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Market Power in the U.S. Dairy Industry

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*Invited Case Study Paper prepared for presentation
at the 2022 Agricultural & Applied Economics Association Annual Meeting,
Anaheim, CA; July 31-August 2*

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Abstract

The motivations for this case study are developments in the U.S. dairy industry involving implementation of a private supply management program by the National Milk Producers Federation and the Cooperatives Working Together (CWT). The CWT supply management program combined a herd retirement program (2003-2010) and an export assistance program (2003-present). The objective of CWT program is to balance milk supply and milk demand and to stabilize and strengthen milk prices received by dairy farmers. The herd retirement program raised legal issues leading to antitrust lawsuits filed by buyers of fluid milk, fresh milk products, cheese, and butter against dairy cooperatives, which resulted in large settlements. This case study introduces economic, business, and legal issues related to implementation of the herd retirement program. The case study presents a theoretical framework, which may explain conduct and performance of the U.S. dairy industry in the analyzed situation, as well as a basic market and price analysis based on publicly available data reported by the U.S. Department of Agriculture. The case study is suitable for a variety of undergraduate and graduate courses taught in agricultural economics and agribusiness programs, as well as extension and outreach audiences. A teaching note includes answers to discussion and multiple-choice questions.¹

Key words: Antitrust, Capper-Volstead Act, cooperatives, dairy industry, price-fixing, seller market power, supply management, Sherman Act.

JEL: L1, L2, L4, Q13.

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

1. Introduction

The motivations for this case study are developments in the U.S. dairy industry involving implementation of a private supply management program by the National Milk Producers Federation (NMPF) and the Cooperatives Working Together (CWT), which include dairy cooperatives and individual dairy farmers. The CWT supply management program combined a herd retirement program (2003-2010) and an export assistance program (2003-present). The objective of CWT program is to balance milk supply and milk demand and to stabilize and strengthen milk prices received by dairy farmers.

In 2011 buyers of fluid milk and other fresh milk products at the retail level (indirect buyers) and in 2015 buyers of raw milk, cheese, and butter at the wholesale level, who purchased these products directly from dairy cooperatives (direct buyers), filed class action antitrust lawsuits against NMPF, CWT, and a group of dairy cooperatives: Agri-Mark, Inc., Dairy Farmers of America, Inc., Dairylea Cooperative Inc., and Land O'Lakes. In their complaints filed in the court, the buyers alleged that by implementing the herd retirement program the cooperatives engaged in an unlawful conspiracy to limit the production of raw milk, with the purpose of eliminating competition by decreasing the number of dairy farmers, and to achieve short-run and long-run increases in the wholesale prices of raw farm milk, cheese, and butter, and in the retail prices of fluid milk and other fresh milk products (cottage cheese, cream cheese, cream, half-and-half, sour cream, and yogurt).²

The buyers argued that the herd retirement program was not within the scope of Capper-Volstead Act (1922) immunity and consequently violated Section 1 of the Sherman Act (1890) and the state antitrust and restraint of trade laws. The cooperatives settled the lawsuit with indirect

² Figure A1 presented in Appendix 1 depicts the dairy product supply chain.

buyers in 2016 for \$52 million (Hagens Berman 2018; Fresh Milk Products Antitrust Litigation 2022). The cooperatives settled the lawsuit with direct buyers of cheese and butter in 2019 for \$220 million (Fu 2019; Butter and Cheese Class Action 2022). In their settlement agreements, the cooperatives did not admit to any wrongdoing.

This case study introduces economic, business, and legal issues related to implementation of the herd retirement program. In particular, the case study presents a theoretical framework, which may explain conduct and performance of the U.S. dairy industry in the analyzed situation, as well as a basic market and price analysis based on publicly available data reported by the U.S. Department of Agriculture.

The case study is suitable for a variety of undergraduate and graduate courses taught in agricultural economics and agribusiness programs, including microeconomics, agricultural economics, managerial economics, agricultural marketing, agricultural markets and prices, farm management, supply chain management, and applied industrial organization. The case study is also suitable for extension and outreach audiences. Table 1 summarizes student learning objectives.

2. Cooperatives Working Together (CWT) Herd Retirement Program

The CWT supply management program is a private, industry-funded, and administered program (Siebert and Lyford 2009; Brown et al. 2010; CWT 2022). Originally, this program was the dairy industry's initiative to mitigate a number of economic forces adversely affecting the dairy farm profitability at the beginning of the 2000s: milk oversupply, increasing volatility of milk prices received by dairy farmers, increasing level and volatility of agricultural input prices (in particular, feed and energy prices), a substantial decrease in the Federal government milk price support, a

decrease in the Federal government intervention in purchasing manufactured dairy products, and increasing exposure to fluctuations taking place in international dairy markets.

The CWT program originally developed in 2003 included a herd retirement program (2003-2010) and an export assistance program (2003-present). There has not been any government participation or assistance involved. The participation of dairy farmers is on a voluntary basis. The participating dairy farmers have marketed on average 70 percent of the national milk supply. The CWT program has been funded by the assessments of participating dairy farmers. The assessment introduced in July 2003 was \$0.05 per hundredweight (cwt) of milk.³ It was increased to \$0.10 per cwt of milk in July 2006. Initially, approximately 90 percent of all funds were allocated to the herd retirement program.

The objective of the herd retirement program was to control milk supply by removing from production the entire milking herds of selected dairy farmers. The herd retirement program was implemented in the period of 2003-2010.⁴ During this period, CWT held ten herd retirement rounds. To decide on whether to conduct a herd retirement round, CWT used guidelines, which included an analysis of economic indicators such as all-milk price, milk production costs, milk-feed price ratio, and milk cow inventories. During each herd retirement round, the participating dairy farmers had to submit their bids on how much money they were willing to accept to slaughter their entire milking herds. The CWT selected the best bids, and dairy farmers with the accepted

³ One hundredweight (cwt) is equal to one hundred pounds.

⁴ A detailed discussion of this program is presented in the complaints filed by the buyers of raw milk and manufactured dairy products: *Edwards et al v. National Milk Producers Federation et al.* (2014) and *First Impressions Salon, Inc., et al. v. National Milk Producers Federation, et al.* (2015). The CWT program is also discussed in Siebert and Lyford (2009), Brown et al (2010), and newsletters available on the webpage of the Cooperatives Working Together (CWT 2022).

bids had to slaughter their milking herds during 15 days after the audit process of their production was completed. These were pre-mature herd retirements.

According to the complaint filed by the buyers of cheese and butter in the court,⁵ as a result of ten herd retirement rounds (2003-2010), 2,802 dairy farms retired their milking herds, 506,921 cows were removed from production, and milk supply was reduced by 9.672 billion pounds of milk. In addition, the effect of the herd retirement program on the U.S. milk price was \$0.05 per cwt in 2003, \$0.16 per cwt in 2004, \$0.44 per cwt in 2005, \$0.55 per cwt in 2006, \$0.62 per cwt in 2007, and \$0.57 per cwt in 2008.

Since 2011, the entire focus of CWT program shifted to export assistance. The objective of the export assistance program is to help dairy farmers expand foreign markets for manufactured dairy products by allocating subsidies to participating dairy cooperatives on export of selected products. In the period of 2003-2009, butter and cheese were the products subject to CWT export assistance. Beginning in 2010, the product list was expanded to include whole milk powder.

3. Theoretical Framework

Figure 1 depicts a wholesale demand curve for raw milk, a wholesale demand curve for manufactured dairy products, and a retail demand curve for manufactured dairy products. These demand curves represent inverse demand functions.⁶ Figure 1 also depicts price-quantity combinations for raw milk and manufactured dairy products (fluid milk, cheese, butter, etc.) for two market scenarios: a competitive industry scenario representing the market situation prior to the herd retirement program (Q_c , FP_c , WP_c , and RP_c), and a scenario where the dairy industry exercises seller market power by implementing the herd retirement program (Q_m , FP_m , WP_m ,

⁵ *First Impressions Salon, Inc., et al. v. National Milk Producers Federation, et al.* (2015).

⁶ Inverse demand function is a price-dependent demand function: price is a function of quantity.

and RP_m). Raw milk is the main input used to produce manufactured dairy products.⁷ This is the reason the same Q is used to define the raw milk quantity and the quantity of manufactured dairy products in Figure 1.

A decrease in milk cow inventory due to the herd retirement program causes the raw milk quantity and consequently the quantity of manufactured dairy products at the wholesale and retail levels to decrease from Q_c to Q_m . As a result, the raw milk price received by dairy farmers increases from FP_c to FP_m , and the wholesale price of manufactured dairy products charged by manufacturers of these products (dairy cooperatives and proprietary firms) increases from WP_c to WP_m . The retail price of manufactured dairy products charged by food retailers increases from RP_c to RP_m . In the market power scenario, buyers of raw milk and manufactured dairy products pay higher prices and are overcharged.

The overcharge attributed to direct buyers of raw milk is $FP_m - FP_c$ in \$ per pound of raw milk, and the total \$ overcharge is $(FP_m - FP_c) * Q_m$, which is the “Overcharge-1” rectangle in Figure 1. The overcharge attributed to direct buyers of manufactured dairy products is $WP_m - WP_c$ in \$ per pound of these products, and the total \$ overcharge is $(WP_m - WP_c) * Q_m$, which is the “Overcharge-2” rectangle in Figure 1. The overcharge attributed to indirect buyers who purchased manufactured dairy products at the retail level is $RP_m - RP_c$ in \$ per pound, and the total \$ overcharge is $(RP_m - RP_c) * Q_m$, which is the “Overcharge-3” rectangle in Figure 1. The total overcharge is the basis for damages that direct buyers of raw milk and manufactured dairy products

⁷ For example, in manufacturing fluid (beverage) milk products one unit (gallon) of raw milk is required to produce one unit (gallon) of fluid milk. In cheese manufacturing, ten units (pounds) of raw milk are typically required to produce one unit (pound) of cheese.

(cheese and butter) at the wholesale level and indirect buyers of fluid milk and other fresh milk products at the retail level aimed to recover during the antitrust litigations.⁸

4. Empirical Market and Price Analysis in the U.S. Dairy Industry

This section presents a basic market and price analysis in the U.S. dairy industry during the three periods of interest: the period of the herd retirement program (HR period) and two more competitive periods: prior and after the herd retirement program (pre-HR period and post-HR period, respectively). The purpose of this analysis is to evaluate market and price behavior at the dairy farm, wholesale, and retail levels of the dairy product supply chain during the three periods of interest to assess possible effects of the herd retirement program.⁹

The yearly data on milk cow inventory, milk production per cow, total milk quantity produced (total milk production), and milk prices received by dairy farmers are collected from the U.S. Department of Agriculture National Agricultural Statistics Service (USDA NASS 2022). Figure 2 depicts the U.S. yearly milk production and prices for the three analyzed periods. The monthly wholesale prices of cheddar cheese and butter are collected from the U.S. Department of Agriculture Agricultural Marketing Service (USDA AMS 2022).¹⁰ The monthly retail prices of

⁸ Under the Clayton Act (1914), buyers who purchased raw milk and manufactured dairy products directly from dairy cooperatives (direct buyers) aimed to recover treble damages (three times the overcharge) for violations of the Sherman Act. As a result of the antitrust litigation involving direct buyers, only direct buyers of cheese and butter were awarded damages. Buyers who purchased fluid milk and other fresh milk products at the retail level were entitled to recover damages in the states where antitrust and restraint of trade laws allowing to recover these damages existed.

⁹ The market and price behavior in the HR period (2003-2010) reflects the effects of the herd retirement program and to a smaller extent the effects of the export assistance program. Most of the funds were allocated to the herd retirement program in this period. The market and price behavior in the post-HR period (2011-2014) may reflect the delayed effects of the herd retirement program and the effects of the export assistance program.

¹⁰ Milk prices that dairy farmers receive in the U.S. are determined within the system of Federal and State Milk Marketing Orders. Milk prices are calculated on a monthly basis using a series of price formulas, which include wholesale prices of manufactured dairy products (cheddar cheese,

fluid whole milk are collected from the U.S. Bureau of Labor Statistics (U.S. BLS 2022). Figure 3 depicts the U.S. monthly wholesale prices of cheddar cheese and butter and retail fluid whole milk prices for the three analyzed periods.

The averages and coefficients of variation¹¹ are calculated for the analyzed economic variables for the three periods of interest. The changes in the averages and the coefficients of variation among the three periods are also calculated.¹²

4.1. Dairy Farm Level of the Dairy Product Supply Chain

Table 2 presents yearly averages and coefficients of variation (CV) for milk cow inventory, milk production, and milk price for the three analyzed periods, as well as changes in the averages and CVs among the three periods.¹³ In the pre-HR period, the yearly average milk cow inventory is 9.25 million cows, the yearly average milk production per cow is 17,453 pounds, the yearly average total milk production is 161 billion pounds, and the yearly average milk price received by dairy farmers is \$13.79 per cwt.

In the HR period, the yearly average milk cow inventory decreases to 9.13 million cows (a decrease by _____ percent relative to the pre-HR period), and the yearly average milk production per cow increases to 19,934 pounds (an increase by _____percent relative to the pre-HR period).

butter, nonfat dry milk, and dry whey). Appendix 2 provides a brief description of the Federal Milk Marketing Orders pricing system.

¹¹ Coefficient of variation is chosen to measure the volatility of the analyzed variables in this case study. Although other measures of volatility are available, for example, standard deviation and variance, an advantage of the coefficient of variation is that it measures the standard deviation relative to the mean of the analyzed variable. The coefficient of variation can also be expressed in a percentage form.

¹² The teaching note includes an Excel file with all data and calculations.

¹³ Students should calculate percentage changes in the analyzed economic variables among the analyzed periods, record them in Table 2 and in the text of the case study (Discussion Question 5.1).

As a result, the yearly average total milk production increases to 182.2 billion pounds (an increase by _____percent relative to the pre-HR period). The yearly average milk price increases to \$15.47 per cwt (an increase by _____percent relative to the pre-HR period). The volatility of milk cow inventory and milk production per cow decreases, and the volatility of total milk production and milk price increases in the HR period, as compared with the pre-HR period.

In the post-HR period, as compared with the HR period, the yearly average cow inventory increases to 9.2 million cows (an increase by _____percent relative to the HR period), and the yearly average milk production per cow increases to 21,783 pounds (an increase by _____percent relative to the HR period). As a result, the yearly average total milk production increases to 201 billion pounds (an increase by _____percent relative to the HR period). The yearly average milk price increases to \$20.75 per cwt (an increase by _____percent relative to the HR period). The volatility of all analyzed economic variables decreases in the post-HR period, as compared with the HR period.

The following changes in the analyzed economic variables might reflect the current and delayed effects of the herd retirement program. First, the yearly average milk cow inventory and the volatility of milk cow inventory decreased in the HR and post-HR periods, as compared with the pre-HR period. Second, the volatility of total milk production (“supply volatility”) decreased in the post-HR period, as compared with the pre-HR and HR periods. Third, the yearly average milk price received by dairy farmers increased in the HR and post-HR period, as compared with the pre-HR period.

Because the yearly average milk production per cow increased over time, the yearly average total milk quantity produced increased as well. In addition, given the fact that the non-participating in the CWT program dairy farmers marketed about 30 percent of the national milk

supply, some of these dairy farmers might have expanded their milking herds, thus contributing to the increases in total milk production in the analyzed periods. The latter likely decreased the effectiveness of the herd retirement program. In summary, the herd retirement program decreased the growth rate in the total milk production, which might have contributed to the increases in milk prices received by dairy farmers.

4.2. Wholesale and Retail Levels of the Dairy Product Supply Chain

Table 3 presents monthly averages and coefficients of variation (CV) for wholesale prices of cheese and butter and retail price of fluid whole milk for the three analyzed periods, as well as changes in the averages and CVs among the three periods.¹⁴

In the pre-HR period, the monthly average wholesale prices of cheddar cheese and butter are \$1.23 per pound and \$1.26 per pound, respectively, and the monthly average retail price of fluid whole milk is \$2.79 per gallon. In the HR period, as compared with the pre-HR period, the monthly average wholesale prices of cheddar cheese and butter increase to \$1.54 per pound and \$1.45 per pound, respectively, and the monthly average retail price of fluid whole milk increases to \$3.27 per gallon. The monthly average wholesale prices of cheddar cheese and butter and the monthly average retail price of fluid whole milk increase by ____percent, ____percent, and ____percent, respectively. The volatility of the wholesale cheddar cheese price and retail fluid whole milk price increases and the volatility of the wholesale butter price decreases in the HR period, as compared with the pre-HR period.

In the post-HR period, as compared with the HR period, the monthly average wholesale prices of cheddar cheese and butter increase to \$1.86 per pound and \$1.81 per pound, respectively,

¹⁴ Students should calculate percentage changes in the analyzed economic variables among the analyzed periods, record them in Table 3 and in the text of the case study (Discussion Question 5.2).

and the monthly average retail price of fluid whole milk increases to \$3.55 per gallon. The monthly average wholesale prices of cheddar cheese and butter and the monthly average retail price of fluid whole milk increase by ____percent, ____percent, and ____percent, respectively. The volatility of all analyzed prices decreases in the HR period, as compared with the pre-HR period.

The price increases of the analyzed manufactured dairy products at the wholesale and retail levels of the dairy product supply chain in the HR and post-HR periods are likely to reflect some of the effects of the herd retirement program. A decrease in raw milk supply due to the herd retirements and consequently a decrease in raw milk quantity available to manufacture dairy products would increase prices of raw milk and consequently wholesale and retail prices of dairy products manufactured from raw milk (Figure 1).

5. Legal Issues: Herd Retirement Program and Antitrust

Dairy cooperatives presumed that their herd retirement program was within the scope of the Capper-Volstead Act immunity. Section 1 of the Capper-Volstead Act provides a limited antitrust immunity for collective agricultural marketing activities to the Sherman Act. Section 1 of the Capper-Volstead Act declares:

“Persons engaged in the production of agricultural products as farmers, planters, ranchmen, dairymen, nut or fruit growers may act together in associations, corporate or otherwise, with or without capital stock, in collectively processing, preparing for market, handling, and marketing in interstate and foreign commerce, such products of persons so engaged. Such associations may have marketing agencies in common; and such associations and their members may make the necessary contracts and agreements to effect such purposes: Provided, however, That such associations are operated for the mutual benefit of the members thereof...”

Absent the Capper-Volstead Act, collective agricultural marketing activities would have violated Section 1 of the Sherman Act, which declares illegal contracts, conspiracies, and combinations in restraint of trade in interstate commerce. Price-fixing and output limitation agreements among competitors (firms producing and selling the same or similar products) are examples of the most common restraints of trade violating Section 1 of the Sherman Act.

In 2011 buyers of fluid milk and other fresh milk products at the retail level (indirect buyers) and in 2015 buyers of raw milk, cheese, and butter at the wholesale level, who purchased these products directly from dairy cooperatives (direct buyers), filed class action antitrust lawsuits against the National Milk Producers Federation, Cooperatives Working Together, and a group of dairy cooperatives. These buyers alleged that CWT herd retirement program was not within the scope of the Capper-Volstead Act immunity and that it violated Section 1 of the Sherman Act. The buyers argued that the herd retirement program was not a form of collective agricultural “*marketing*” mentioned in Section 1 of the Capper-Volstead Act. The lawsuits were settled, as it was discussed in the introduction of this case study.

The organizations of agricultural producers in the potato, egg, and mushroom industries in the United States also implemented agricultural supply management programs affecting the quantities of agricultural products produced and faced similar antitrust lawsuits (Bolotova 2014, 2016; Peck 2015). Apparently, there was a very limited case law interpreting the legal status of agricultural supply management programs in light of Section 1 of the Capper-Volstead Act.

Recent legal decisions and discussions establish that the types of agricultural supply management programs - whether they are implemented at the pre-agricultural production stage, agricultural production stage, or post-agricultural production stage - affect their legal status in light of the Capper-Volstead Act (Frackman and O’Rourke 2011; Hibner 2011; Bolotova 2015; Peck

2015). It is crucial whether collective agricultural marketing activities (programs) in question can be interpreted as “marketing” under Section 1 of the Capper-Volstead Act.

Collective agricultural supply management activities implemented at the post-agricultural production stage are more likely to be interpreted as “marketing” and therefore are likely to be within the scope of Capper-Volstead Act immunity. Collective agricultural supply management activities implemented at the pre-agricultural production and agricultural production stages are not likely to be interpreted as “marketing” and therefore are outside the scope of Capper-Volstead Act immunity. The herd retirement program is an example. The courts interpret legal status of collective agricultural marketing activities on a case-by-case basis.

6. Discussion Questions

The teaching note provides additional guidance for responding to selected discussion questions and suggested answers to all discussion questions. In addition, the teaching note includes multiple-choice questions, which can be used as in-class assignments, quizzes, and exam questions.

1. Discuss economic forces leading to the idea of a private supply management program in the U.S. dairy industry.

2. Explain objectives of the private supply management program and the role of dairy cooperatives in developing and implementing this program. Discuss the design of the herd retirement program and the procedure of its implementation.

3. Using a graphical analysis, describe a theoretical framework, which explains conduct and performance of the dairy industry in two market scenarios: a competitive industry scenario and a market power scenario where the dairy industry implements the herd retirement program. Show on a graph relevant curves and price-quantity combinations for these two market scenarios.

Identify changes in quantities and prices as the industry moves from a competitive industry scenario to a market power scenario.

4. Familiarize yourself with the U.S. Department of Agriculture and U.S. Bureau of Labor Statistics databases used to collect economic variables for the analysis presented in this case study. Use the U.S. Department of Agriculture National Agricultural Statistics Service Quick Stats database to download economic variables reported in Table 2: milk cow inventory, milk production per cow, total milk quantity produced, and milk price for the period of 1995-2014.

5. Perform a basic market and price analysis in the U.S. dairy industry.

5.1. Evaluate changes in yearly milk cow inventory, milk production per cow, total milk production, and milk price and their volatility in this case study's three periods of interest: prior, during, and after the herd retirement program. Use data reported in Table 2 to complete this analysis.

5.1.1. Calculate percentage changes in yearly averages and coefficients of variation among the analyzed periods for all economic variables reported in Table 2.

5.1.2. Describe the results of your analysis. Explain which patterns of changes in the analyzed economic variables are consistent with effective implementation of the herd retirement program.

5.2. Evaluate changes in monthly wholesale prices of cheddar cheese and butter and retail prices of fluid whole milk, and in their volatility in the three periods of interest. Use data reported in Table 3 to complete this analysis.

5.2.1. Calculate percentage changes in monthly averages and coefficients of variation among the analyzed periods for the economic variables presented in Table 3.

5.2.2. Explain which patterns of changes in the analyzed prices of manufactured dairy products are consistent with effective implementation of the herd retirement program.

6. Explain why buyers of raw milk and manufactured dairy products (cheese, butter, fluid milk and other fresh milk products) at the wholesale and retail levels of the dairy product supply chain filed antitrust lawsuits against a group of dairy cooperatives involved in implementation of the herd retirement program. Explain the outcomes of the two antitrust litigations mentioned in the case study. Discuss the role of the Capper-Volstead Act in regulating collective agricultural marketing activities of dairy cooperatives in the industry setting discussed in this case study.

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Court documents and relevant webpages

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Fresh Milk Products Antitrust Litigation. 2022. <https://www.boughtmilk.com/>

Edwards et al v. National Milk Producers Federation et al. Case No: 3:11-cv-04766. 2014. Third amended consolidated class action complaint filed by indirect buyers. <https://www.boughtmilk.com/wp-content/uploads/2021/04/12586815-0-7435518-0-C.Operativ.pdf>

First Impressions Salon, Inc., et al. v. National Milk Producers Federation, et al., Case No. 3:13-CV-00454-NJR-GCS. 2015. Third amended consolidated class action complaint filed by direct buyers. <https://www.butterandcheeseaction.com/Content/Documents/Complaint.pdf>

Appendix 1

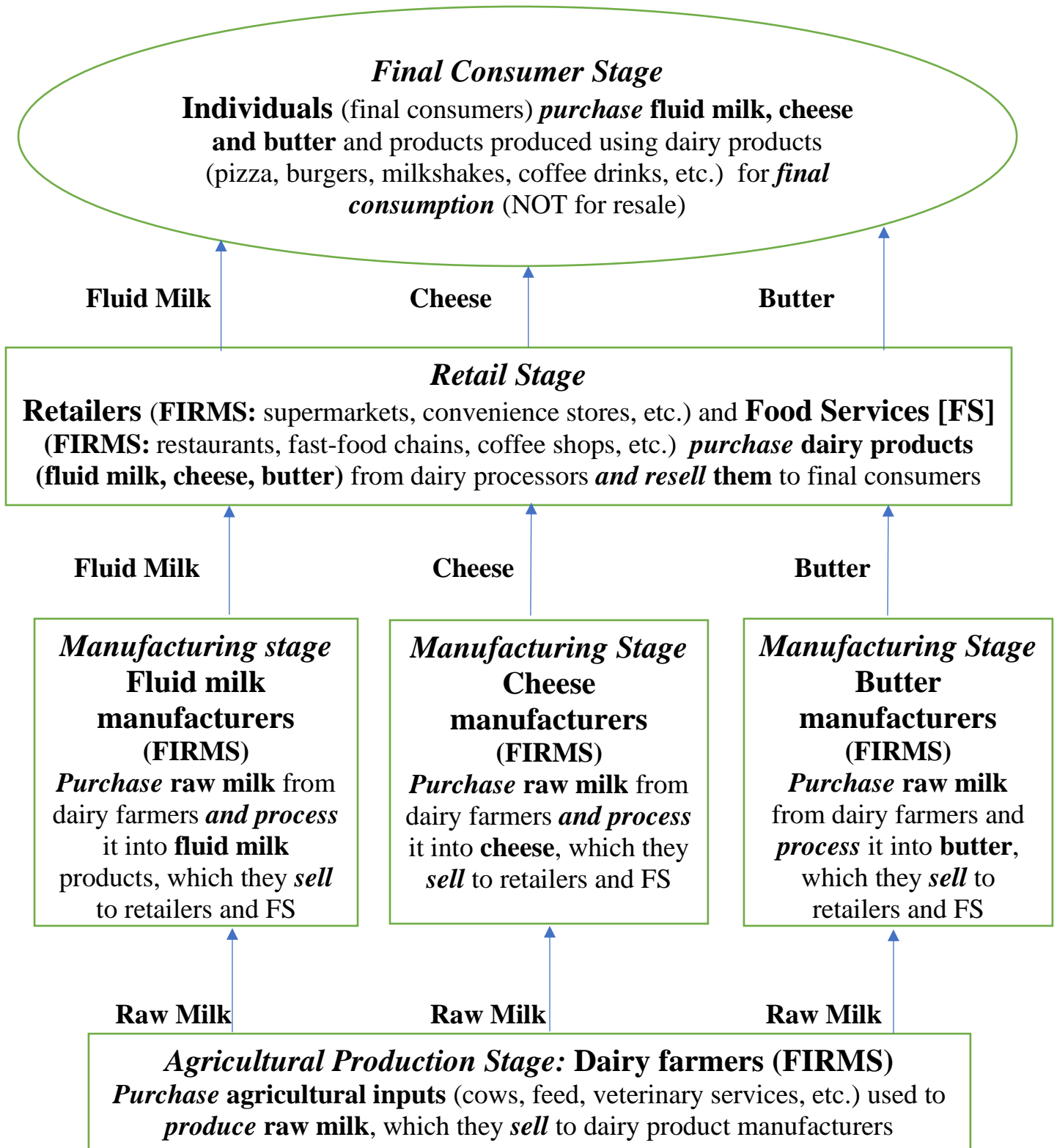


Figure A1. Dairy Product Supply Chain.

Note: Dairy product manufactures include dairy cooperatives and proprietary firms.

Appendix 2

Milk Pricing System within the Federal Milk Marketing Orders

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. FMMOs are geographically defined areas based on the demand for fluid milk products.¹⁵ Currently there are 11 FMMOs, which regulate the marketing of approximately 75 percent of total milk production. 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). Practically all milk produced in the United States is Grade A milk.

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

¹⁵ A comprehensive discussion of Federal Milk Marketing Orders is presented in CRS (2017) and USDA AMS (2019).

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, volume, and milk assembling services provided by dairy cooperatives. Class milk prices and uniform prices are calculated and announced on a monthly basis.

Table 1. Student Learning Objectives (SLOs)

Student Learning Objective	
SLO #1	Students should be able to discuss economic forces leading to the idea of a private supply management program (in particular, herd retirement program) in the U.S. dairy industry.
SLO #2	Students should be able to explain the role of dairy cooperatives in developing and implementing the herd retirement program and this program's implementation procedure.
SLO #3	Using a graphical analysis, students should be able to explain a theoretical framework, which describes seller market power of dairy farmers due to implementation of the herd retirement program and to identify the effects of this seller market power on dairy farmers and buyers of raw milk and manufactured dairy products at the wholesale and retail levels of the dairy product supply chain.
SLO #4	Students should be able to conduct a basic market and price analysis using the U.S. Department of Agriculture data for the period of the herd retirement program and the periods before and after the program to evaluate changes in the market and price behavior that might have been because of this program.
SLO #5	Students should be able to discuss the role of the Capper-Volstead Act, as a limited antitrust immunity to the Sherman Act, in regulating collective agricultural marketing activities of dairy farmers in the analyzed situation.

Table 2. U.S. Dairy Industry: The Yearly Average Milk Cow Inventory, Production, and Price Prior, During, and After the Herd Retirement Program (1995-2014)

Period	Milk cow inventory	Milk production		Milk price
	number of cows	pounds per cow	billion pounds	\$ per cwt
	Average (coefficient of variation)			
Pre-HR period (1995-2002)	9,250,838 (0.02)	17,453 (0.05)	161.0 (0.04)	13.79 (0.09)
HR period (2003-2010)	9,132,175 (0.01)	19,934 (0.04)	182.2 (0.05)	15.47 (0.16)
<i>Percentage change in HR period, relative to pre-HR period</i>	_____ (____)	_____ (____)	_____ (____)	_____ (____)
Post-HR period (2011-2014)	9,204,975 (0.004)	21,783 (0.02)	201.0 (0.02)	20.75 (0.11)
<i>Percentage change in post-HR period, relative to HR period</i>	_____ (____)	_____ (____)	_____ (____)	_____ (____)

Data Source: USDA NASS (2022).

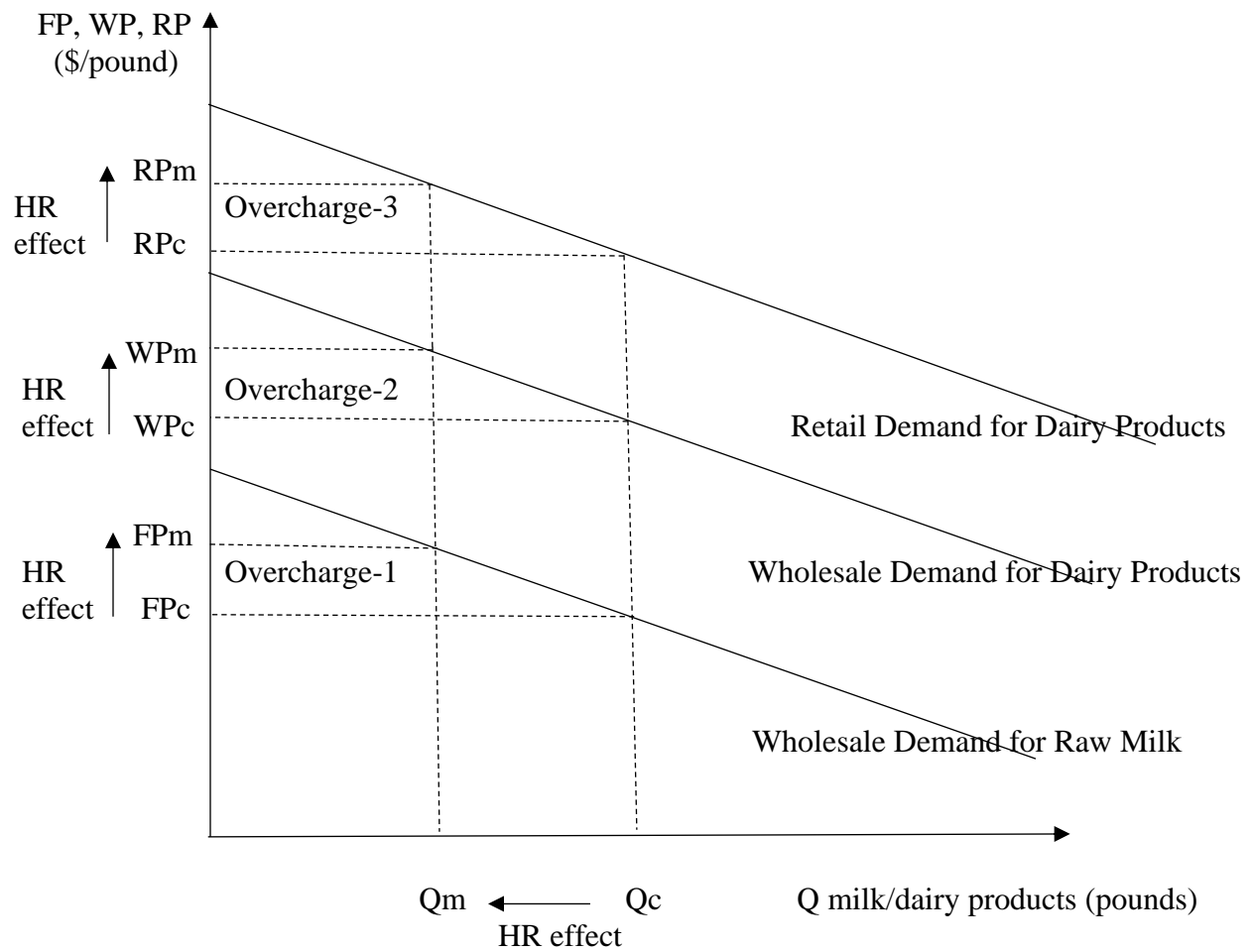
Note: Students should perform relevant calculations to record their answers in cells with missing answers (Discussion Question 5.1).

Table 3. U.S. Dairy Industry: The Monthly Average Wholesale Prices of Cheddar Cheese and Butter and Retail Prices of Fluid Whole Milk Prior, During, and After the Herd Retirement Program (2000-2014)

Period	Wholesale cheese	Wholesale butter	Retail fluid whole
	price	price	milk price
	\$ per pound		\$ per gallon
Average (coefficient of variation)			
Pre-HR period (01/2000-06/2003)	1.23 (0.14)	1.26 (0.25)	2.79 (0.03)
HR period (07/2003-12/2010)	1.54 (0.17)	1.45 (0.19)	3.27 (0.10)
<i>Percentage</i> change in HR period relative to pre-HR period	_____ (_____)	_____ (_____)	_____ (_____)
Post-HR period (01/2011-12/2014)	1.86 (0.13)	1.81 (0.18)	3.55 (0.03)
<i>Percentage</i> change in post-HR period relative to HR period	_____ (_____)	_____ (_____)	_____ (_____)

Data Sources: USDA AMS (2022) and U.S. BLS (2022).

Note: Students should perform relevant calculations to record their answers in cells with missing answers (Discussion Question 5.2).



**Figure 1. Seller market power in the U.S. dairy industry:
The effects on quantities and prices.**

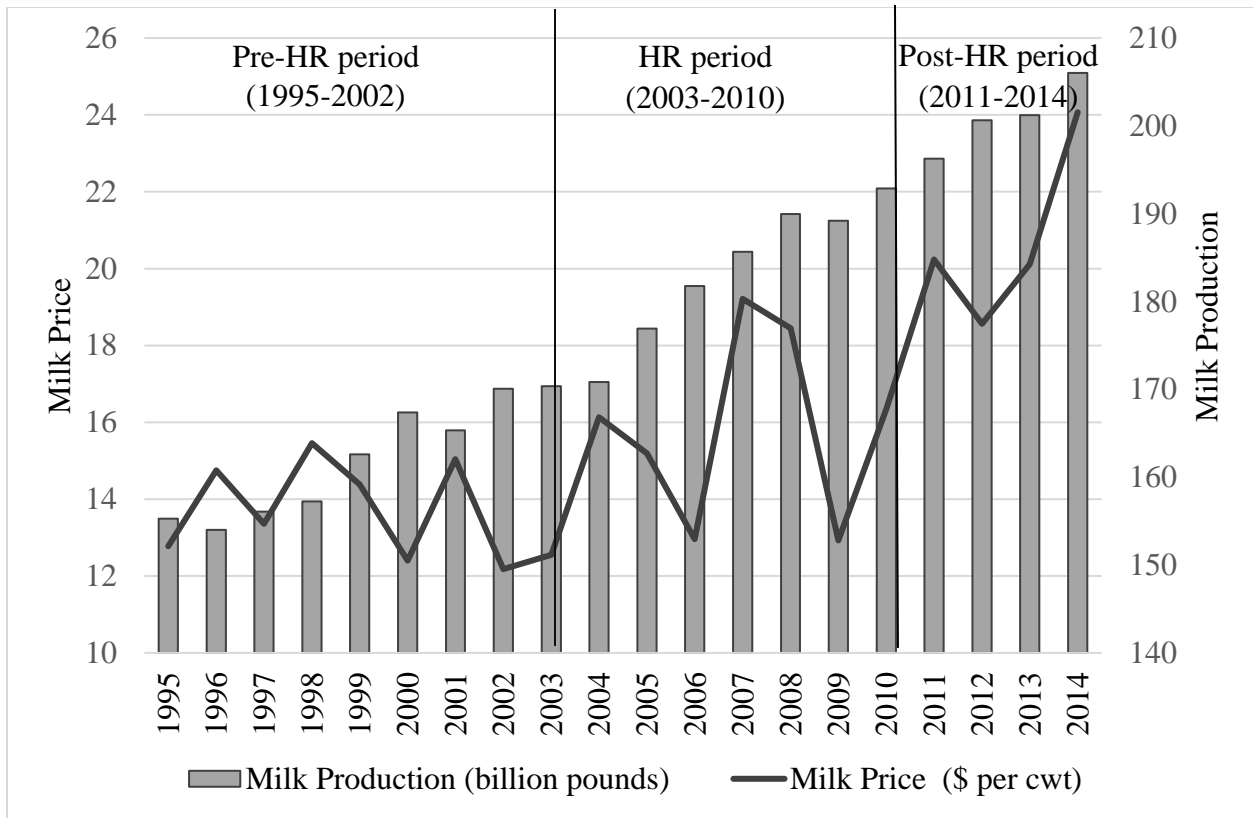


Figure 2. U.S. Yearly Milk Production and Prices: Pre, Post, and During the Herd Retirement (HR) Program (1995-2014).

Data source: USDA NASS (2022).

Note: Pre-HR period, HR period, and post-HR period are the pre-herd retirement program, herd retirement program, and post-herd retirement program periods, respectively.

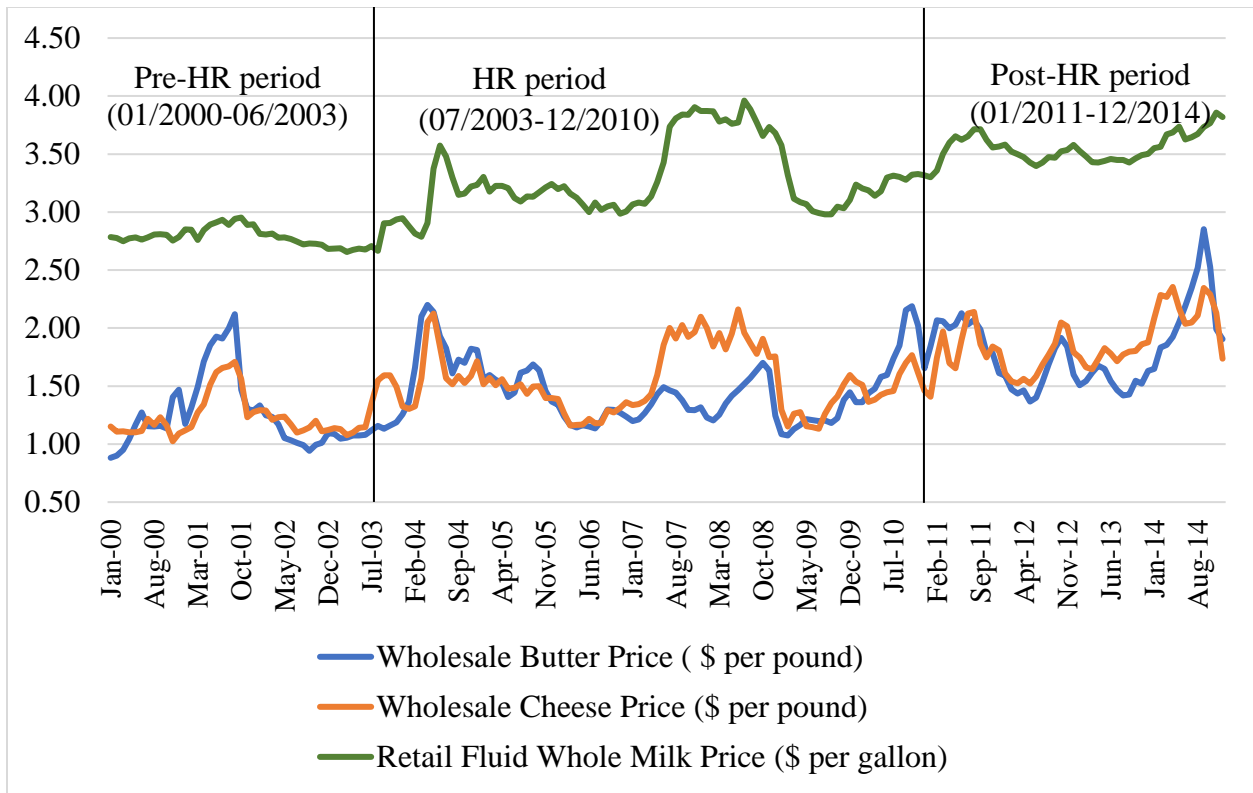


Figure 3. U.S. Monthly Wholesale Prices of Cheddar Cheese and Butter and Retail Fluid Whole Milk Prices: Pre, Post, and During the Herd Retirement (HR) Program (2000-2014).
Data source: USDA AMS (2022) and U.S. BLS (2022).

Note: Pre-HR period, HR period, and post-HR period are the pre-herd retirement program, herd retirement program, and post-herd retirement program periods, respectively.