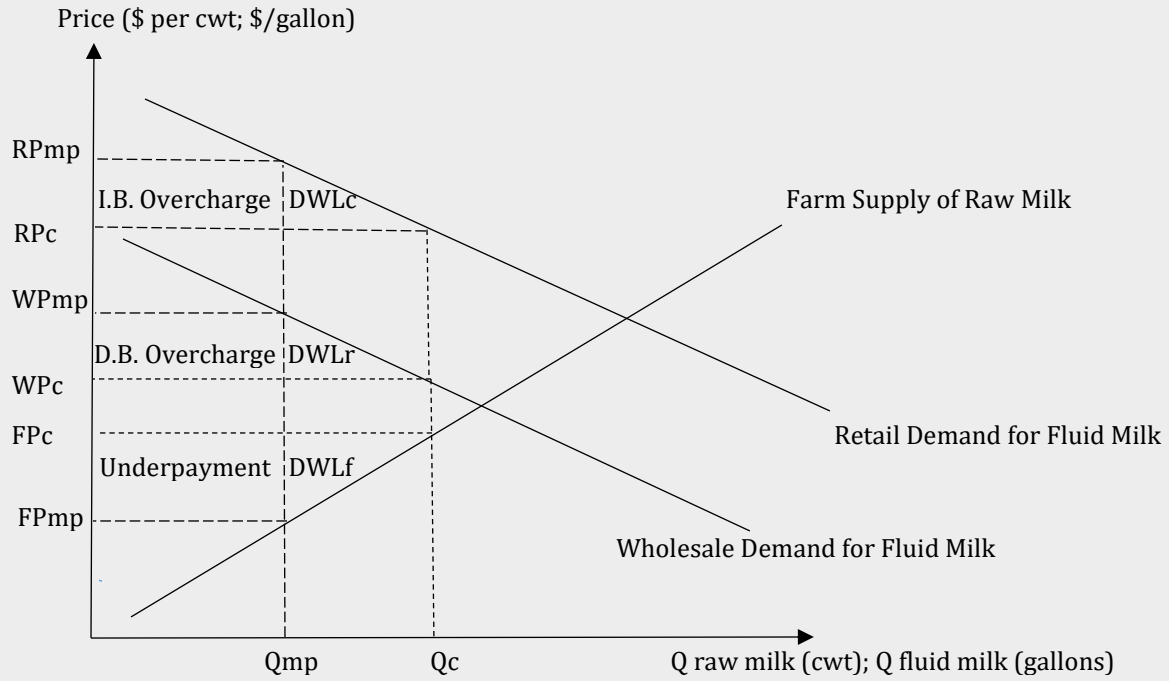

Figure 2. Price Effects of Market Power in the Fluid Milk Processing Industry

Scenario #2: The fluid milk processing industry is an imperfectly competitive industry. The industry has buyer market power in the market for raw milk (input market) and seller market power in the market for fluid milk products (output market).

Assume that as a result of mergers and acquisitions the number of fluid milk processors decreases, and the size of remaining firms increases. There are a small number of large fluid milk processors in the industry. The fluid milk processing industry is an oligopsony on the input side (raw milk purchasing) and an oligopoly on the output side (fluid milk product marketing). As compared with a competitive industry, oligopsonists maximize their profit by decreasing the input quantity they purchase to lower the input price they pay (buyer market power affecting inverse supply). To maximize their profit, oligopolists decrease the output quantity they produce and sell to increase the output price they charge (seller market power affecting inverse demand).

In the market power scenario, fluid milk processors purchase a quantity of raw milk (Class I milk quantity) denoted as Qmp and pay to dairy farmers the raw milk price (Class I milk price) denoted as FPmp in Figure 2. Fluid milk processors process raw milk into fluid milk products. They sell a quantity of fluid milk products denoted as Qmp to retailers and charge the wholesale price denoted as WPmp. Retailers sell a quantity of fluid milk products denoted as Qmp to final consumers and charge the retail price denoted as RPmp. In the market power scenario, the marketing margin (farm-to-wholesale margin) attributed to fluid milk processors is WPmp – FPmp in $ per unit and (WPmp – FPmp)*Qmp in total $. The two additional marketing margins shown in Figure 2 are the wholesale-to-retail margin, RPmp-WPmp in $ per unit and (RPmp-WPmp)*Qmp in total $, and the farm-to-retail margin, RPmp-FPmp in $ per unit and (RPmp-FPmp)*Qmp in total $.

As compared with a competitive industry, dairy farmers who sell milk are underpaid due to the buyer market power of fluid milk processors. The underpayment to dairy farmers is FPc-FPmp in $ per unit and (FPc-FPmp)*Qmp in total $. The total $ amount underpaid to dairy farmers due to a reduction in milk quantity purchased by fluid milk processors is represented by the underpayment rectangle in Figure

2.[28] Dairy farmers who do not sell milk, due to a reduction in milk quantity purchased by fluid milk processors, likely exit the market. The deadweight loss (DWL) attributed to the dairy farm sector is represented by the DWLf triangle in Figure 2.[29]

As compared with a competitive industry, retailers (direct buyers) and final consumers (indirect buyers) are overcharged due to the seller market power of fluid milk processors. The overcharge attributed to retailers (direct buyers) is WPmp-WPc in $ per unit and (WPmp-WPc)*Qmp in total $. The total $ amount that retailers overpaid due to a reduction in fluid milk quantity sold by fluid milk processors is represented by the overcharge rectangle denoted as "D.B. overcharge" in Figure 2.[30] The overcharge attributed to final consumers (indirect buyers) is RPmp-RPc in $ per unit and (RPmp-RPc)*Qmp in total $. The total $ amount that final consumers overpaid due to a reduction in fluid milk quantity is represented by the overcharge rectangle denoted as "I.B. overcharge" in Figure 2. Some retailers and final consumers do not purchase fluid milk products due to a reduction in fluid milk quantity sold by fluid milk processors. The deadweight loss attributed to the retail sector and the deadweight loss attributed to final consumers are represented by the DWLr and DWLc triangles, respectively, in Figure 2.

Buyer market power increases the profit of fluid milk processors by the amount of underpayment to dairy farmers. Seller market power increases the profit of fluid milk processors by the amount of overcharge attributed to buyers of fluid milk products. There is also a deadweight loss attributed to the fluid milk processing sector.

The competition concerns raised by dairy farmers were related to the buyer market power of fluid milk processors. As compared with a competitive industry, fluid milk processors decrease the quantity of Class I milk they purchase, which decreases the Class I milk price they pay. Dairy farmers sell a smaller Class I milk quantity, leading to a lower Class I milk price.[31] Given that the milk price received by dairy farmers includes the FMMO minimum price and over-order premiums, the buyer market power of fluid milk processors decreases the amount of over-order premiums, and consequently it decreases the milk price received by dairy farmers. In addition, some dairy farmers exit the market.

The activities of DFA and Dean (those presented in the complaints) that have affected and that might have decreased the Class I milk quantity available in the market and purchased include the following: (a) using full-supply agreements and long-term full supply agreements between DFA and Dean to control dairy farmers' access to fluid milk bottling plants, (b) requiring dairy farmers to market their milk only through DFA or DFA-controlled entities (marketing agencies controlled by DFA) in order to gain access to fluid milk bottling plants, (c) foreclosing (precluding) dairy farmers' access to fluid milk bottling plants, and (d) purchasing fluid milk bottling plants, closing fluid milk bottling plants, or refusing to operate fluid milk bottling plants.

The economic incentives for DFA and Dean to use these business practices in the fluid milk industry in the Southeast and Northeast regions were to decrease milk costs in order to increase the profit of fluid milk manufacturing. As compared with the FMMOs averages, the Southeast and Northeast regions have the highest Class I milk utilization rates, the highest Class I milk prices, and the highest uniform prices, thus leading to higher costs that fluid milk processors have to incur in these regions

[28] The underpayment (in $ per unit) is a price decrease due to a quantity decrease. Supply elasticity (reflected in the steepness of the supply curve on a graph) will affect the magnitude of price decrease.

[29] Deadweight loss (DWL) measured in monetary units is the loss of economic benefits for all sellers or all buyers of the analyzed product. DWL is a decrease in the producer surplus or the consumer surplus or both. In this case study, DWL is due to a decrease in milk quantity purchased and marketed by fluid milk processors because of their buyer and seller market power.

[30] The overcharge (in $ per unit) is a price increase due to a quantity decrease. Demand elasticity (reflected in the steepness of the demand curve on a graph) will affect the magnitude of price increase.

[31] FMMOs' minimum Class milk prices are calculated with a series of formulas, which include wholesale prices of manufactured dairy products (cheese, butter, dry whey, and nonfat dry milk) (USDA AMS Dairy Program 2017).

(Table 2).

5 Fluid Milk Market and Price Behavior: Empirical Analysis

This section presents a basic empirical market and price analysis using publicly available data reported by the U.S. Department of Agriculture Agricultural Marketing Service. The analysis is conducted at the farm and retail levels of the fluid milk supply chain. The farm level analysis focuses on the number of dairy farmers, milk quantities, milk prices (table 3, yearly data), and over-order premiums paid to dairy farmers (tables 4 and 5, monthly data).[32] The retail level analysis focuses on retail fluid whole milk prices and farm-to-retail margins (tables 6 and 7, monthly data).

First, the averages of the economic variables are calculated for the two periods of interest: the pre-antitrust action period (the period of allegedly anticompetitive conduct of fluid milk processors) and the antitrust action period (the period of antitrust litigations). Second, the changes in the averages between these two periods are calculated. In light of the theoretical framework used in the present analysis, the pre-antitrust action period can be thought of as a market power scenario (a lesser degree of competition among fluid milk processors due to their anticompetitive conduct), and the antitrust action period may be thought of as a competitive industry scenario.[33]

5.1 Farm-Level Effects: Milk Producer Numbers, Milk Quantities, and Milk Prices (Table 3) [34]

This section discusses changes in the analyzed economic variables in the antitrust action period, as compared with the pre-antitrust action period.[35]

5.1.1 FO7 Southeast

The yearly average number of milk producers (dairy farmers) in FO7 decreased from 3,688 to 2,356. The yearly average Class I milk quantity decreased from 4,718 million pounds to 4,177 million pounds. The yearly average Class I milk utilization rate increased from 63.1 percent to 69.2 percent. The yearly average Class I milk price increased from $17.42 per cwt to $20.60 per cwt.

[32] The results reported in tables 3–7 were generated in Excel. If selected calculations are reproduced using a calculator, results might be slightly different than those reported here.

[33] The market and price behavior might not change significantly during the antitrust action period, as compared with the pre-antitrust action period. However, for teaching purposes, it may be assumed that the threat of antitrust litigations and potential penalties made fluid milk processors behave more competitively.

[34] The original data analyzed in this section were collected from statistical materials available on the webpages of the analyzed Federal Milk Marketing Orders (USDA AMS Dairy Program 2019a, b, c).

[35] In the case of the Southeast region, the pre-antitrust action period is 2001 to 2008, and the antitrust action period is 2009 to 2018. In the case of the Northeast region, the pre-antitrust action period is 2002 to 2009, and the antitrust action period is 2010 to 2018. The beginning of the pre-antitrust action period (in the case of each region) is the year when the allegedly anticompetitive conduct of Dean and DFA began affecting fluid milk markets, according to the complaints filed by dairy farmers with the courts. The beginning of the antitrust action period (in the case of each region) is the year when complaints were filed by dairy farmers with the courts.

Table 3. Market Analysis for Federal Milk Marketing Order 7 "Southeast," Federal Milk Marketing Order 5 "Appalachian" and Federal Milk Marketing Order 1 "Northeast" (2000-2018)

Measure	Units	Pre-antitrust action period Average	Antitrust action period Average	Change in the Average between the two periods (percentage change)
Federal Milk Marketing Order 7				
Number of milk producers	number	3,688	2,356	-1,332 (-36.1)
Class I milk producer quantity	million pounds	4,718	4,177	_____(_____)
Total milk producer quantity	million pounds	7,497	6,069	-1,428 (-19)
Class I milk utilization	percent	63.1	69.2	_____(_____)
Class I milk price	$/cwt	17.42	20.6	_____(_____)
Uniform price	$/cwt	16.27	19.57	3.3 (20.3)
Federal Milk Marketing Order 5				
Number of milk producers	number	3,266	2,231	-1,035 (-31.7)
Class I milk producer quantity	million pounds	4,269	3,985	_____(_____)
Total milk producer quantity	million pounds	6,286	5,808	-478 (-7.6)
Class I milk utilization	percent	68	68.6	_____(_____)
Class I milk price	$/cwt	17.4	20.2	_____(_____)
Uniform price	$/cwt	16.3	19.21	2.86 (17.5)
Federal Milk Marketing Order 1				
Number of milk producers	number	14,757	12,055	-2,701 (-18.3)
Class I milk producer quantity	million pounds	10,549	9,352	_____(_____)
Total milk producer quantity	million pounds	23,591	25,794	2,204 (9.3)
Class I milk utilization	percent	44.8	36.4	_____(_____)
Class I milk price	$/cwt	17.16	20.64	_____(_____)
Uniform price	$/cwt	15.34	18.59	3.24 (21.1)

Data source: USDA AMS Dairy Program (2019a, b, c).
Note 1: Southeast region: the pre-antitrust action period is 2001 to 2008, and the antitrust action period is 2009 to 2018
Northeast region: the pre-antitrust action period is 2002 to 2009, and the antitrust action period is 2010 to 2018.
Note 2: Students have to perform relevant calculations to record their answers in cells with missing answers (Discussion Question 4.1).

5.1.2 FO5 Appalachian

The yearly average number of milk producers (dairy farmers) in FO5 decreased from 3,266 to 2,231. The yearly average Class I milk quantity decreased from 4,269 million pounds to 3,985 million pounds. The yearly average Class I milk utilization rate increased from 68 percent to 68.6 percent. The yearly average Class I milk price increased from $17.40 per cwt to $20.20 per cwt.

5.1.3 FO1 Northeast

The yearly average number of milk producers (dairy farmers) in FO1 decreased from 14,757 to 12,055. The yearly average Class I milk quantity decreased from 10,549 million pounds to 9,352 million pounds. The yearly average Class I milk utilization rate decreased from 44.8 percent to 36.4 percent. The yearly average Class I milk price increased from $17.16 per cwt to $20.64 per cwt.

5.2 Farm-Level Effects: Over-Order Premiums

The Class I milk prices analyzed in the previous section are the FMMO minimum prices that fluid milk processors have to pay. Dairy cooperatives negotiate with fluid milk processors premiums (over-order

premiums or over-order payments) that are paid in addition to the FMMO minimum Class I milk prices. Over-order premiums increase the revenue and profitability of dairy farmers. The premium measured in $ per cwt of milk[36] is calculated as the difference between the announced cooperative Class I milk price and FMMO minimum Class I milk price reported for a particular geographic location.[37] The premium is also calculated as a percentage of the announced cooperative Class I milk price. Given that the analyzed premiums are calculated using the *announced* cooperative prices, *actual* premiums paid might be different.

5.2.1 Southeast Region: FO5 and FO7 Selected Markets (Table 4)[38]

During the pre-antitrust action period, the monthly average premiums are $1.70 per cwt in New Orleans, $1.77 per cwt in Memphis, $1.85 per cwt in Louisville, $1.93 per cwt in Charlotte, and $1.97 per cwt in Atlanta.[39] The monthly average premium expressed as a percentage of the cooperative Class I milk price is in the range of 9 percent to10 percent in the majority of the analyzed cities in the Southeast region.

The monthly average premiums measured in $ per cwt and as a percentage of the cooperative Class I milk prices increase in all analyzed cities in the antitrust action period, as compared with the pre-antitrust action period. In the antitrust action period, the monthly average premiums are $2.94 per cwt in New Orleans, $3.11 per cwt in Louisville, $3.24 per cwt in Charlotte, $3.30 per cwt in Memphis, and $3.32 per cwt in Atlanta. The monthly average premium expressed as a percentage of the cooperative Class I milk price is in the range of 14 percent to 15 percent in the majority of the analyzed cities in the Southeast region.

5.2.2 Northeast Region: FO1 Selected Markets (Table 5)[40]

During the pre-antitrust action period, the monthly average premiums are $1.55 per cwt in Boston and Harford, $1.78 per cwt in Baltimore and Washington D.C., and $2.20 per cwt in Philadelphia. The monthly average premium expressed as a percentage of the cooperative Class I milk price is in the range of 8 percent to10 percent in the majority of the analyzed cities in the Northeast region.

The monthly average premium measured in $ per cwt increases in Boston, Hartford, and Philadelphia and decreases in Baltimore and Washington D.C. in the antitrust action period, as compared with the pre-antitrust action period. The monthly average premium calculated as a percentage of the cooperative Class I milk price decreases in Boston, Hartford, Baltimore, and Washington D.C. and increases in Philadelphia in the antitrust action period, as compared with the pre-antitrust action period.

In the antitrust action period, the monthly average premiums are $1.61 per cwt in Boston and Harford, $1.67 per cwt in Baltimore and Washington D.C., and $3.09 per cwt in Philadelphia. The monthly average premium expressed as a percentage of the cooperative Class I milk price is in the range of 7 percent to 8 percent in the majority of the analyzed cities in the Northeast region.

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[36] "Cwt" is one hundredweight (100 pounds).

[37] The original data used in sections 5.2 and 5.3 are available in the U.S. Department of Agriculture Agricultural Marketing Service Milk Marketing Order Statistics Public Database (USDA AMS 2020). The database reports the announced cooperative Class I milk prices and FMMO minimum Class I milk prices for selected geographic locations. The Class I milk prices reported in the database are monthly prices.

[38] The monthly Class I milk prices and premiums for Atlanta, Georgia, are plotted in Figure A2.2. The teaching note includes figures plotting these prices and premiums for other geographic locations.

[39] Although the length of the pre-antitrust action period in this analysis practically coincides with the length of this period in the analysis of yearly data presented in the previous section, the length of the antitrust action period is shorter (it ends in December 2012, the last year for which announced cooperative Class I milk prices are available).

[40] The monthly Class I milk prices and premiums for Boston, Massachusetts, are plotted in Figure A2.3. The teaching note includes figures plotting these prices and premiums for other geographic locations.

Table 4. U.S. Southeast Region: FMMO Minimum Class I Milk Prices, Announced Cooperative Class I Milk Prices, and Premiums in Selected Markets (2001 to 2012)

City/Price/Premium	Units	Pre-antitrust action period 01/2001 to 07/2008 Average	Antitrust action period 08/2008 to 12/2012 Average	Change in the Average between the two periods (percentage change)
Louisville, KY				
FMMO Class I milk price	$/cwt	16.32	18.25	1.93 (11.8)
Coop Class I milk price	$/cwt	18.17	21.36	3.19 (17.6)
Premium	$/cwt	1.85	3.11	1.26 (68.1)
Premium	percent of Coop price	10.12	14.85	4.73 (46.7)
Memphis, TN				
FMMO Class I milk price	$/cwt	16.92	18.85	1.93 (11.4)
Coop Class I milk price	$/cwt	18.68	22.15	3.47 (18.6)
Premium	$/cwt	1.77	3.30	1.53 (86.4)
Premium	percent of Coop price	9.48	15.20	5.72 (60.3)
Charlotte, NC				
FMMO Class I milk price	$/cwt	17.22	19.35	2.13 (12.4)
Coop Class I milk price	$/cwt	19.16	22.59	3.43 (17.9)
Premium	$/cwt	1.93	3.24	1.31 (67.9)
Premium	percent of Coop price	10.20	14.57	4.37 (42.8)
Atlanta, GA				
FMMO Class I milk price	$/cwt	17.24	19.75	_____(____)
Coop Class I milk price	$/cwt	19.21	23.07	_____(____)
Premium	$/cwt	_____	_____	_____(____)
Premium	percent of Coop price	_____	_____	_____(____)
New Orleans, LA				
FMMO Class I milk price	$/cwt	17.72	19.75	_____(____)
Coop Class I milk price	$/cwt	19.42	22.69	_____(____)
Premium	$/cwt	_____	_____	_____(____)
Premium	percent of Coop price	_____	_____	_____(____)

Data source for prices: USDA AMS (2020).
Note: Students have to perform relevant calculation to record their answer in cells with missing answers (Discussion Question 4.2).

5.3 Retail-Level Effects: Fluid Whole Milk Prices and Farm-to-Retail Margins

The farm-to-retail margin measured in $ per gallon used in the analysis presented in this section is the difference between the retail fluid whole milk price ($ per gallon) and Class I milk price ($ per gallon) reported for a particular geographic location.[41] The Class I milk price can be thought of as a farm price for the purpose of the analysis. The farm-to-retail margin is also calculated as a percentage of the retail fluid whole milk price.[42]

[41] Class I milk prices are reported in $ per cwt. Class I milk prices are converted in $ per gallon to be used in the analysis presented in this section.
[42] Theoretically, the farm-to-retail margin is the sum of the farm-to-wholesale margin and the wholesale-to-retail margin. Wholesale prices of fluid milk products (prices charged by fluid milk processors) are not available for public access. Therefore, it is not possible to calculate the farm-to-wholesale margin and the wholesale-to-retail margin in the fluid milk supply chain.

Table 5. U.S. Northeast Region: FMMO Minimum Class I Milk Prices, Announced Cooperative Class I Milk Prices, and Premiums in Selected Markets (2002 to 2012)

City/Price/Premium	Units	Pre-antitrust action period 01/2002 to 09/2009 Average	Antitrust action period 10/2009 to 12/2012 Average	Change in the Average between the two periods (percentage change)
Boston, MA				
FMMO Class I milk price	$/cwt	17.19	20.24	_____(____)
Coop Class I milk price	$/cwt	18.74	21.85	_____(____)
Premium	$/cwt	_____	_____	_____(____)
Premium	percent of Coop price	_____	_____	_____(____)
Hartford, CT				
FMMO Class I milk price	$/cwt	17.09	20.14	3.05 (17.8)
Coop Class I milk price	$/cwt	18.64	21.75	3.11 (16.7)
Premium	$/cwt	1.55	1.61	0.06 (3.9)
Premium	percent of Coop price	8.57	7.48	-1.09 (-12.7)
Philadelphia, PA				
FMMO Class I milk price	$/cwt	16.99	20.04	_____(____)
Coop Class I milk price	$/cwt	19.19	23.13	_____(____)
Premium	$/cwt	____	____	_____(____)
Premium	percent of Coop price	_____	____	_____(____)
Baltimore, MD				
FMMO Class I milk price	$/cwt	16.94	19.99	3.05 (18.00)
Coop Class I milk price	$/cwt	18.71	21.66	2.95 (15.8)
Premium	$/cwt	1.78	1.67	-0.11 (-6.2)
Premium	percent of Coop price	9.79	7.81	-1.98 (-20.2)
Washington, D.C.				
FMMO Class I milk price	$/cwt	16.94	19.99	3.05 (18.0)
Coop Class I milk price	$/cwt	18.71	21.66	2.95 (15.8)
Premium	$/cwt	1.78	1.67	-0.11 (-6.2)
Premium	percent of Coop price	9.79	7.81	-1.98 (-20.2)

Data source for prices: USDA AMS (2020).
Note: Students have to perform relevant calculations to record their answers in cells with missing answers (Discussion Question 4.2).

5.3.1 Southeast Region: FO5 and FO7 Selected Markets (Table 6) [43]

In the pre-antitrust action period, the monthly average cooperative Class I milk prices are $1.56 per gallon in Louisville, $1.65 per gallon in Atlanta, and $1.67 per gallon in New Orleans. The monthly average retail whole milk prices are $2.88 per gallon in Louisville, $3.35 per gallon in Atlanta, and $3.78 per gallon in New Orleans. The monthly average farm-to-retail margins are $1.31 per gallon in Louisville, $1.70 per gallon in Atlanta, and $2.11 per gallon in New Orleans. The monthly average farm-to-retail margins measured as a percentage of retail prices are approximately 46 percent in Louisville, 51 percent in Atlanta, and 56 percent in New Orleans.

The following changes take place in the antitrust action period, as compared with the pre-antitrust action period. The monthly average cooperative Class I milk prices and the monthly average retail fluid

[43] The monthly prices and farm-to-retail margin for Atlanta, Georgia, are plotted in Figure A2.4. The teaching note includes figures plotting these prices and margin for other geographic locations.

Table 6. U.S. Southeast Region: Announced Cooperative Class I Milk Prices, Retail Fluid Whole Milk Prices, and Farm-to-Retail Margins in Selected Markets (2001 to 2012)

City/Price/Margin	Units	Pre-antitrust action period 01/2001 to 07/2008 Average	Antitrust action period 08/2008 to 12/2012 Average	Change in the Average between the two periods (percentage change)
Atlanta, GA				
Coop Class I milk price	$/gallon	1.65	1.98	0.33 (20.1)
Retail price	$/gallon	3.35	3.42	0.08 (2.3)
Farm-to-retail margin	$/gallon	1.70	1.44	-0.25 (-15.0)
Farm-to-retail margin	percent of retail price	50.92	41.70	-9.22 (-18.1)
Louisville, KY				
Coop Class I milk price	$/gallon	1.56	1.84	0.27 (17.6)
Retail price	$/gallon	2.88	3.06	0.19 (6.5)
Farm-to-retail margin	$/gallon	1.31	1.23	-0.09 (-6.6)
Farm-to-retail margin	percent of retail price	45.96	39.72	-6.24 (-13.6)
New Orleans, LA				
Coop Class I milk price	$/gallon	1.67	1.95	_____(____)
Retail price	$/gallon	3.78	4.33	_____(____)
Farm-to-retail margin	$/gallon	_____	____	_____(____)
Farm-to-retail margin	percent of retail price	_____	____	_____(____)

Data source for prices: USDA AMS (2020).
Note: Students have to perform relevant calculations to record their answers in cells with missing answers (Discussion Question 4.3).

whole milk prices increase in all analyzed cities. The rate of the Class I milk price increase is much higher than the rate of the retail price increase in Atlanta and Louisville. The monthly average farm-to-retail margin measured in $ per gallon decreases in Atlanta and Louisville and increases in New Orleans. The monthly average farm-to-retail margin measured as a percentage of the retail price decreases in all analyzed cities.

In the antitrust action period, the monthly average retail whole milk prices are $3.06 per gallon in Louisville, $3.42 per gallon in Atlanta, and $4.33 per gallon in New Orleans. The monthly average farm-to-retail margins are $1.23 per gallon in Louisville, $1.44 per gallon in Atlanta, and $2.38 per gallon in New Orleans. The monthly average farm-to-retail margins calculated as a percentage of retail prices are approximately 40 percent in Louisville, 42 percent in Atlanta, and 55 percent in New Orleans.

5.3.2 Northeast Region: FO1 Selected Markets (Table 7)[44]

In the pre-antitrust action period, the monthly average cooperative Class I milk prices are $1.60 per gallon in Hartford, $1.61 per gallon in Boston, and $1.65 per gallon in Philadelphia. The monthly average retail fluid whole milk prices are $3.29 per gallon in Boston, $3.30 per gallon in Philadelphia, and $3.38 per gallon in Hartford. The monthly average farm-to-retail margins are $1.65 per gallon in Philadelphia, $1.68 per gallon in Boston, and $1.78 per gallon in Hartford. The monthly average farm-to-retail margins measured as a percentage of retail prices are approximately 50 percent in Philadelphia, 51 percent in Boston, and 53 percent in Hartford.

[44] The monthly prices and farm-to-retail margin for Boston, Massachusetts, are plotted in Figure A2.5. Additional figures plotting these prices and margin for other geographic locations are included in the teaching note.

Table 7. U.S. Northeast Region: Announced Cooperative Class I Milk Prices, Retail Fluid Whole Milk Prices, and Farm-to-Retail Margins in Selected Markets (2002 to 2012)

City/Price/Margin	Units	Pre-antitrust action period 01/2002 to 09/2009 Average	Antitrust action period 10/2009 to 12/2012 Average	Change in the Average between the two periods (percentage change)
Philadelphia, PA				
Coop Class I milk price	$/gallon	1.65	1.99	0.34 (20.5)
Retail price	$/gallon	3.30	3.95	0.65 (19.7)
Farm-to-retail margin	$/gallon	1.65	1.96	0.31 (18.9)
Farm-to-retail margin	percent of retail price	50.92	49.72	-0.57 (-1.1)
Hartford, CT				
Coop Class I milk price	$/gallon	1.60	1.87	0.27 (16.7)
Retail price	$/gallon	3.38	3.67	0.28 (8.4)
Farm-to-retail margin	$/gallon	1.78	1.79	0.02 (1.0)
Farm-to-retail margin	percent of retail price	52.81	49.04	-3.78 (-7.1)
Boston, MA				
Coop Class I milk price	$/gallon	1.61	1.88	_____(____)
Retail price	$/gallon	3.29	3.63	_____(____)
Farm-to-retail margin	$/gallon	_____	____	_____(____)
Farm-to-retail margin	percent of retail price	_____	____	_____(____)

Data source for prices: USDA AMS (2020).
Note: Students have to perform relevant calculations to record their answers in cells with missing answers (Discussion Question 4.3).

The following changes take place in the antitrust action period, as compared with the pre-antitrust action period. The monthly average cooperative Class I milk prices and the monthly average retail whole milk prices increase in all analyzed cities. The rate of the Class I milk price increase is higher than the rate of the retail price increase in Boston and Hartford. Both the monthly average Class I milk price and the monthly average retail price increase by approximately the same rate in Philadelphia.[45] The monthly average farm-to-retail margin measured in $ per gallon increases in all analyzed cities. However, the monthly average farm-to-retail margin measured as a percentage of the retail price decreases in all analyzed cities.

In the antitrust action period, the monthly average retail fluid whole milk prices are $3.63 per gallon in Boston, $3.67 per gallon in Hartford, and $3.95 per gallon in Philadelphia. The monthly average farm-to-retail margins are $1.75 per gallon in Boston, $1.79 per gallon in Hartford, and $1.96 per gallon in Philadelphia. The monthly average farm-to-retail margins calculated as a percentage of retail prices are approximately 48 percent in Boston, 49 percent in Hartford, and 50 percent in Philadelphia.

[45] A somewhat different pattern of milk price behavior in Pennsylvania is due to the effect of the state's milk price control regulation, which affects both the wholesale and retail prices of fluid milk products in Pennsylvania (Novakovic and Washburn 2008; Bolotova and Novakovic 2016). Although FMMOs affect farm-level milk pricing, some states have milk price control regulations affecting retail fluid milk prices (New York) or wholesale and retail fluid milk prices (Pennsylvania) (Bolotova and Novakovic 2012).

5.4 Market and Price Analysis in the Fluid Milk Industry in the Eastern United States: Summary

During the analyzed period (2000 to 2018), the total milk quantity produced tended to decrease in the Southeast (FO5 and FO7) and to increase in the Northeast (FO1). The Class I milk quantity produced tended to decrease in both regions. During the antitrust action period, the Class I milk utilization rate increased in FO7 (Southeast), it practically did not change in FO5 (Appalachian), and it decreased in FO1 (Northeast). Class I milk prices and uniform prices increased over time.

The over-order premiums measured as a percentage of the cooperative Class I milk prices increased in the Southeast region and decreased in the Northeast region (except Philadelphia) in the antitrust action period, as compared with the pre-antitrust action period. In the antitrust action period, the over-order premiums were approximately 15 percent of the cooperative Class I milk prices in the Southeast markets. During the same period the over-order premiums were approximately 8 percent of the cooperative Class I milk prices in the Northeast markets (except Philadelphia). Finally, the number of milk producers (dairy farmers) decreased over time in the analyzed regions.

The rates of Class I milk price increases were higher than the rates of retail fluid whole milk price increases between the pre-antitrust action and antitrust action periods in the majority of the analyzed cities in both the Southeast and Northeast regions. Farm-to-retail margins measured as a percentage of the retail fluid whole milk prices decreased in the antitrust action period in all analyzed cities. The magnitude of the margin decrease was higher in the Southeast markets than in the Northeast markets. In the antitrust action period, farm-to-retail margins were approximately 40 percent of the retail fluid whole milk prices in Atlanta and Louisville (Southeast). Farm-to-retail margins were approximately 50 percent of the retail fluid whole milk prices in Philadelphia, Boston, and Hartford (Northeast).

6 Discussion Questions

The teaching note provides additional guidance for selected discussion questions and suggested answers to all discussion questions.

Set #1 The fluid milk industry structure, structural changes, and competition issues

1.1. Discuss the structural changes that took place in the fluid milk industry in the United States and Eastern United States at the end of the last century and at the beginning of this century. Discuss the largest fluid milk processors, their size, and their market shares as well as the number of fluid milk processing plants they operated. Discuss the number of dairy farmers producing milk in the Southeast and Northeast regions.

1.2. Explain the meaning of the four-firms concentration ratios reported for different stages of the fluid milk supply chain in the United States and Eastern United States. Do these ratios indicate that different participants in the fluid milk industry might exercise market power? Use Figure A2.1 to define market structures in the fluid milk supply chain.

1.3. Discuss the elements of business conduct of Dean Foods and Dairy Farmers of America (DFA) that raised the competition concerns of dairy farmers in the antitrust lawsuits filed in the U.S. Southeast and Northeast regions.

1.4. What is the main difference in the business objectives of Dean Foods (an investor-owned firm) and DFA (a cooperative of dairy farmers)? Explain a competition issue raised by dairy farmers that was related to DFA not performing its main business objective.

1.5. Were the competition concerns raised by dairy farmers during the antitrust litigations related primarily to the buyer market power or the seller market power of fluid milk processors?

Set #2 The theoretical framework explaining buyer and seller market power in the fluid milk processing industry

2.1. Show on a graph two market scenarios for the fluid milk industry explained in this case study: a competitive industry scenario and a market power scenario (show relevant curves, quantities, prices, and marketing margins). The latter scenario should incorporate fluid milk processors' buyer market power in the input (raw milk) market and seller market power in the output (fluid milk products) market. Discuss the effects of fluid milk processors' market power on dairy farmers, retailers, and final consumers (discuss changes in relevant quantities, prices, and marketing margins).

2.2. Dean Foods filed for bankruptcy in fall 2019. DFA acquired most of Dean's assets in spring 2020. DFA is to become the country's largest buyer/marketer/supplier of raw milk used in fluid milk product manufacturing and largest seller of fluid milk products. Extend the graphical analysis presented in Figure 2 to show a new market scenario in which there is one (dominant) fluid milk processor in the industry. Use Figure A2.1 to define the types of market structures in this new market scenario.

Set #3 Data sources

Familiarize yourself with sources of data utilized in the empirical market and price analysis in this case study. Check webpages of the U.S. Department of Agriculture Agricultural Marketing Service Dairy Program Marketing Order Statistics to download selected documents and locate price and quantity data used in the case study. The teaching note provides additional guidance.

Set #4 Empirical market and price analysis in the fluid milk industry in the Eastern United States

4.1. Use data reported in Table 3 to conduct market and price analysis at the dairy farm level for Federal Order 7 "Southeast" (FO7), Federal Order 5 "Appalachian" (FO5), and Federal Order 1 "Northeast" (FO1) during the two periods of interest (the pre-antitrust action period and the antitrust action period). To conduct this analysis: (4.1.1) reproduce calculations of changes in the yearly averages (expressed in physical units and as percentage changes) for the number of milk producers, total milk producer quantity, and uniform price; (4.1.2) calculate changes in the yearly averages (expressed in physical units and as percentage changes) for the Class I milk producer quantity, Class I milk utilization rate, and Class I milk price; and (4.1.3) record your answers in Table 3 and describe the results of your analysis.

4.2. Use data reported in tables 4 and 5 to conduct a price analysis at the dairy farm level for the analyzed FMMOs during the two periods of interest (the pre-antitrust action period and the antitrust action period). To conduct this analysis: (4.2.1) reproduce calculations of the monthly average over-order premiums ("premiums") expressed in $ per hundredweight (cwt) and as a percentage of the cooperative Class I milk prices for the cities for which answers are provided in tables 4 and 5 and (4.2.2) calculate these premiums for the cities for which answers are not provided in these tables; (4.2.3) reproduce calculations of changes in the monthly averages for Class I milk prices and premiums (expressed in physical units and as percentage changes) for the cities for which answers are provided in the last columns of tables 4 and 5 and (4.2.4) calculate these changes for the cities for which answers are not provided in these tables; (4.2.5) record your answers in tables 4 and 5 and describe the results of your analysis.

4.3. Use data reported in tables 6 and 7 to analyze retail fluid whole milk prices and farm-to-retail margins during the two periods of interest (the pre-antitrust action period and the antitrust action period). To conduct this analysis: (4.3.1) reproduce calculations of the monthly average farm-to-retail

margins expressed in $ per gallon and as a percentage of retail prices for the cities for which answers are provided in tables 6 and 7 and (4.3.2) calculate these margins for the cities for which answers are not provided in these tables; (4.3.3) reproduce calculations of changes in the monthly averages for Class I milk prices, retail fluid whole milk prices, and farm-to-retail margins (expressed in physical units and as percentage changes) for the cities for which answers are provided in the last columns of tables 6 and 7 and (4.3.4) calculate these changes for the cities for which answers are not provided in these tables; (4.3.5) record your answers in tables 6 and 7 and describe the results of your analysis.

4.4. Compare the market and price analysis results (tables 3 through 7) for the Northeast region (FO1) and the Southeast region (FO5 and FO7). To complete this analysis, answer the following questions: (4.4.1) Do both regions exhibit similar patterns of changes in the analyzed economic variables during the antitrust action period, as compared with the pre-antitrust action period? (4.4.2) In which city(es)/region(s) and during which period(s) does the empirical evidence on market and price behavior tend to be consistent with a competitive industry scenario? Which economic variables would you use to arrive at your conclusions? (4.4.3) In which city(es)/region(s) and during which period(s) does the empirical evidence on market and price behavior tend to be consistent with a market power scenario? Which economic variables would you use to arrive at your conclusions?

Set #5 Legal issues

5.1. Discuss the reasons that dairy farmers filed class action antitrust lawsuits against DFA and Dean Foods.

5.2. Discuss the purpose of remedies included in the settlement agreements (monetary compensations paid to dairy farmers and some changes in the business conduct of DFA).

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Legal documents and relevant webpages

Southeast milk antitrust litigation

http://www.southeastdairyclass.com/index.htm

Sweetwater Valley Farm, Inc., et al v. Dean Foods Company et al. (corrected consolidated amended complaint filed on August 04, 2008): http://www.southeastdairyclass.com/PDFs/CorrectedConsolidatedAmendedComplaint.pdf

Dean Foods Company settlement notice (U.S. District Court for the Eastern District of Tennessee; February 14, 2012): http://www.southeastdairyclass.com/PDFs/FINAL percent20- percent20Notice percent20wAtty percent20chgs percent202-21-12.pdf

Settlement agreement between Dean Foods and dairy farmers in the Southeast: http://www.southeastdairyclass.com/PDFs/SettlementAgreement.pdf

Northeast milk antitrust litigation

Allen et al. v. Dairy Farmers of America, Inc. et al. (revised consolidated amended class action complaint and jury demand filed on April 13, 2011): https://www.courtlistener.com/recap/gov.uscourts.vtd.18481.286.0.pdf

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Appendix 1

Section 1 of the Sherman Act makes illegal agreements among competitors aiming to affect market prices, quantities, or both. These agreements are often referred to as cartels or price-fixing cartels or price-fixing conspiracies. Section 2 of the Sherman Act makes illegal conduct by a single firm and conspiracy by a group of firms aiming to attempt to monopolize or to monopolize the market, conduct that often affects market prices, quantities, or both. The Clayton Act (1914) allows private parties (individuals and firms) to recover treble damages and reasonable attorney fees for violations of the Sherman Act.

The Capper-Volstead Act (1922) is limited antitrust immunity for collective agricultural marketing activities of agricultural producers from the Sherman Act (assuming these activities are implemented through properly formed organizations). The Capper-Volstead Act immunity allows dairy cooperatives to negotiate with milk processors over-order premiums paid for milk and other terms of trade. According to the case law interpreting the Capper-Volstead Act, any attempt of a cooperative to engage in predatory (anticompetitive) conduct to attempt to monopolize or to monopolize the market or to combine (to conspire) with other entities (cooperatives and non-cooperatives) to attempt to monopolize or to monopolize the market is outside Capper-Volstead Act immunity (Frederick 1989).

Appendix 2

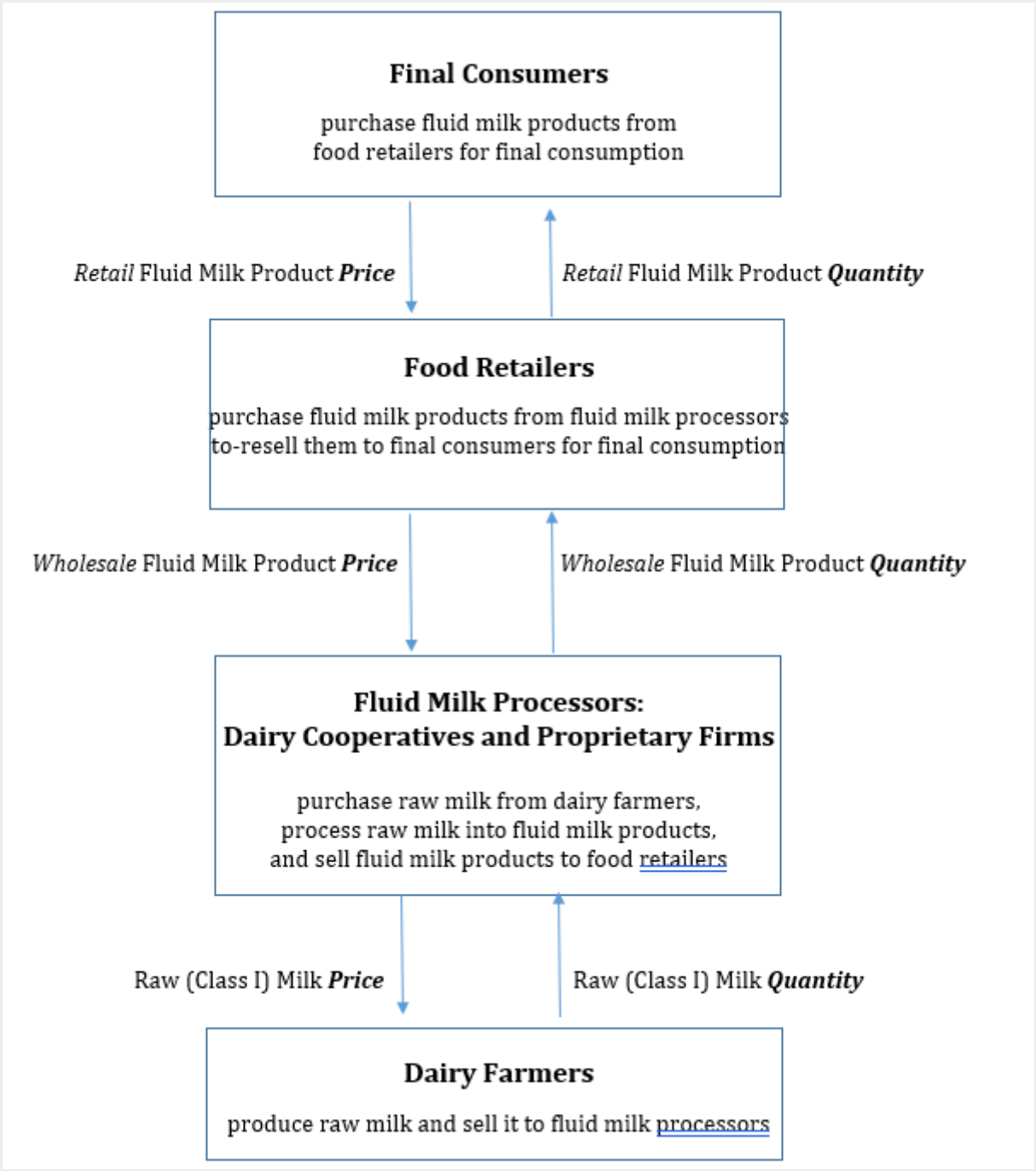

Figure A2.1. Fluid Milk Supply Chain Structure

Note: Dairy cooperatives do not "purchase" milk from dairy farmers. Dairy cooperatives process and market milk on behalf of dairy farmers.

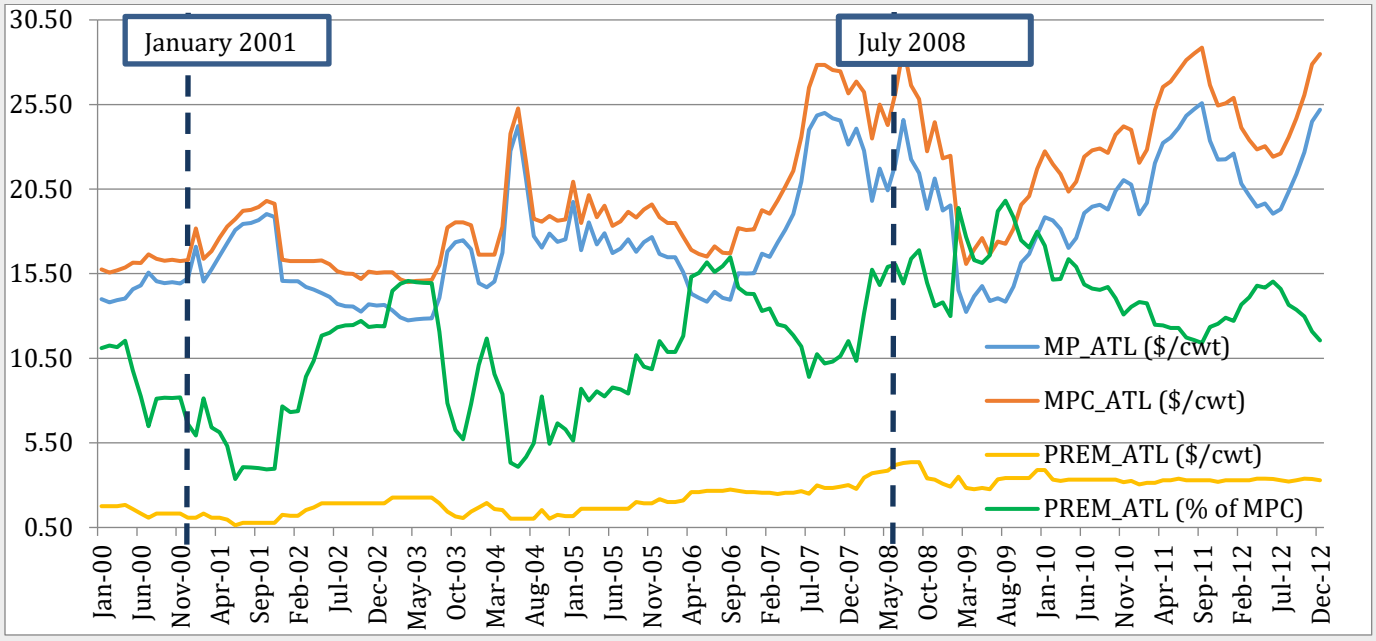

Figure A2.2. Atlanta, Georgia: FMMO Minimum Class I Milk Price (MP), Announced Cooperative Class I Milk Price (MPC), and Premium (PREM) (2000-2012).

Data source for prices: USDA AMS (2020). The premium is calculated by the author.
Note: The pre-antitrust action period is January 2001 to July 2008, and the antitrust action period is August 2008 to December 2012.

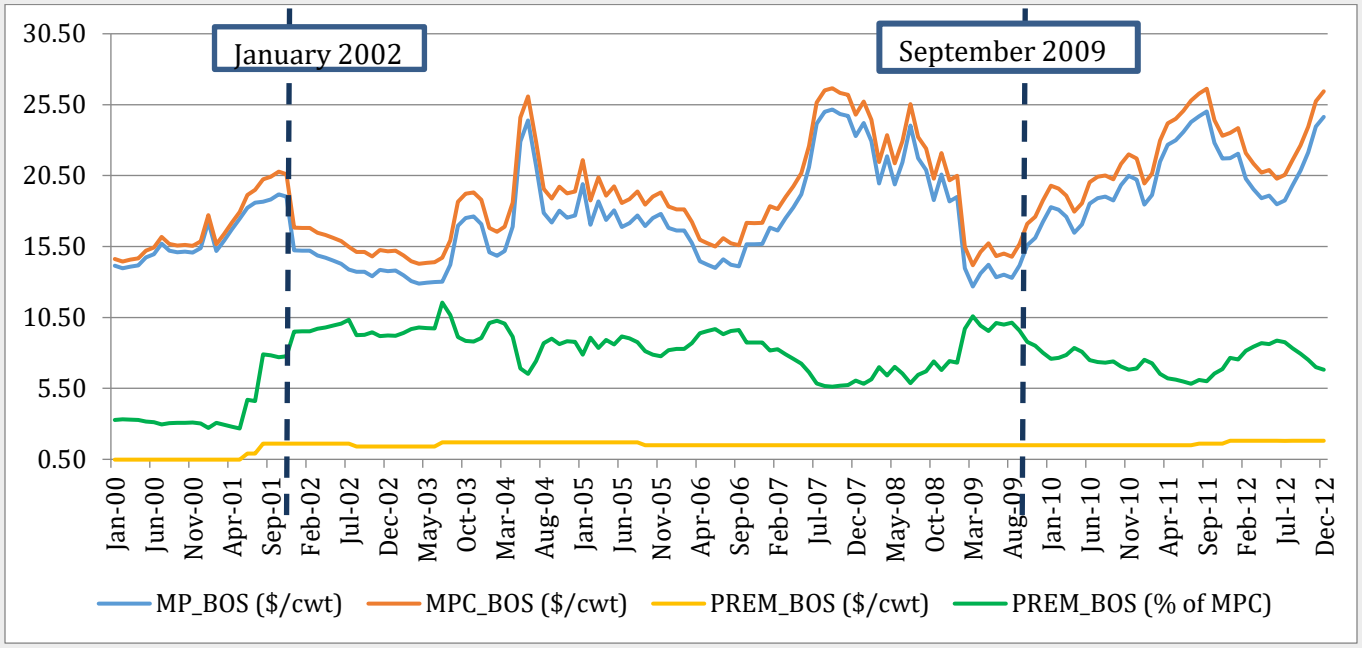

Figure A2.3. Boston, Massachusetts: FMMO Minimum Class I Milk Price (MP), Announced Cooperative Class I Milk Price (MPC), and Premium (PREM) (2000-2012).

Data source for prices: USDA AMS (2020). The premium is calculated by the author.
Note: The pre-antitrust action period is January 2002 to September 2009, and the antitrust action period is October 2009 to December 2012.

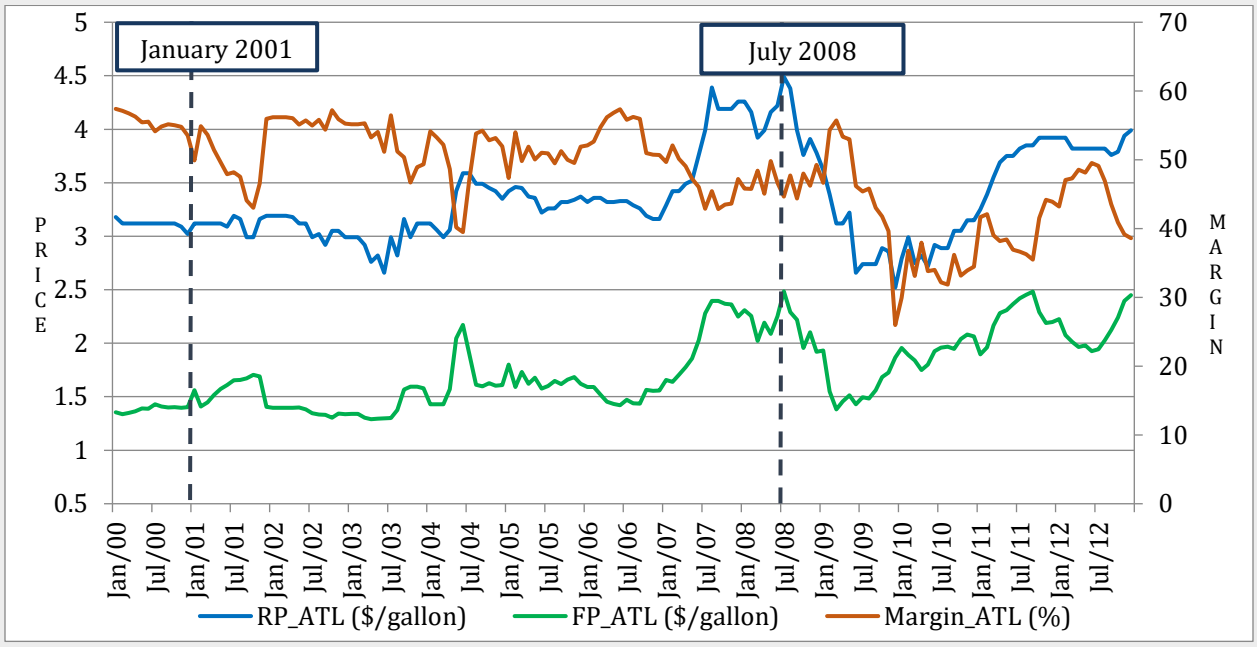

Figure A2.4. Atlanta, Georgia: Retail Fluid Whole Milk Price (RP), Announced Cooperative Class I Milk Price (FP), and Farm-to-Retail Margin (Margin) (2000-2012).

Data source for prices: USDA AMS (2020). The margin is calculated by the author.
Note: The pre-antitrust action period is January 2001 to July 2008, and the antitrust action period is August 2008 to December 2012.

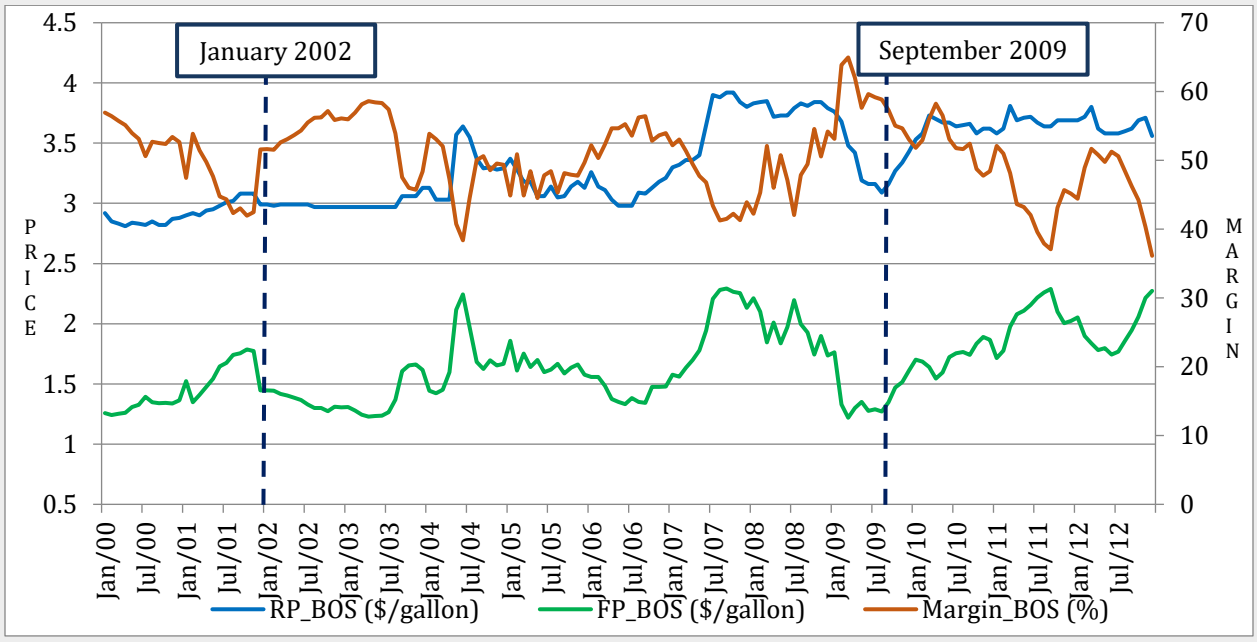

Figure A2.5. Boston, Massachusetts: Retail Fluid Whole Milk Price (RP), Announced Cooperative Class I Milk Price (FP), and Farm-to-Retail Margin (Margin) (2000-2012).

Data source for prices: USDA AMS (2020). The margin is calculated by the author.
Note: The pre-antitrust action period is January 2002 to September 2009, and the antitrust action period is October 2009 to December 2012.