Fluid Milk Pricing and Market Power in the U.S. Dairy Industry

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Abstract

In the period of 2003-2010, the National Milk Producers Federation and Cooperatives Working Together implemented a herd retirement program. This program was used to control milk supply by removing from production the entire milking herds of selected dairy farmers. In 2011, buyers of fluid milk and other fresh milk products at the retail level filed a class action antitrust lawsuit alleging that by implementing the herd retirement program the cooperatives of dairy farmers engaged in an unlawful price-fixing conspiracy leading to higher prices for fluid milk and other fresh milk products at the retail level.

The research presented in the paper conducts an econometric analysis of the retail fluid whole milk price behavior during the period of the herd retirement (HR) program and a prior, more competitive period. The empirical evidence indicates that in the pre-HR period retail fluid whole milk pricing is consistent with an imperfectly competitive pricing (oligopoly or monopoly) in 23 out of 25 analyzed cities. In the HR period, retail fluid whole milk pricing is consistent with an imperfectly competitive pricing (oligopoly or monopoly) in 16 out of 25 analyzed cities.

1. Introduction

In the period of 2003-2010, the National Milk Producers Federation and Cooperatives Working Together (which include dairy cooperatives and individual dairy farmers) implemented a herd retirement program. This program was used to control milk supply by removing from production the entire milking herds of selected dairy farmers. As part of a broader private milk supply management initiative, the herd retirement program was expected to help balance milk supply and milk demand, to stabilize milk prices received by dairy farmers, and to obtain a satisfactory level of these prices. The herd retirement program was funded by the assessments paid by the participating dairy farmers. Collective agricultural marketing activities of agricultural producers acting through their organizations are possible due to the Capper-Volstead Act (1922), a limited antitrust exemption to the Sherman Act (1890).

In 2011, buyers of fluid (beverage) milk and other fresh milk products[1] at the retail level (indirect buyers) filed a class action antitrust lawsuit alleging that by implementing the herd retirement program the cooperatives of dairy farmers engaged in an unlawful conspiracy with the purpose of fixing, increasing, and stabilizing prices of fluid milk and other fresh milk products and violated the states' antitrust and restraint of trade laws. These buyers claimed that they were overcharged. The cooperatives of dairy farmers settled this lawsuit in 2016 for $52 million (Hagens Berman 2018; Fresh Milk Products Antitrust Litigation webpage 2022).[2]

The research objective is to conduct an empirical analysis of retail fluid whole milk price behavior in 25 cities during the two periods of interest: the period of the herd retirement (HR) program (07/2003 - 12/2010) and a prior, more competitive period (01/2000 – 06/2003). A particular focus is on estimating cost pass-throughs (CPT), which characterize the relationships between retail fluid whole milk prices and farm milk prices. The CPT magnitude is further used to distinguish between a perfectly competitive pricing and an imperfectly competitive pricing

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[1] The examples of fluid (beverage) milk products include whole milk, reduced-fat milk, and skim milk. The examples of fresh milk products include cream, half and half, yogurt, cottage cheese, cream cheese, and sour cream.

[2] Buyers of cheese and butter, who purchased these products directly from dairy cooperatives (CWT members) filed a similar lawsuit against dairy cooperatives alleging that the herd retirement program was a form of illegal price-fixing violating Section 1 of the Sherman Act. This lawsuit was settled in 2019 for $220 million (Butter and Cheese Class Action webpage 2022). An analysis of the wholesale cheese price behavior in the periods prior, during, and after the herd retirement program is presented in Bolotova (2020).

(oligopoly or monopoly) at the retail stage of the fluid milk supply chain. The empirical analysis is conducted using publicly available data reported by the U.S. Department Agriculture Agricultural Marketing Service.

The paper is organized as follows. Section 2 describes the Cooperatives Working Together herd retirement program. Section 3 presents a simple theoretical framework, which explains the effects of the herd retirement program on milk quantity and prices in the fluid milk supply chain. Section 4 introduces a descriptive statistical analysis of farm milk prices, retail fluid whole milk prices, farm-to-retail margins, and farm sector shares in the periods before, during, and after the HR program, which results are discussed in Appendix II. Section 5 develops an econometric model of the retail fluid whole milk price behavior, presents hypotheses on the nature of retail fluid milk pricing (perfectly competitive pricing, oligopoly pricing, and monopoly pricing), and discusses the estimation results. Section 6 is the conclusion.

2. Cooperatives Working Together (CWT) Herd Retirement Program

The CWT milk supply management program is a private, industry-funded, and administered program. Originally, this program was the dairy industry's initiative to mitigate a number of economic forces adversely affecting 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 has been 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.

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

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 winning bids, and dairy farmers with the accepted 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.

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 an inverse demand curve for raw farm milk at the farm stage and inverse demand curves for fluid milk at the wholesale and retail stages of the fluid milk supply chain.[5] Figure 1 also depicts price-quantity combinations for raw milk and fluid milk for two market scenarios: a competitive industry scenario representing the market situation prior to the herd retirement program, and a market power scenario where the dairy industry (dairy farmers) exercises seller market power by implementing the herd retirement program. Raw milk is the main input used to

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[4] A detailed discussion of this program is presented in the complaint filed by buyers of fluid milk and other fresh milk products at the retail level: *Edwards et al v. National Milk Producers Federation et al* 2014. 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). A discussion of legal issues related to implementation of the herd retirement program is presented in Frackman and O'Rourke (2011), Hibner (2011), Bolotova (2014, 2015), and Peck (2015).

[5] These demand curves reflect price-dependent (inverse) demand functions: price is a function of quantity.

produce fluid milk products.[6] This is the reason the same Q is used to denote a raw milk quantity and a fluid milk quantity in Figure 1.

A decrease in milk cow inventory due to the herd retirement program causes the raw milk quantity and consequently the fluid milk quantity at the wholesale and retail stages of the fluid milk supply chain to decrease from Qc to Qm. As a result, the raw milk price charged (received) by dairy farmers (farm price) increases from FPc to FPm. The effective implementation of the herd retirement program would increase seller market power of dairy farmers.[7] This increase in seller market power at the farm stage of the fluid milk supply chain leads to the increases in wholesale and retail prices of fluid milk. The wholesale price of fluid milk charged by fluid milk manufacturers (dairy cooperatives and proprietary firms) increases from WPc to WPm. The retail price of fluid milk charged by food retailers increases from RPc to RPm. In the market power scenario, buyers of raw milk and buyers of fluid milk at the wholesale and retail stages of the fluid milk supply chain pay higher prices and are overcharged.

The overcharge attributed to direct buyers of raw farm milk (for example, fluid milk processors who purchased raw milk from dairy cooperatives) is FPm-FPc in $ per gallon of raw milk, and the total $ overcharge is (FPm-FPc)*Qm. The latter is the "Overcharge-1" rectangle in Figure 1. The overcharge attributed to direct buyers of fluid milk (for example, food retailers who purchased fluid milk products from dairy cooperatives) is WPm-WPc in $ per gallon, and the total $ overcharge is (WPm-WPc)*Qm. The latter is the "Overcharge-2" rectangle in Figure 1. The overcharge attributed to indirect buyers who purchased fluid milk at the retail level (for example, final consumers who purchased fluid milk products from food retailers) is RPm-RPc in $ per gallon, and the total $ overcharge is (RPm-RPc)*Qm. The latter is the "Overcharge-3" rectangle in Figure 1, which is the basis for damages that indirect buyers of fluid milk and other fresh milk products (final consumers) aimed to recover during the antitrust litigation.

4. Descriptive Statistical Analysis

Appendix I describes a milk pricing system within the Federal Milk Marketing Orders (FMMOs). Appendix II presents a descriptive statistical analysis and includes tables that report monthly

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[6] In fluid milk manufacturing, one unit (gallon) of raw milk is required to produce one unit (gallon) of fluid milk.

[7] An alternative economic model explaining seller market power of dairy cooperatives due to implementation of the herd retirement program is presented in Bolotova (2016).

averages for farm milk prices, retail fluid whole milk prices, farm-to-retail margins, and farm sector shares calculated for 26 cities for the three periods of interest: the period prior to the herd retirement program (the pre-HR period: 01/2000-06/2003), the period of the herd retirement program (HR period: 07/2003-12/2010), and the period following the herd retirement program (the post-HR period: 01/2011-12/2012). The prices are collected from the U.S. Department of Agriculture Agricultural Marketing Service Dairy Public Database (USDA AMS 2022a). The farm milk prices used in the analysis are the announced cooperative Class I milk prices, which include the minimum Federal Milk Marketing Order (FMMO) prices paid for Class I milk (raw milk used in fluid milk manufacturing) and over-order premiums negotiated by dairy cooperatives with fluid milk processors.[8] Figure 2 is a map of Federal Milk Marketing Orders. Table 1 summarized milk quantities produced in FMMOs and milk prices.

The farm sector share is calculated as the ratio of the farm price to the retail price multiplied by 100 percent. The farm-to-retail margin is calculated using two approaches: (a) as the difference between the retail and farm prices (expressed in $ per gallon), and (b) as a percentage of the retail price (a $ per gallon margin expressed as a percentage of the retail price). The farm-to-retail margin includes fluid milk processing costs and profit of fluid milk processors (dairy cooperatives and proprietary firms) and fluid milk retailing costs and profit of food retailers. The farm sector share expressed as a percentage of the retail price might reflect to some extent seller market power of the dairy farm stage of the fluid milk supply chain. The farm-to-retail margin expressed as a percentage of the retail price might reflect to some extent market power of the fluid milk processing and retailing stages of the fluid milk supply chain.

5. Econometric Analysis

The econometric analysis evaluates the relationships between retail fluid whole milk prices and farm milk prices in 25 cities to identify whether there was a presence of seller market power at the retail stage of the fluid milk supply chain in the pre-HR and HR periods. The cost pass-throughs (CPT) at the farm-to-retail stage of the fluid milk supply chain are estimated to identify the nature

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[8] USDA AMS discontinued a series of reports publishing announced cooperative Class I milk prices at the beginning of 2013. This is the reason the post-HR period encompasses only two years: 2011 and 2012.

of retail fluid whole milk pricing (a perfectly competitive pricing, an oligopoly pricing, or a monopoly pricing) in the two periods of interest.[9]

5.1. Economic model

Equation 1 represents a linear farm-to-retail price transmission process, which services as a foundation for the econometric models. The retail fluid whole milk price (measured in $ per gallon) is specified as a linear function of the farm milk price (measured in $ per gallon).

*(1) Retail Price = a + b*Farm Price.*

a is a fixed absolute markup (FAM), which is a non-negative constant. *b* is a cost pass-through (CPT), which is farm-to-retail price transmission coefficient. The CPT indicates a $ per gallon increase (decrease) in the retail fluid whole milk price, which follows a $1 per gallon increase (decrease) in the farm milk price.

Table 2 summarizes typical cases for CPT magnitude, relevant economic models, and output pricing methods (George and King 1971; Harris and Sullivan 1979; Cotterill 1998; Cotterill et al 2001; Carman and Sexton 2005; Kosicki and Cahill 2006; Bolotova, and Novakovic 2012; RBB Economics 2014). These cases are hypotheses on the CPT magnitude tested using the estimated econometric models.

5.2. Econometric Model

The econometric model of retail fluid whole milk price behavior to be estimated for each retail fluid milk price series (city) is represented by Equation 2. This is a linear regression model.

(2) $RP_t = \alpha_0 + \beta_0 FP_t + \gamma_0 HR_t + \mu_0 FP_t HR_t + \varepsilon_t$

RP_t is retail fluid whole milk price in a particular city in month t measured in $ per gallon. FP_t is the current month farm milk price (Class I milk price) measured in $ per gallon reported for the same city. Class I milk price represents a cost of milk for fluid milk manufacturers and fluid milk retailers. HR_t is a binary variable (intercept shifter). It is equal to one, if a price observation belongs to the HR period (07/2003-12/2010), and it is equal to zero if a price observation belongs to the pre-HR period (01/2000-06/2003); the latter is a reference group. $FP_t HR_t$ is the interaction effect of the fam milk price with the HR binary variable (slope shifter). ε_t is the error term. Each retail fluid whole milk price series used in the econometric analysis includes 132 observations (11 years

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[9] Because the number of observations for the post-HR period is only 24 due to data availability, this period is not included in the econometric analysis.

of monthly data). The Ordinary Least Squares (OLS) estimation procedure is used to estimate the econometric models.

The fixed absolute markups (FAM) and cost pass-throughs (CPT) are determined as follows. The pre-HR period: FAM=α_0 and CPT=β_0. The HR period: FAM=$(\alpha_0+\gamma_0)$ and CPT=$(\beta_0+\mu_0)$. The change in FAM between the pre-HR and HR periods is γ_0. The change in CPT between the pre-HR and HR periods is μ_0.

5.3. Estimation Results

The estimation results for 25 econometric models are summarized in the tables included in Appendix III. As indicated by R2, the estimated econometric models for most of the analyzed cities have a relatively high degree of explanatory power (R2s are greater than 60 percent). All estimated fixed absolute markups (FAM) are statistically significant from zero in the pre-HR and HR periods. Most of the estimated cost pass-throughs (CPT) are statistically significant from zero in the pre-HR period, and all estimated CPTs are statistically significant from zero in the HR period. In most of the analyzed cities, the estimated changes in FAMs and CPTs between the pre-HR and HR periods are statistically significant from zero.

Tables 3-10 summarize selected estimation results: fixed absolute markups and cost pass-throughs for the pre-HR and HR periods. In addition, these tables report the outcomes of T-tests used to evaluate the magnitude of CPT to identify if the retail fluid whole milk pricing is consistent with a perfectly competitive pricing or an imperfectly competitive pricing in the two analyzed periods. The null hypotheses are formulated based on the CPT magnitudes presented in Table 2.

The pre-herd retirement program period (pre-HR period)

The null hypothesis of a perfectly competitive pricing is rejected in favor of the alternative hypothesis of an imperfectly competitive pricing (oligopoly or monopoly) in 22 out of 25 analyzed cities. In these 22 cities, the estimated CPTs are incomplete (CPTs<1). The incomplete CPT indicates that a $1 per gallon increase (decrease) in the farm milk price causes the retail fluid whole milk price to increase (decrease) by less than $1 per gallon.

The incomplete CPT may reflect either oligopoly/monopoly pricing in the market with linear demand ([0.5<CPT<1)) or oligopoly/monopoly pricing in the market with concave demand (CPT<0.5). The examples of oligopoly and monopoly pricing in the market with linear demand include Philadelphia, Pittsburg, and Baltimore (Tables 3 and 4); Detroit (Table 5); Chicago (Table

6); Oklahoma City (Table 7); St. Louis and Kansas City (Table 8); Atlanta and Miami (Table 9); and Houston and Seattle (Table 10).

The examples of oligopoly and monopoly pricing in the market with concave demand include Boston, Hartford, and Washington DC (Tables 3 and 4); Cleveland and Cincinnati (Table 5); Milwaukee and Minneapolis (Table 6); Denver (Table 7); Louisville (Table 9); and Phoenix (Table 10).

The estimated CPT is not statistically significant from one in Omaha (Table 7), which is consistent with a perfectly competitive pricing. The estimated CPTs in New Orleans (Table 9) and Dallas (Table 10) are consistent with both perfectly competitive pricing and imperfectly competitive pricing.

The incomplete CPT (CPT<1) indicates that the retail fluid whole milk price depends to a greater extent on the fixed absolute markup and to a smaller extent on changes in the farm milk price reflected in the cost pass-through. The incomplete cost pass-through is consistent with the retail price stabilization method used by fluid milk retailers. The retail price stabilization method increases the retail fluid whole milk price stability, decreases adverse effects of strategic uncertainty caused by increasing volatility of input (farm milk) prices, and may increase profit of fluid milk retailers.

The herd retirement program period (HR period)

In the HR period, the null hypothesis of a perfectly competitive pricing is rejected in favor of the alternative hypothesis of an imperfectly competitive pricing (oligopoly or monopoly) in 16 out of 25 analyzed cities.

In the HR period, as compared to the pre-HR period, CPT increases in 23 out of 25 analyzed cities and decreases in 2 cities. The estimated changes in CPT in 21 out of 25 cities are statistically significant from zero. At the same time, FAM decreases in 19 out of 25 analyzed cities and increases in 6 cities. The estimated changes in FAM are statistically significant from zero in 19 out of 25 cities. Despite the estimated increases in CPT in most of the analyzed cities in the HR period, CPT remains incomplete and the retail fluid whole milk pricing remains consistent with imperfectly competitive pricing (oligopoly or monopoly) in most of the analyzed cities in the HR period.

For example, retail fluid whole milk pricing shifts from being consistent with oligopoly/monopoly pricing in the market with concave demand (CPT<0.5) to

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oligopoly/monopoly pricing in the market with linear demand ([0.5<CPT<1)) in Boston and Washington DC (Tables 3 and 4); Cleveland and Cincinnati (Table 5); Milwaukee and Minneapolis (Table 6); Denver (Table 7); and Phoenix (Table 10). In these cases, retail fluid whole milk pricing reflects retail price stabilization method used by fluid milk retailers.

In a few cases, retail fluid whole milk pricing shifts from being consistent with oligopoly/monopoly pricing in the market with linear demand ([0.5<CPT<1)) to oligopoly/monopoly pricing in the market with convex demand (CPT>1). The incomplete CPT in the pre-HR period changes to more than complete CPT in the HR period in these cases. More than complete CPT indicates that a $1 per gallon increase (decrease) in the farm milk price causes the retail fluid whole milk price to increase (decrease) by more than $1 per gallon. This is consistent with a fixed percentage markup pricing method used by fluid milk retailers. This pricing method ensures that changes in farm milk prices are completely reflected in retail fluid milk prices, which may increase the volatility (instability) of retail fluid milk prices. The examples include Philadelphia (Table 3), Oklahoma City (Table 7), and Kansas City (Table 8).

In a few cases, retail fluid whole milk pricing remains consistent with oligopoly or monopoly pricing in the market with linear demand in the HR period. The examples include Baltimore (Table 4); Chicago (Table 6); and Seattle (Table 10).

In several cases, retail fluid whole milk pricing shifts from being consistent with oligopoly/monopoly pricing in the markets with linear demand ([0.5<CPT<1)) and concave demand (CPT<0.5) to a perfectly competitive pricing (CPT=1). A complete CPT (CPT=1) indicates that a $1 per gallon increase (decrease) in the farm milk price causes a $1 per gallon increase (decrease) in the retail fluid whole milk price. The examples include Pittsburg (Table 4), St. Louis (Table 8); Atlanta, Louisville, and Miami (Table 9). The perfectly competitive pricing is consistent with a fixed absolute markup pricing method used by fluid milk retailers.

The increases in CPT and simultaneous decreases in FAM observed in a substantial number of the analyzed cities in the HR period indicate that retail fluid whole milk pricing in these cities in the HR period becomes more dependent on changes in the farm milk prices and less dependent on the fixed absolute markups. However, in some cities both CPTs and FAMs increase in the HR period.

6. Conclusion

The empirical evidence presented in the paper indicates that in the period of the herd retirement program (HR period), as compared to the pre-HR period, the monthly average farm milk prices (Class I milk prices) increase in all cities, and the monthly average retail fluid whole milk prices increase in the vast majority of the analyzed cities. In addition, the monthly average farm sector shares increase, and the monthly average farm-to-retail margins (measured as a percentage of the retail prices) decrease in the majority of the analyzed cities. Similar patterns of changes in the monthly averages of these economic variables are observed between the HR and post-HR periods.[10]

In the pre-HR period, retail fluid whole milk pricing is consistent with an imperfectly competitive pricing (oligopoly or monopoly) in 23 out of 25 analyzed cities. The estimated cost pass-throughs are incomplete (smaller than one) in these 23 cities, reflecting a retail price stabilization method used by food retailers. Retail fluid whole milk pricing is consistent with a perfectly competitive pricing in 2 remaining cities. The cost pass-throughs are complete in the latter case, reflecting a fixed absolute markup pricing method used by food retailers.

In the HR period, as compared to the pre-HR period, cost pass-throughs increase and fixed absolute markup decrease in the majority of the analyzed cities. Despite the observed increases in cost pass-throughs in the HR period, the estimated cost-pass throughs are either remain incomplete (smaller than one) or change to being more than complete (greater than one) in 16 out of 25 analyzed cities. The incomplete cost pass-throughs are consistent with oligopoly/monopoly pricing in the markets with linear and concave demand and reflect a retail price stabilization method used by food retailers. The cost pass-throughs that are more than complete are consistent with oligopoly/monopoly pricing in the market with convex demand and reflect a fixed percentage markup pricing method used by food retailers.

In the HR period, retail fluid whole milk pricing is consistent with a perfectly competitive pricing in 5 out of 25 analyzed cities. In these cases, the estimated cost pass-throughs are complete (equal to one), reflecting a fixed absolute markup pricing method used by food retailers. The empirical evidence is mixed in the case of 4 out of 25 analyzed cities, where retail fluid whole milk pricing is consistent with both perfectly and imperfectly competitive pricing.

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[10] Descriptive statistical analysis is presented in Appendix II.

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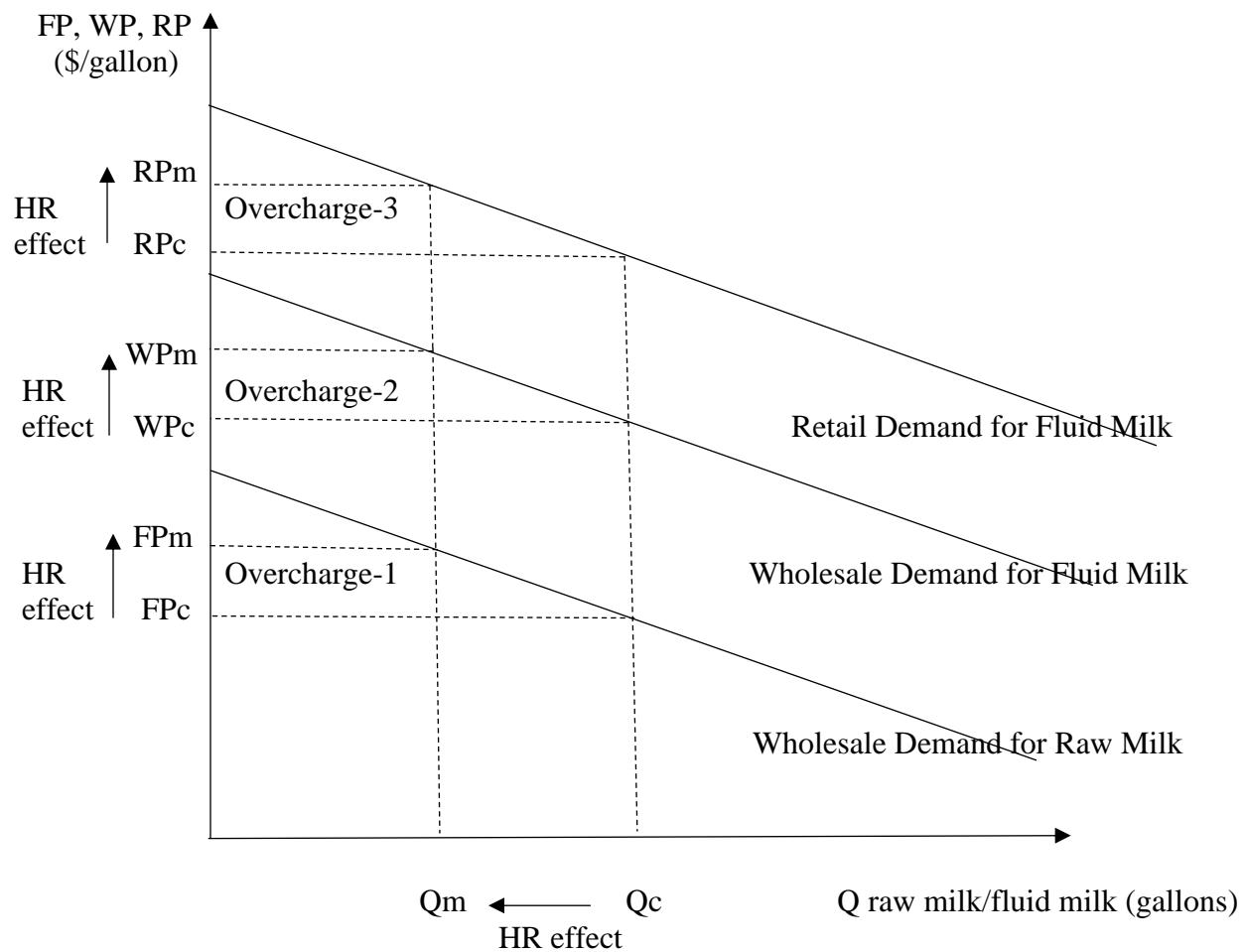
Figure 1. Seller market power in the U.S. fluid milk supply chain:
The effects on milk quantities and prices.
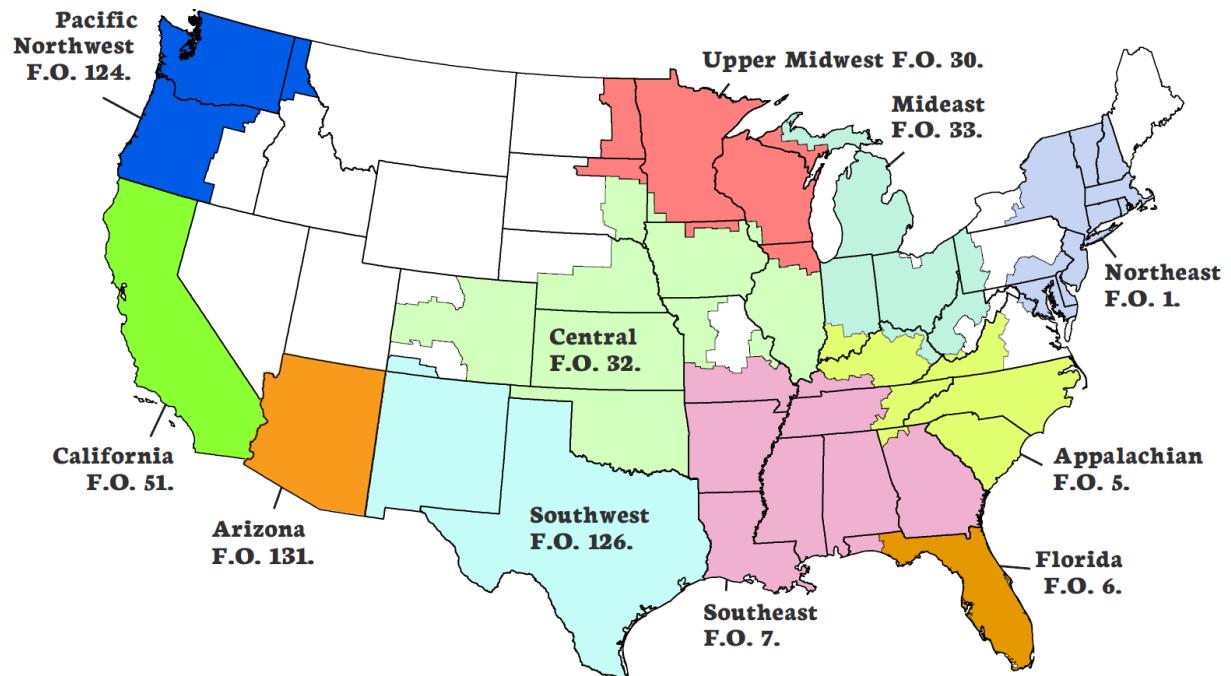
Figure 2. Map of Federal Milk Marketing Orders. *Source: USDA AMS (2022b).*

Table 1. Federal Milk Marketing Orders: Market Summary (2013).

FMMO	Total milk quantity (million pounds)	Class I milk quantity (million pounds)	Class I milk utilization rate (percent)	Class I milk price ($/cwt)	Uniform price ($/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**

Source: USDA AMS Dairy Program (2014).

Table 2. Cost Pass-Through (CPT), Economic Models, and Output Pricing Methods.

Cost Pass-Through	Economic Model	Pricing Method
CPT > 1 (more than complete CPT)	monopoly or oligopoly pricing in a market with non-linear (convex) demand and constant marginal cost	fixed percentage markup
CPT = 1 (complete CPT)	perfectly competitive pricing	fixed absolute markup
CPT < 1 (incomplete CPT)	oligopoly or monopoly pricing in a market with linear demand and constant marginal cost	retail price stabilization
CPT = 0.75[*] or 0.5<CPT<1 (incomplete CPT)	oligopoly pricing in a market with linear demand and constant marginal cost	retail price stabilization
CPT = 0.5 (incomplete CPT)	monopoly pricing in a market with linear demand and constant marginal cost	retail price stabilization
CPT < 0.5 (incomplete CPT)	monopoly or oligopoly pricing in a market with non-linear (concave) demand and constant marginal cost	retail price stabilization

[*] CPT=0.75 is chosen as a midpoint for the hypothesis on oligopoly pricing in a market with linear demand. This hypothesis can also be tested as (0.5<CPT<1) by rejecting the null hypothesis of a monopoly pricing in the market with linear demand and at the same time by rejecting the null hypothesis of a perfectly competitive pricing.

Table 3. FMMO 1 "Northeast" Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010): *Boston MA, Hartford CT, and Philadelphia, PA.*

	Boston, MA	Hartford, CT	Philadelphia, PA
Pre-HR period (01/2000-06/2003)			
Fixed Absolute Markup (FAM)	2.58	2.63	1.96
Cost Pass Through (CPT)	**0.26** Ho: CPT=0.50 RIF[1] Ha: CPT<0.50 (T-st=-4.04)	**0.23** Ho: CPT=0.50 RIF Ha: CPT<0.50 (T-st=-3.84)	**0.63** Ho: CPT=1.00 RIF Ha: CPT<1.00 (T-st=-7.72) Ho: CPT= 0.50 RIF Ha: CPT>0.50 (T-st=2.71)
Economic model	**Monopoly pricing** **Oligopoly pricing** [concave demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]	**Oligopoly pricing** [linear demand]
Pricing method	**Retail price stabilization**	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)			
Fixed Absolute Markup (FAM)	1.98	2.00	1.53
Cost Pass Through (CPT)	**0.84** Ho: CPT= 0.75 FTBR[2] (T-st=1.11)	**0.88** Ho: CPT=1.00 FTBR (T-st=-1.12) Ho: CPT= 0.75 FTBR (T-st=1.19)	**1.11** Ho: CPT= 1.00 RIF Ha: CPT>1.00 (T-st=1.90)
Economic model	**Oligopoly pricing** [linear demand]	**Perfectly competitive (PC) pricing** **Oligopoly (O) pricing** [linear demand]	**Oligopoly pricing** **Monopoly pricing** [convex demand]
Pricing method	**Retail price stabilization**	**Fixed absolute markup (PC)** **Retail price stabilization (O)**	**Fixed percentage markup**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 4. FMMO 1 "Northeast" Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010):
Pittsburg PA, Baltimore MD, and Washington DC.

	Pittsburg, PA	Baltimore, MD	Washington, DC
Pre-HR period *(01/2000-06/2003)*			
Fixed Absolute Markup (FAM)	1.57	2.15	2.39
Cost Pass Through (CPT)	**0.86** Ho: CPT=1.00 RIF Ha: CPT<1.00 (T-st=-2.40) Ho: CPT=0.50 RIF Ha: CPT>0.50 (T-st=5.98)	**0.47** Ho: CPT=0.50 FTBR (T-st=-0.47)	**0.37** Ho: CPT=0.50 RIF Ha: CPT<0.50 (T-st=-1.71)
Economic model	**Oligopoly pricing** [linear demand]	**Monopoly pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]
Pricing method	**Retail price stabilization**	**Retail price stabilization**	**Retail price stabilization**
HR period *(07/2003-12/2010)*			
Fixed Absolute Markup (FAM)	1.68	2.27	2.41
Cost Pass Through (CPT)	**1.02** Ho: CPT=1.00 FTBR (T-st=0.16)	**0.71** Ho: CPT=0.75 FTBR (T-st=-0.29)	**0.75** Ho: CPT=0.75 FTBR (T-st=0.001)
Economic model	**Perfectly competitive pricing**	**Oligopoly pricing** [linear demand]	**Oligopoly pricing** [linear demand]
Pricing method	**Fixed absolute markup**	**Retail price stabilization**	**Retail price stabilization**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 5. FMMO 33 "Mideast": Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010).

	Detroit, MI	Cleveland, OH	Cincinnati, OH
Pre-HR period (01/2000-06/2003)			
Fixed Absolute Markup (FAM)	2.28	2.44	2.87
Cost Pass Through (CPT)	**0.38** Ho: CPT=0.50 FTBR (T-st=-0.32)	**0.20** Ho: CPT= 0.50 RIF Ha: CPT<0.5 (T-st=-1.65)	**0.00** Ho: CPT=0.50 RIF Ha: CPT<0.50 (T-st=-1.65)
Economic model	**Monopoly pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]
Pricing method	**Retail price stabilization**	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)			
Fixed Absolute Markup (FAM)	1.43	1.81	1.87
Cost Pass Through (CPT)	**0.89** Ho: CPT=1.00 FTBR (T-st=-0.90) Ho: CPT= 0.75 FTBR (T-st=1.11)	**0.83** Ho: CPT= 0.75 FTBR (T-st=0.83)	**0.49** Ho: CPT=0.50 FTBR (T-st=-0.08)
Economic model	**Perfectly competitive (PC) pricing** **Oligopoly (O) pricing** [linear demand]	**Oligopoly pricing** [linear demand]	**Monopoly pricing** [linear demand]
Pricing method	**Fixed absolute markup (PC)** **Retail price stabilization (O)**	**Retail price stabilization**	**Retail price stabilization**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 6. FMMO 30 "Upper Midwest": Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010).

	Chicago, IL	Milwaukee, WI	Minneapolis, MN
Pre-HR period (01/2000-06/2003)			
Fixed Absolute Markup (FAM)	2.35	2.04	3.15
Cost Pass Through (CPT)	**0.60** Ho: CPT=0.50 FTBR (T-st=0.50) Ho: CPT= 0.75 FTBR (T-st=-0.75)	**0.28** Ho: CPT=0.50 RIF Ha: CPT<0.50 (T-st=-3.92)	**-0.01** Ho: CPT= 0.50 RIF Ha: CPT<0.50 (T-st=-3.68)
Economic model	**Monopoly pricing** **Oligopoly pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]
Pricing method	**Retail price stabilization**	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)			
Fixed Absolute Markup (FAM)	2.87	2.60	2.75
Cost Pass Through (CPT)	**0.46** Ho: CPT=0.50 FTBR (T-st=-0.35)	**0.58** Ho: CPT=0.50 FTBR (T-st=0.47) Ho: CPT=0.75 FTBR (T-st=-1.03)	**0.65** Ho: CPT=0.50 FTBR (T-st=1.23) Ho: CPT= 0.75 FTBR (T-st=-0.87)
Economic model	**Monopoly pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [linear demand]
Pricing method	**Retail price stabilization**	**Retail price stabilization**	**Retail price stabilization**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 7. FMMO 32 "Central" Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010): *Omaha NE, Oklahoma City OK, and Denver CO.*

	Omaha, NE	Oklahoma City, OK	Denver, CO
Pre-HR period (01/2000-06/2003)			
Fixed Absolute Markup (FAM)	1.78	1.88	3.37
Cost Pass Through (CPT)	**0.89** Ho: CPT=1 FTBR (T-st=-1.21)	**0.69** Ho: CPT=0.50 FTBR (T-st=0.71) Ho: CPT= 0.75 FTBR (T-st=-0.24)	**-0.06** Ho: CPT= 0.50 RIF Ha: CPT<0.50 (T-st=-2.43)
Economic model	**Perfectly competitive pricing**	**Monopoly pricing** **Oligopoly pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]
Pricing method	**Fixed absolute markup**	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)			
Fixed Absolute Markup (FAM)	1.52	0.61	2.16
Cost Pass Through (CPT)	**1.11** Ho: CPT=1 RIF Ha: CPT>1 (T-st=1.30)	**1.63** Ho: CPT=1 RIF Ha: CPT>1 (T-st=4.14)	**0.74** Ho: CPT= 0.75 FTBR (T-st=-0.03)
Economic model	**Oligopoly pricing** **Monopoly pricing** [convex demand]	**Oligopoly pricing** **Monopoly pricing** [convex demand]	**Oligopoly pricing** [linear demand]
Pricing method	**Fixed percentage markup**	**Fixed percentage markup**	**Retail price stabilization**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 8. FMMO 32 "Central": Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010):
   St. Louis MO and Kansas City MO.

	St. Louis, MO	Kansas City, MO
Pre-HR period (01/2000-06/2003)		
Fixed Absolute Markup (FAM)	2.31	1.96
Cost Pass Through (CPT)	**0.54** Ho: CPT=0.50 FTBR (T-st=1.15)	**0.67** Ho: CPT=1.00 RIF Ha: CPT<1.00 (T-st=-10.46) Ho: CPT= 0.50 RIF Ha: CPT>0.50 (T-st=5.16)
Economic model	**Monopoly pricing** [linear demand]	**Oligopoly pricing** [linear demand]
Pricing method	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)		
Fixed Absolute Markup (FAM)	1.55	1.54
Cost Pass Through (CPT)	**1.02** Ho: CPT=1 FTBR (T-st=0.24)	**1.26** Ho: CPT=1 RIF Ha: CPT>1 (T-st=3.38)
Economic model	**Perfectly competitive pricing**	**Oligopoly pricing** **Monopoly pricing** [convex demand]
Pricing method	**Fixed absolute markup**	**Fixed percentage markup**

[1] RIF means that the null hypothesis (Ho) is "<u>R</u>ejected <u>I</u>n <u>F</u>avor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "<u>F</u>ails <u>T</u>o <u>B</u>e <u>R</u>ejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 9. FMMOs 5 "Appalachian", 6 "Florida," and 7 "Southeast":
Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010).

	Atlanta, GA	New Orleans, LA	Louisville, KY	Miami, FL
Pre-HR period (01/2000-06/2003)				
Fixed Absolute Markup (FAM)	2.55	2.28	2.76	2.35
Cost Pass Through (CPT)	**0.36** Ho: CPT=0.50 FTBR (T-st=-0.67)	**0.77** Ho: CPT=1.00 FTBR (T-st=-0.94) Ho: CPT= 0.75 FTBR (T-st=0.09)	**-0.13** Ho: CPT= 0.50 RIF Ha: CPT<0.50 (T-st=-7.55)	**0.43** Ho: CPT=0.50 FTBR (T-st=-0.99)
Economic model	**Monopoly pricing** [linear demand]	**Perfectly competitive (PC) pricing** **Oligopoly (O) pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]	**Monopoly pricing** [linear demand]
Pricing method	**Retail price stabilization**	**Fixed absolute markup (PC)** **Retail price stabilization (O)**	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)				
Fixed Absolute Markup (FAM)	1.48	2.60	1.44	1.40
Cost Pass Through (CPT)	**1.06** Ho: CPT=1 FTBR (T-st=0.47)	**0.81** Ho: CPT= 0.75 FTBR (T-st=0.42)	**0.94** Ho: CPT=1 FTBR (T-st=-0.42)	**1.08** Ho: CPT=1 FTBR (T-st=0.94)
Economic model	**Perfectly competitive pricing**	**Oligopoly pricing** [linear demand]	**Perfectly competitive pricing**	**Perfectly competitive pricing**
Pricing method	**Fixed absolute markup**	**Retail price stabilization**	**Fixed absolute markup**	**Fixed absolute markup**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Table 10. FMMOs 124 "Pacific Northwest", 126 "Southwest", and 131 "Arizona":
   Retail Fluid Whole Milk Pricing Methods and Cost Pass-Throughs (2000-2010).

	Houston, TX	Dallas, TX	Phoenix, AZ	Seattle, WA
Pre-HR period (01/2000-06/2003)				
Fixed Absolute Markup (FAM)	2.32	1.73	2.92	3.02
Cost Pass Through (CPT)	**0.44** Ho: CPT=0.50 FTBR (T-st=-0.47)	**0.74** Ho: CPT=1.00 FTBR (T-st=-1.04) Ho: CPT= 0.75 FTBR (T-st=-0.02) Ho: CPT=0.5 FTBR (T-st=1.00)	**0.03** Ho: CPT= 0.50 RIF Ha: CPT<0.50 (T-st=-4.59)	**0.50** Ho: CPT=0.50 FTBR (T-st=-0.02)
Economic model	**Monopoly pricing** [linear demand]	**Perfectly competitive (PC) pricing** **Oligopoly (O) pricing** **Monopoly (M) pricing** [linear demand]	**Monopoly pricing** **Oligopoly pricing** [concave demand]	**Monopoly pricing** [linear demand]
Pricing method	**Retail price stabilization**	**Fixed absolute markup (PC)** **Retail price stabilization (O/M)**	**Retail price stabilization**	**Retail price stabilization**
HR period (07/2003-12/2010)				
Fixed Absolute Markup (FAM)	1.83	1.65	2.37	2.94
Cost Pass Through (CPT)	**0.84** Ho: CPT=1.00 FTBR (T-st=-1.20) Ho: CPT= 0.75 FTBR (T-st=0.69)	**0.77** Ho: CPT=1.00 FTBR (T-st=-1.07) Ho: CPT= 0.75 FTBR (T-st=0.10)	**0.71** Ho: CPT= 0.75 FTBR (T-st=-0.38)	**0.34** Ho: CPT=0.50 FTBR (T-st=-1.22)
Economic model	**Perfectly competitive (PC) pricing** **Oligopoly (O) pricing** [linear demand]	**Perfectly competitive (PC) pricing** **Oligopoly (O) pricing** [linear demand]	**Oligopoly pricing** [linear demand]	**Monopoly pricing** [linear demand]
Pricing method	**Fixed absolute markup (PC)** **Retail price stabilization (O)**	**Fixed absolute markup (PC)** **Retail price stabilization (O)**	**Retail price stabilization**	**Retail price stabilization**

[1] RIF means that the null hypothesis (Ho) is "Rejected In Favor" of the alternative hypothesis (Ha). T-statistic is in the parentheses.

[2] FTBR means that the null hypothesis (Ho) "Fails To Be Rejected". T-statistic is in the parentheses.

T-statistic cut-off value used to conclude on statistical significance of CPT is |1.28| (one-tailed T-test, 10% significance level).

Appendix I

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.[1] 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. 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 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. 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.

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

Appendix II Descriptive Statistical Analysis

1). Federal Milk Marketing Order 1 "Northeast": *Table 1*

Pre-HR period (January 2000 – June 2003)

The <u>monthly average retail fluid whole milk price</u> (to be referred to as "retail price") is in the range of $2.74 per gallon (Pittsburg) to $2.95 per gallon (Hartford). The <u>monthly average farm-to-retail margin expressed as a percentage of the retail price</u> (to be referred to as "farm-to-retail margin") is in the range of 49.5% (Baltimore) to 52.9% (Harford). The <u>monthly average farm sector share</u> (expressed as a percentage of the retail price) is in the range of 47.1% (Hartford) to 50.5% (Baltimore).

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, retail prices increase in all analyzed cities. The retail price increase varies from 15% (Boston) to 25% (Washington, DC). While in the HR period the farm-to-retail margin decreases in Boston and Hartford by 4% and 2%, respectively, this margin increases in Pittsburg, Baltimore, and Washington, DC by 1%, 4%, and 6%, respectively, and this margin does not change in Philadelphia. The farm sector share changes in the opposite direction by the same magnitude.

In the HR period, retail prices are in the range of $3.38 per gallon (Pittsburg) to $3.67 per gallon (Washington, DC). The farm-to-retail margin is in the range of 50% (Philadelphia) to 54.3% (Washington, DC). The farm sector share is in the range of 45.7% (Washington, DC) to 50% (Philadelphia).

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, retail prices increase in all analyzed cities except for Baltimore. The retail price increase varies from 4% (Washington, DC) to 18% (Philadelphia and Pittsburg). The retail price in Baltimore decreases by 1%. In the post-HR period, the farm-to-retail margin decreases in all analyzed cities. The margin decrease is in the range of 3% (Philadelphia) to 18% (Baltimore). The farm sector share increases in all analyzed cities. The farm sector share increase is in the range of 3% (Philadelphia) to 19% (Baltimore).

In the post-HR period, retail prices are in the range of $3.43 per gallon (Baltimore) to $4.08 per gallon (Philadelphia). The farm-to-retail margin is in the range of 42.4% (Baltimore) to 48.5% (Philadelphia). The farm sector share is in the range of 51.5% (Philadelphia) to 57.6% (Baltimore).

Table 1. FMMO 1 "Northeast": Averages for Retail Fluid Whole Milk Prices, Class I Milk Prices, Farm-to-Retail Margins, and Farm Sector Shares for the Periods Prior, During, and After the Herd Retirement (HR) Program (2000-2012).

City	Unit	Pre-HR period (01/2000-06/2003)	HR period (07/2003-12/2010)	HR period, relative to pre-HR period		Post-HR period (01/2011-12/2012)	Post-HR period, relative to HR period	
		Average	Average	*change in the Average*		Average	*change in the Average*	
				$/gallon or %-point	*%*		*$/gallon or %-point*	*%*
Boston, MA								
Retail price	$/gallon	2.94	3.40	*0.46*	*15*	3.66	*0.26*	*8*
Coop Class I price	$/gallon	1.40	1.68	*0.28*	*20*	2.00	*0.31*	*19*
Farm-to-retail margin	$/gallon	1.54	1.72	*0.17*	*11*	1.67	*-0.05*	*-3*
Farm-to-retail margin	% of retail price	52.5	50.6	*-1.9*	*-4*	45.5	*-5.2*	*-10*
Farm sector share	% of retail price	47.5	49.4	*1.9*	*4*	54.5	*5.2*	*10*
Hartford, CT								
Retail price	$/gallon	2.95	3.47	*0.53*	*18*	3.78	*0.31*	*9*
Coop Class I price	$/gallon	1.39	1.67	*0.28*	*20*	1.99	*0.31*	*19*
Farm-to-retail margin	$/gallon	1.56	1.80	*0.24*	*15*	1.79	*-0.01*	*0*
Farm-to-retail margin	% of retail price	52.9	52.0	*-1.0*	*-2*	47.4	*-4.5*	*-9*
Farm sector share	% of retail price	47.1	48.0	*1.0*	*2*	52.6	*4.5*	*9*
Philadelphia, PA								
Retail price	$/gallon	2.87	3.47	*0.60*	*21*	4.08	*0.61*	*18*
Coop Class I price	$/gallon	1.44	1.74	*0.30*	*21*	2.10	*0.36*	*21*
Farm-to-retail margin	$/gallon	1.43	1.73	*0.30*	*21*	1.98	*0.25*	*15*
Farm-to-retail margin	% of retail price	49.9	50.0	*0.1*	*0*	48.5	*-1.5*	*-3*
Farm sector share	% of retail price	50.1	50.0	*-0.1*	*0*	51.5	*1.5*	*3*
Pittsburg, PA								
Retail price	$/gallon	2.74	3.38	*0.64*	*24*	3.98	*0.59*	*18*
Coop Class I price	$/gallon	1.37	1.68	*0.31*	*23*	2.07	*0.39*	*23*
Farm-to-retail margin	$/gallon	1.37	1.70	*0.33*	*24*	1.91	*0.20*	*12*
Farm-to-retail margin	% of retail price	50.2	50.5	*0.3*	*1*	48.1	*-2.5*	*-5*
Farm sector share	% of retail price	49.8	49.5	*-0.3*	*-1*	51.9	*2.5*	*5*
Washington, D.C.								
Retail price	$/gallon	2.92	3.67	*0.74*	*25*	3.82	*0.15*	*4*
Coop Class I price	$/gallon	1.43	1.68	*0.25*	*18*	1.97	*0.30*	*18*
Farm-to-retail margin	$/gallon	1.50	1.99	*0.49*	*33*	1.84	*-0.15*	*-8*
Farm-to-retail margin	% of retail price	51.3	54.3	*3.0*	*6*	48.3	*-6.0*	*-11*
Farm sector share	% of retail price	48.7	45.7	*-3.0*	*-6*	51.7	*6.0*	*13*
Baltimore, MD								
Retail price	$/gallon	2.82	3.46	*0.64*	*23*	3.43	*-0.03*	*-1*
Coop Class I price	$/gallon	1.43	1.68	*0.25*	*18*	1.97	*0.30*	*18*
Farm-to-retail margin	$/gallon	1.40	1.78	*0.39*	*28*	1.45	*-0.33*	*-18*
Farm-to-retail margin	% of retail price	49.5	51.5	*1.9*	*4*	42.4	*-9.0*	*-18*
Farm sector share	% of retail price	50.5	48.5	*-1.9*	*-4*	57.6	*9.0*	*19*

2). Federal Milk Marketing Order 33 "Mideast": *Table 2*

Pre-HR period (January 2000 – June 2003)

The <u>monthly average retail fluid whole milk price</u> (to be referred to as "retail price") is in the range of $2.71 per gallon (Cleveland) to $2.86 per gallon (Cincinnati). The <u>monthly average farm-to-retail margin expressed as a percentage of the retail price</u> (to be referred to as "farm-to-retail margin") is in the range of 50.1% (Cleveland) to 53.5% (Detroit). The <u>monthly average farm sector share</u> (expressed as a percentage of the retail price) is in the range of 46.5% (Detroit) to 49.9% (Cleveland).

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, retail prices increase in all analyzed cities, except for Cincinnati. The retail price increase varies from 3% (Detroit) to 18% (Cleveland). The retail price decreases in Cincinnati by 6%. In the HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 3% (Cleveland) to 27% (Cincinnati). The farm sector share increase is in the range of 3% (Cleveland) to 29% (Cincinnati).

In the HR period, retail prices are in the range of $2.69 per gallon (Cincinnati) to $3.18 per gallon (Cleveland). The farm-to-retail margin is in the range of 38.1% (Cincinnati) to 48.5% (Cleveland). The farm sector share is in the range of 51.5% (Cleveland) to 61.9% (Cincinnati).

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, retail prices increase in all analyzed cities. The retail price increase varies from 3% (Detroit) to 12% (Indianapolis). In the post-HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 11% (Indianapolis) to 28% (Cincinnati). The farm sector share increase is in the range of 10% (Indianapolis) to 20% (Detroit).

In the post-HR period, retail prices are in the range of $2.80 per gallon (Cincinnati) to $3.42 per gallon (Indianapolis). The farm-to-retail margin is in the range of 27.5% (Cincinnati) to 41.2% (Indianapolis). The farm sector share is in the range of 58.8% (Indianapolis) to 72.5% (Cincinnati).

Table 2. FMMO 33 "Mideast": Averages for Retail Fluid Whole Milk Prices, Class I Milk Prices, Farm-to-Retail Margins, and Farm Sector Shares for the Periods Prior, During, and After the Herd Retirement (HR) Program (2000-2012).

City	Unit	Pre-HR period (01/2000-06/2003)	HR period (07/2003-12/2010)	HR period, relative to pre-HR period		Post-HR period (01/2011-12/2012)	Post-HR period, relative to HR period	
		Average	Average	*change in the Average*		Average	*change in the Average*	
				$/gallon or %-point	*%*		*$/gallon or %-point*	*%*
Indianapolis, IN								
Retail price	$/gallon	2.77	3.06	*0.29*	*10*	3.42	*0.36*	*12*
Coop Class I price	$/gallon	1.36	1.64	*0.28*	*20*	2.01	*0.37*	*22*
Farm-to-retail margin	$/gallon	1.41	1.42	*0.01*	*1*	1.42	*0.00*	*0*
Farm-to-retail margin	% of retail price	50.7	46.3	*-4.4*	*-9*	41.2	*-5.2*	*-11*
Farm sector share	% of retail price	49.3	53.7	*4.4*	*9*	58.8	*5.2*	*10*
Detroit, MI								
Retail price	$/gallon	2.77	2.87	*0.09*	*3*	2.95	*0.08*	*3*
Coop Class I price	$/gallon	1.29	1.62	*0.33*	*26*	1.99	*0.37*	*23*
Farm-to-retail margin	$/gallon	1.49	1.25	*-0.24*	*-16*	0.96	*-0.29*	*-23*
Farm-to-retail margin	% of retail price	53.5	43.6	*-9.9*	*-18*	32.6	*-11.1*	*-25*
Farm sector share	% of retail price	46.5	56.4	*9.9*	*21*	67.4	*11.1*	*20*
Cleveland, OH								
Retail price	$/gallon	2.71	3.18	*0.48*	*18*	3.39	*0.21*	*6*
Coop Class I price	$/gallon	1.35	1.64	*0.29*	*22*	2.01	*0.37*	*22*
Farm-to-retail margin	$/gallon	1.36	1.54	*0.18*	*13*	1.38	*-0.16*	*-10*
Farm-to-retail margin	% of retail price	50.1	48.5	*-1.6*	*-3*	40.7	*-7.8*	*-16*
Farm sector share	% of retail price	49.9	51.5	*1.6*	*3*	59.3	*7.8*	*15*
Cincinnati, OH								
Retail price	$/gallon	2.86	2.69	*-0.18*	*-6*	2.80	*0.11*	*4*
Coop Class I price	$/gallon	1.37	1.66	*0.29*	*21*	2.02	*0.37*	*22*
Farm-to-retail margin	$/gallon	1.50	1.03	*-0.47*	*-31*	0.77	*-0.25*	*-25*
Farm-to-retail margin	% of retail price	52.2	38.1	*-14.1*	*-27*	27.5	*-10.6*	*-28*
Farm sector share	% of retail price	47.8	61.9	*14.1*	*29*	72.5	*10.6*	*17*

3). Federal Milk Marketing Order 30 "Upper Midwest": *Table 3*

Pre-HR period (January 2000 – June 2003)

The monthly average retail fluid whole milk price (to be referred to as "retail price") is in the range of $2.42 per gallon (Milwaukee) to $3.15 per gallon (Chicago). The monthly average farm-to-retail margin expressed as a percentage of the retail price (to be referred to as "farm-to-retail margin") is in the range of 44.3% (Milwaukee) to 58.7% (Minneapolis). The monthly average farm sector share (expressed as a percentage of the retail price) is in the range of 41.3% (Minneapolis) to 55.7% (Milwaukee).

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, retail prices increase in all analyzed cities. The retail price increase varies from 15% (Chicago) to 47% (Milwaukee). In the HR period, the farm-to-retail margin decreases in Minneapolis and Chicago by 1% and 5%, respectively, and increases in Milwaukee by 20%. The farm sector share increases in Minneapolis and Chicago by 2% and 7%, respectively, and decreases in Milwaukee by 16%.

In the HR period, retail prices are in the range of $3.56 per gallon (Milwaukee) to $3.77 per gallon (Minneapolis). The farm-to-retail margin is in the range of 53.2% (Milwaukee) to 58% (Minneapolis). The farm sector share is in the range of 42% (Minneapolis) to 46.8% (Milwaukee).

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, retail prices increase in all analyzed cities. The retail price increase varies from 4% (Minneapolis) to 9% (Chicago). In the post-HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 10% (Chicago) to 13% (Minneapolis). The farm sector share increase is in the range of 12% (Chicago) to 17% (Minneapolis).

In the pos-HR period, retail prices are in the range of $3.84 per gallon (Milwaukee) to $3.96 per gallon (Chicago). The farm-to-retail margin is in the range of 47.2% (Milwaukee) to 50.7% (Minneapolis). The farm sector share is in the range of 49.3% (Minneapolis) to 52.8% (Milwaukee).

Table 3. FMMO 30 "Upper Midwest": Averages for Retail Fluid Whole Milk Prices, Class I Milk Prices, Farm-to-Retail Margins, and Farm Sector Shares for the Periods Prior, During, and After the Herd Retirement (HR) Program (2000-2012).

City	Unit	Pre-HR period (01/2000-06/2003)	HR period (07/2003-12/2010)	HR period, relative to pre-HR period		Post-HR period (01/2011-12/2012)	Post-HR period, relative to HR period	
		Average	Average	*change in the Average*		Average	*change in the Average*	
				$/gallon or %-point	*%*		*$/gallon or %-point*	*%*
Minneapolis, MN								
Retail price	$/gallon	3.14	3.77	*0.64*	*20*	3.92	*0.14*	*4*
Coop Class I price	$/gallon	1.29	1.59	*0.29*	*23*	1.93	*0.34*	*22*
Farm-to-retail margin	$/gallon	1.84	2.19	*0.35*	*19*	1.99	*-0.20*	*-9*
Farm-to-retail margin	% of retail price	58.7	58.0	*-0.6*	*-1*	50.7	*-7.3*	*-13*
Farm sector share	% of retail price	41.3	42.0	*0.6*	*2*	49.3	*7.3*	*17*
Milwaukee, WI								
Retail price	$/gallon	2.42	3.56	*1.14*	*47*	3.84	*0.28*	*8*
Coop Class I price	$/gallon	1.35	1.66	*0.31*	*23*	2.03	*0.37*	*22*
Farm-to-retail margin	$/gallon	1.07	1.90	*0.83*	*77*	1.81	*-0.09*	*-5*
Farm-to-retail margin	% of retail price	44.3	53.2	*8.9*	*20*	47.2	*-6.0*	*-11*
Farm sector share	% of retail price	55.7	46.8	*-8.9*	*-16*	52.8	*6.0*	*13*
Chicago, IL								
Retail price	$/gallon	3.15	3.63	*0.48*	*15*	3.96	*0.33*	*9*
Coop Class I price	$/gallon	1.35	1.66	*0.32*	*24*	2.04	*0.37*	*22*
Farm-to-retail margin	$/gallon	1.81	1.97	*0.16*	*9*	1.92	*-0.04*	*-2*
Farm-to-retail margin	% of retail price	57.3	54.1	*-3.1*	*-5*	48.6	*-5.6*	*-10*
Farm sector share	% of retail price	42.7	45.9	*3.1*	*7*	51.4	*5.6*	*12*

4). Federal Milk Marketing Order 32 "Central": *Table 4*

Pre-HR period (January 2000 – June 2003)

The <u>monthly average retail fluid whole milk price</u> (to be referred to as "retail price") is in the range of $2.81 per gallon (Oklahoma City) to $3.30 per gallon (Denver). The <u>monthly average farm-to-retail margin expressed as a percentage of the retail price</u> (to be referred to as "farm-to-retail margin") is in the range of 51.6% (Oklahoma City) to 60.1% (Denver). The <u>monthly average farm sector share</u> (expressed as a percentage of the retail price) is in the range of 39.9% (Denver) to 48.4% (Oklahoma City).

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, retail prices increase in all analyzed cities. The retail price increase varies from 1% (Denver) to 25% (Kansas City). In the HR period, the farm-to-retail margin decreases in all cities, except for Kansas City. The margin decrease is in the range of 3% (Oklahoma City) to 14% (Denver). The margin increases in Kansas City by 4%. In the HR period, the farm sector share increases in all cities, except for Kansas City. The farm sector share increase is in the range of 4% (Oklahoma City) to 21% (Denver). The farm sector share decreases in Kansas City by 4%.

In the HR period, retail prices are in the range of $3.19 per gallon (St Louis) to $3.54 per gallon (Kansas City). The farm-to-retail margin is in the range of 49.8% (St Louis) to 55.4% (Kansas City). The farm sector share is in the range of 44.6% (Kansas City) to 50.2% (St Louis).

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, retail prices increase in all analyzed cities, except for Denver. The retail price increase varies from 9% (St Louis) to 23% (Oklahoma City). The retail price decreases in Denver by 7%. In the post-HR period, the farm-to-retail margin decreases in all cities, except for Oklahoma City. The margin decrease is in the range of 2% (Kansas City) to 25% (Denver). The margin increases in Oklahoma City by 1%. In the post-HR period, the farm sector share increases in all cities, except for Oklahoma City. The farm sector share increase is in the range of 3% (Kansas City) to 26% (Denver). The farm sector share decreases in Oklahoma City by 1%.

In the post-HR period, retail prices are in the range of $3.13 per gallon (Denver) to $4.23 per gallon (Kansas City). The farm-to-retail margin is in the range of 38.8% (Denver) to 54.2% (Kansas City). The farm sector share is in the range of 45.8% (Kansas City) to 61.2% (Denver).

Table 4. FMMO 32 "Central": Averages for Retail Fluid Whole Milk Prices, Class I Milk Prices, Farm-to-Retail Margins, and Farm Sector Shares for the Periods Prior, During, and After the Herd Retirement (HR) Program (2000-2012).

City	Unit	Pre-HR period (01/2000-06/2003)	HR period (07/2003-12/2010)	*HR period, relative to pre-HR period*		Post-HR period (01/2011-12/2012)	*Post-HR period, relative to HR period*	
		Average	Average	*change in the Average*		Average	*change in the Average*	
				$/gallon or %-point	*%*		*$/gallon or %-point*	*%*
Omaha, NE								
Retail price	$/gallon	2.93	3.28	*0.35*	*12*	3.89	*0.61*	*19*
Coop Class I price	$/gallon	1.29	1.58	*0.29*	*22*	1.94	*0.36*	*23*
Farm-to-retail margin	$/gallon	1.64	1.69	*0.06*	*3*	1.95	*0.25*	*15*
Farm-to-retail margin	% of retail price	55.9	51.9	*-4.1*	*-7*	50.1	*-1.8*	*-4*
Farm sector share	% of retail price	44.1	48.1	*4.1*	*9*	49.9	*1.8*	*4*
Oklahoma City, OK								
Retail price	$/gallon	2.81	3.25	*0.44*	*16*	3.99	*0.74*	*23*
Coop Class I price	$/gallon	1.36	1.62	*0.26*	*19*	1.98	*0.36*	*22*
Farm-to-retail margin	$/gallon	1.45	1.63	*0.18*	*12*	2.01	*0.38*	*23*
Farm-to-retail margin	% of retail price	51.6	49.9	*-1.7*	*-3*	50.5	*0.5*	*1*
Farm sector share	% of retail price	48.4	50.1	*1.7*	*4*	49.5	*-0.5*	*-1*
Denver, CO								
Retail price	$/gallon	3.30	3.34	*0.05*	*1*	3.13	*-0.22*	*-7*
Coop Class I price	$/gallon	1.31	1.58	*0.27*	*21*	1.91	*0.32*	*20*
Farm-to-retail margin	$/gallon	1.98	1.76	*-0.22*	*-11*	1.22	*-0.54*	*-31*
Farm-to-retail margin	% of retail price	60.1	51.5	*-8.5*	*-14*	38.8	*-12.7*	*-25*
Farm sector share	% of retail price	39.9	48.5	*8.5*	*21*	61.2	*12.7*	*26*
St Louis, MO								
Retail price	$/gallon	3.03	3.19	*0.16*	*5*	3.49	*0.29*	*9*
Coop Class I price	$/gallon	1.33	1.61	*0.28*	*21*	1.96	*0.35*	*22*
Farm-to-retail margin	$/gallon	1.71	1.58	*-0.12*	*-7*	1.52	*-0.06*	*-4*
Farm-to-retail margin	% of retail price	56.3	49.8	*-6.5*	*-12*	43.7	*-6.1*	*-12*
Farm sector share	% of retail price	43.7	50.2	*6.5*	*15*	56.3	*6.1*	*12*
Kansas City, MO								
Retail price	$/gallon	2.83	3.54	*0.71*	*25*	4.23	*0.68*	*19*
Coop Class I price	$/gallon	1.32	1.59	*0.27*	*20*	1.94	*0.35*	*22*
Farm-to-retail margin	$/gallon	1.51	1.96	*0.44*	*29*	2.29	*0.33*	*17*
Farm-to-retail margin	% of retail price	53.5	55.4	*1.9*	*4*	54.2	*-1.2*	*-2*
Farm sector share	% of retail price	46.5	44.6	*-1.9*	*-4*	45.8	*1.2*	*3*

5). Federal Milk Marketing Orders 5 "Appalachian", 6 "Florida" and 7 "Southeast": *Table 5*

Pre-HR period (January 2000 – June 2003)

The <u>monthly average retail fluid whole milk price</u> (to be referred to as "retail price") is in the range of $2.59 per gallon (Louisville) to $3.39 per gallon (New Orleans). The <u>monthly average farm-to-retail margin expressed as a percentage of the retail price</u> (to be referred to as "farm-to-retail margin") is in the range of 46.3% (Miami) to 57.6% (New Orleans). The <u>monthly average farm sector share</u> (expressed as a percentage of the retail price) is in the range of 42.4% (New Orleans) to 53.7% (Miami).

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, retail prices increase in all analyzed cities. The retail price increase varies from 10% (Atlanta) to 20% (New Orleans). In the HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 3% (New Orleans) to 12% (Atlanta). The farm sector share increase is in the range of 4% (Miami and New Orleans) to 14% (Atlanta).

In the HR period, retail prices are in the range of $3.02 per gallon (Louisville) to $4.05 per gallon (New Orleans). The farm-to-retail margin is in the range of 44.2% (Miami) to 55.7% (New Orleans). The farm sector share is in the range of 44.3% (New Orleans) to 55.8% (Miami).

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, retail prices increase in all analyzed cities. The retail price increase varies from 3% (Louisville) to 12% (Atlanta). In the post-HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 5% (New Orleans) to 24% (Louisville). The farm sector share increase is in the range of 6% (New Orleans) to 19% (Louisville).

In the post-HR period, retail prices are in the range of $3.10 per gallon (Louisville) to $4.49 per gallon (New Orleans). The farm-to-retail margin is in the range of 34% (Louisville) to 53.1% (New Orleans). The farm sector share is in the range of 46.9% (New Orleans) to 66% (Louisville).

Table 5. FMMOs 5 "Appalachian", 6 "Florida" and 7 "Southeast": Averages for Retail Fluid Whole Milk Prices, Class I Milk Prices, Farm-to-Retail Margins, and Farm Sector Shares for the Periods Prior, During, and After the Herd Retirement (HR) Program (2000-2012).

City	Unit	Pre-HR period (01/2000-06/2003) Average	HR period (07/2003-12/2010) Average	HR period, relative to pre-HR period change in the Average		Post-HR period (01/2011-12/2012) Average	Post-HR period, relative to HR period change in the Average	
				$/gallon or %-point	*%*		*$/gallon or %-point*	*%*
Miami, FL (FMMO 6)								
Retail price	$/gallon	3.04	3.55	*0.50*	*17*	3.81	*0.26*	*7*
Coop Class I price	$/gallon	1.63	1.98	*0.35*	*21*	2.45	*0.47*	*24*
Farm-to-retail margin	$/gallon	1.41	1.57	*0.16*	*11*	1.36	*-0.21*	*-13*
Farm-to-retail margin	% of retail price	46.3	44.2	*-2.1*	*-5*	35.8	*-8.5*	*-19*
Farm sector share	% of retail price	53.7	55.8	*2.1*	*4*	64.2	*8.5*	*15*
Atlanta, GA (FMMO 7)								
Retail price	$/gallon	3.07	3.37	*0.31*	*10*	3.79	*0.41*	*12*
Coop Class I price	$/gallon	1.42	1.78	*0.35*	*25*	2.18	*0.40*	*23*
Farm-to-retail margin	$/gallon	1.65	1.60	*-0.05*	*-3*	1.60	*0.01*	*1*
Farm-to-retail margin	% of retail price	53.6	47.1	*-6.5*	*-12*	42.4	*-4.8*	*-10*
Farm sector share	% of retail price	46.4	52.9	*6.5*	*14*	57.6	*4.8*	*9*
New Orleans, LA (FMMO 7)								
Retail price	$/gallon	3.39	4.05	*0.66*	*20*	4.49	*0.44*	*11*
Coop Class I price	$/gallon	1.44	1.79	*0.36*	*25*	2.10	*0.31*	*17*
Farm-to-retail margin	$/gallon	1.95	2.25	*0.30*	*15*	2.39	*0.13*	*6*
Farm-to-retail margin	% of retail price	57.6	55.7	*-1.8*	*-3*	53.1	*-2.7*	*-5*
Farm sector share	% of retail price	42.4	44.3	*1.8*	*4*	46.9	*2.7*	*6*
Louisville, KY (FMMO 5)								
Retail price	$/gallon	2.59	3.02	*0.43*	*17*	3.10	*0.08*	*3*
Coop Class I price	$/gallon	1.32	1.67	*0.36*	*27*	2.04	*0.37*	*22*
Farm-to-retail margin	$/gallon	1.27	1.34	*0.07*	*6*	1.05	*-0.29*	*-22*
Farm-to-retail margin	% of retail price	49.0	44.5	*-4.6*	*-9*	34.0	*-10.5*	*-24*
Farm sector share	% of retail price	51.0	55.5	*4.6*	*9*	66.0	*10.5*	*19*

6). Federal Milk Marketing Orders 124 "Pacific Northwest", 126 "Southwest", and 131 "Arizona": *Table 6*

6.1. Houston, Dallas, and Phoenix

Pre-HR period (January 2000 – June 2003)

The <u>monthly average retail fluid whole milk price</u> (to be referred to as "retail price") is in the range of $2.74 per gallon (Dallas) to $2.96 per gallon (Phoenix). The <u>monthly average farm-to-retail margin expressed as a percentage of the retail price</u> (to be referred to as "farm-to-retail margin") is in the range of 50% (Dallas) to 57.8% (Phoenix). The <u>monthly average farm sector share</u> (expressed as a percentage of the retail price) is in the range of 42.2% (Phoenix) to 50% (Dallas).

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, retail prices increase in all analyzed cities. The retail price increase varies from 7% (Dallas) to 16% (Phoenix). In the HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 2% (Phoenix) to 15% (Dallas). The farm sector share increase is in the range of 3% (Phoenix) to 15% (Dallas).

In the HR period, retail prices are in the range of $2.93 per gallon (Dallas) to $3.44 per gallon (Phoenix). The farm-to-retail margin is in the range of 42.3% (Dallas) to 56.4% (Phoenix). The farm sector share is in the range of 43.6% (Phoenix) to 57.7% (Dallas).

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, retail prices decrease in Dallas and Phoenix by 6% and 2%, respectively, and increase in Houston by 10%. In the post-HR period, the farm-to-retail margin decreases, and the farm sector share increases in all analyzed cities. The margin decrease is in the range of 9% (Houston) to 32% (Dallas). The farm sector share increase is in the range of 8% (Houston) to 24% (Phoenix).

In the post-HR period, retail prices are in the range of $2.76 per gallon (Dallas) to $3.59 per gallon (Houston). The farm-to-retail margin is in the range of 28.8% (Dallas) to 46% (Phoenix). The farm sector share is in the range of 54% (Phoenix) to 71.2% (Dallas).

6.2. Seattle

Pre-HR period (January 2000 – June 2003)
The <u>monthly average retail fluid whole milk price</u> (to be referred to as "retail price") is $3.64 per gallon. The <u>monthly average farm-to-retail margin expressed as a percentage of the retail price</u> is 65.8%. The <u>monthly average farm sector share</u> (expressed as a percentage of the retail price) is 34.2%.

HR period (July 2003 – December 2010)

In the HR period, as compared to the pre-HR period, the retail price decreases by 6%. The farm-to-retail margin decreases by 14%, and the farm sector share increases by 26%. In the HR period, the retail price is $3.44 per gallon, the farm-to-retail margin is 56.9%, and the farm sector share is 43.1%.

Post-HR period (January 2011 – December 2012)

In the post-HR period, as compared to the HR period, the retail price decreases by 8%. The farm-to-retail margin decreases by 24%, and the farm sector share increases by 32%. In the HR period, the retail price is $3.16 per gallon, the farm-to-retail margin is 43%, and the farm sector share is 57%.

Table 6. FMMOs 124 "Pacific Northwest", 126 "Southwest", and 131 "Arizona": Averages for Retail Fluid Whole Milk Prices, Class I Milk Prices, Farm-to-Retail Margins, and Farm Sector Shares for the Periods Prior, During, and After the Herd Retirement (HR) Program (2000-2012).

City	Unit	Pre-HR period (01/2000-06/2003)	HR period (07/2003-12/2010)	*HR period, relative to pre-HR period*		Post-HR period (01/2011-12/2012)	*Post-HR period, relative to HR period*	
		Average	Average	*change in the Average*		Average	*change in the Average*	
				$/gallon or %-point	*%*		*$/gallon or %-point*	*%*
Houston, TX (FMMO 126)								
Retail price	$/gallon	2.95	3.26	*0.32*	*11*	3.59	*0.32*	*10*
Coop Class I price	$/gallon	1.42	1.70	*0.29*	*20*	2.03	*0.33*	*19*
Farm-to-retail margin	$/gallon	1.53	1.56	*0.03*	*2*	1.56	*0.00*	*0*
Farm-to-retail margin	% of retail price	51.9	47.6	*-4.3*	*-8*	43.3	*-4.3*	*-9*
Farm sector share	% of retail price	48.1	52.4	*4.3*	*9*	56.7	*4.3*	*8*
Dallas, TX (FMMO 126)								
Retail price	$/gallon	2.74	2.93	*0.18*	*7*	2.76	*-0.17*	*-6*
Coop Class I price	$/gallon	1.37	1.65	*0.28*	*21*	1.94	*0.29*	*18*
Farm-to-retail margin	$/gallon	1.38	1.28	*-0.10*	*-7*	0.82	*-0.46*	*-36*
Farm-to-retail margin	% of retail price	50.0	42.3	*-7.7*	*-15*	28.8	*-13.5*	*-32*
Farm sector share	% of retail price	50.0	57.7	*7.7*	*15*	71.2	*13.5*	*23*
Phoenix, AZ (FMMO 131)								
Retail price	$/gallon	2.96	3.44	*0.47*	*16*	3.37	*-0.07*	*-2*
Coop Class I price	$/gallon	1.25	1.50	*0.25*	*20*	1.82	*0.32*	*21*
Farm-to-retail margin	$/gallon	1.71	1.94	*0.22*	*13*	1.55	*-0.39*	*-20*
Farm-to-retail margin	% of retail price	57.8	56.4	*-1.4*	*-2*	46.0	*-10.4*	*-18*
Farm sector share	% of retail price	42.2	43.6	*1.4*	*3*	54.0	*10.4*	*24*
Seattle, WA (FMMO 124)								
Retail price	$/gallon	3.64	3.44	*-0.20*	*-6*	3.16	*-0.28*	*-8*
Coop Class I price	$/gallon	1.25	1.48	*0.24*	*19*	1.80	*0.32*	*22*
Farm-to-retail margin	$/gallon	2.40	1.96	*-0.44*	*-18*	1.36	*-0.60*	*-31*
Farm-to-retail margin	% of retail price	65.8	56.9	*-9.0*	*-14*	43.0	*-13.9*	*-24*
Farm sector share	% of retail price	34.2	43.1	*9.0*	*26*	57.0	*13.9*	*32*

Appendix III. Estimation Results

Table 1. FMMO 1 "Northeast": Retail Fluid Whole Milk Pricing in the Periods Prior and During the Herd Retirement (HR) Program (2000-2010) *The OLS Estimation Results.*

Variable	Interpretation	Boston, MA		Hartford, CT		Philadelphia, PA		Pittsburg, PA		Baltimore		Washington, DC	
		Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coef.	T-ratio
Pre-HR period (01/2000-06/2003)													
Constant	FAM: α_0	2.58*	28.44	2.63*	24.91	1.96*	28.74	1.57*	18.01	2.15*	22.44	2.39*	23.10
FP	**CPT: β_0**	**0.26***	4.32	**0.23***	3.35	**0.63***	13.15	**0.86***	14.35	**0.47***	7.24	**0.37***	4.97
Change between the pre-HR and HR periods													
HR	change in FAM: γ_0	-0.60*	-3.39	-0.62*	-2.76	-0.43*	-3.35	0.11	0.52	0.12	0.45	0.02	0.07
FP*HR	change in CPT: μ_0	0.58*	5.72	0.65*	5.00	0.48*	6.29	0.16[a]	1.33	0.24[a]	1.50	0.38*	3.04
HR period (07/2003-12/2010)													
Constant+HR	FAM: $(\alpha_0+\gamma_0)$	1.98*	13.16	2.00*	10.09	1.53*	14.11	1.68*	8.85	2.27*	8.86	2.41*	12.59
FP+FP*HR	**CPT: $(\beta_0+\mu_0)$**	**0.84***	10.22	**0.88***	8.11	**1.11***	18.57	**1.02***	9.79	**0.71***	4.85	**0.75***	7.43
R2		75%		76%		90%		82%		67%		77%	

Number of observations is 132. FAM is a fixed absolute markup. CPT is a cost pass-through.

T-ratios are calculated using autocorrelation-adjusted standard errors based on Newey-West approach.

[*] The estimated coefficient (EC) is statistically significant from zero at the 10% significant level using a two-tailed T-test. Ho: EC=0, and Ha: EC≠0; the T statistic rejection regions are (-∞; -1.65] and [1.65; +∞).

[a] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC>0; the T statistic rejection region is [1.28; +∞).

[b] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC<0; the T statistic rejection region is (-∞; -1.28].

Table 2. FMMO 33 "Mideast": Retail Fluid Whole Milk Pricing in the Periods Prior and During the Herd Retirement (HR) Program (2000-2010) *The OLS Estimation Results.*

Variable	Interpretation	Detroit, MI		Cleveland, OH		Cincinnati, OH	
		Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio
Pre-HR period (01/2000-06/2003)							
Constant	FAM: α_0	2.28*	4.90	2.44*	9.73	2.87*	13.68
FP	**CPT: β_0**	**0.38**	1.05	**0.20**	1.07	**0.00**	-0.01
Change between the pre-HR and HR periods							
HR	change in FAM: γ_0	-0.85*	-1.68	-0.63*	-2.06	-1.00*	-3.73
FP*HR	change in CPT: μ_0	0.50ᵃ	1.31	0.64*	3.04	0.49*	2.85
HR period (07/2003-12/2010)							
Constant+HR	FAM: $(\alpha_0+\gamma_0)$	1.43*	7.28	1.81*	10.46	1.87*	11.33
FP+FP*HR	**CPT: $(\beta_0+\mu_0)$**	**0.89***	7.15	**0.83***	8.21	**0.49***	5.16
R2		43%		64%		32%	

Number of observations is 132. FAM is a fixed absolute markup. CPT is a cost pass-through.

T-ratios are calculated using autocorrelation-adjusted standard errors based on Newey-West approach.

[*] The estimated coefficient (EC) is statistically significant from zero at the 10% significant level using a two-tailed T-test. Ho: EC=0, and Ha: EC≠0; the T statistic rejection regions are (-∞; -1.65] and [1.65; +∞).

[a] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC>0; the T statistic rejection region is [1.28; +∞).

[b] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC<0; the T statistic rejection region is (-∞; -1.28].

Table 3. FMMO 30 "Upper Midwest": Retail Fluid Whole Milk Pricing in the Periods Prior and During the Herd Retirement (HR) Program (2000-2010) *The OLS Estimation Results.*

Variable	Interpretation	Chicago, IL		Milwaukee, WI		Minneapolis, MN	
		Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio
Pre-HR period (01/2000-06/2003)							
Constant	FAM: α_0	2.35*	7.92	2.04*	26.21	3.15*	17.88
FP	**CPT: β_0**	**0.60***	3.01	**0.28***	5.03	**-0.01**	-0.09
Change between the pre-HR and HR periods							
HR	change in FAM: γ_0	0.53[a]	1.40	0.56*	1.72	-0.41[b]	-1.59
FP*HR	change in CPT: μ_0	-0.14	-0.62	0.30*	1.66	0.66*	3.59
HR period (07/2003-12/2010)							
Constant+HR	FAM: $(\alpha_0+\gamma_0)$	2.87*	12.15	2.60*	8.38	2.75*	15.04
FP+FP*HR	**CPT: $(\beta_0+\mu_0)$**	**0.46***	3.65	**0.58***	3.47	**0.65***	5.44
R2		48%		79%		70%	

Number of observations is 132. FAM is a fixed absolute markup. CPT is a cost pass-through.

T-ratios are calculated using autocorrelation-adjusted standard errors based on Newey-West approach.

[*] The estimated coefficient (EC) is statistically significant from zero at the 10% significant level using a two-tailed T-test. Ho: EC=0, and Ha: EC≠0; the T statistic rejection regions are (-∞; -1.65] and [1.65; +∞).

[a] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC>0; the T statistic rejection region is [1.28; +∞).

[b] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC<0; the T statistic rejection region is (-∞; -1.28].

Table 4. FMMO 32 "Central": Retail Fluid Whole Milk Pricing in the Periods Prior and During the Herd Retirement (HR) Program (2000-2010) *The OLS Estimation Results.*

		Omaha, NE		Oklahoma City, OK		Denver, CO		St. Louis, MO		Kansas City, MO	
Variable	Interpretation	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio
Pre-HR period (01/2000-06/2003)											
Constant	FAM: α_0	1.78*	13.85	1.88*	4.92	3.37*	10.45	2.31*	43.63	1.96*	39.15
FP	CPT: β_0	**0.89***	9.57	**0.69***	2.60	**-0.06**	-0.25	**0.54***	14.46	**0.67***	20.77
Change between the pre-HR and HR periods											
HR	change in FAM: γ_0	-0.26[b]	-1.43	-1.27*	-2.76	-1.21*	-2.66	-0.76*	-5.46	-0.42*	-2.98
FP*HR	change in CPT: μ_0	0.22*	1.77	0.95*	3.12	0.80*	2.71	0.48*	5.34	0.60*	7.04
HR period (07/2003-12/2010)											
Constant+HR	FAM: $(\alpha_0+\gamma_0)$	1.52*	11.76	0.61*	2.32	2.16*	6.77	1.55*	12.19	1.54*	11.82
FP+FP*HR	CPT: $(\beta_0+\mu_0)$	**1.11***	13.31	**1.63***	10.66	**0.74***	3.96	**1.02***	12.77	**1.26***	16.18
R2		82%		70%		12%		76%		90%	

Number of observations is 132. FAM is a fixed absolute markup. CPT is a cost pass-through.

T-ratios are calculated using autocorrelation-adjusted standard errors based on Newey-West approach.

[*] The estimated coefficient (EC) is statistically significant from zero at the 10% significant level using a two-tailed T-test. Ho: EC=0, and Ha: EC≠0; the T statistic rejection regions are (-∞; -1.65] and [1.65; +∞).

[a] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC>0; the T statistic rejection region is [1.28; +∞).

[b] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC<0; the T statistic rejection region is (-∞; -1.28].

Table 5. FMMO 5 "Appalachian", 6 "Florida" and 7 "Southeast": Retail Fluid Whole Milk Pricing in the Periods Prior and During the Herd Retirement (HR) Program (2000-2010) *The OLS Estimation Results.*

Variable	Interpretation	Atlanta, GA		New Orleans, LA		Louisville, KY		Miami, FL	
		Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio	Est. Coeff.	T-ratio
Pre-HR period (01/2000-06/2003)									
Constant	FAM: α_0	2.55*	8.39	2.28*	6.07	2.76*	24.07	2.35*	18.65
FP	**CPT: β_0**	**0.36***	1.74	**0.77***	3.17	**-0.13**[b]	-1.58	**0.43***	5.63
Change between the pre-HR and HR periods									
HR	change in FAM: γ_0	-1.07*	-2.80	0.32	0.72	-1.32*	-5.40	-0.95*	-4.59
FP*HR	change in CPT: μ_0	0.70*	2.80	0.04	0.13	1.08*	6.78	0.66*	5.70
HR period (07/2003-12/2010)									
Constant+HR	FAM: $(\alpha_0+\gamma_0)$	1.48*	6.46	2.60*	10.44	1.44*	6.64	1.40*	8.61
FP+FP*HR	**CPT: $(\beta_0+\mu_0)$**	**1.06***	7.72	**0.81***	6.05	0.94*	**6.99**	**1.08***	12.44
R2		54%		70%		63%		83%	

Number of observations is 132. FAM is a fixed absolute markup. CPT is a cost pass-through.

T-ratios are calculated using autocorrelation-adjusted standard errors based on Newey-West approach.

[*] The estimated coefficient (EC) is statistically significant from zero at the 10% significant level using a two-tailed T-test. Ho: EC=0, and Ha: EC≠0; the T statistic rejection regions are (-∞; -1.65] and [1.65; +∞).

[a] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC>0; the T statistic rejection region is [1.28; +∞).

[b] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC<0; the T statistic rejection region is (-∞; -1.28].

Table 6. FMMO 124 "Pacific Northwest", 126 "Southwest", and 131 "Arizona": Retail Fluid Whole Milk Pricing in the Periods Prior and During the Herd Retirement (HR) Program (2000-2010) *The OLS Estimation Results.*

		Houston, TX		Dallas, TX		Phoenix, AZ		Seattle, WA	
Variable	Interpretation	Est. Coef.	T-ratio	Est. Coef.	T-ratio	Est. Coef.	T-ratio	Est. Coef.	T-ratio
Pre-HR period (01/2000-06/2003)									
Constant	FAM: α_0	2.32*	13.31	1.73*	4.78	2.92*	23.48	3.02*	24.29
FP	**CPT: β_0**	**0.44***	3.67	**0.74***	3.04	**0.03**	0.32	**0.50***	4.99
Change between the pre-HR and HR periods									
HR	change in FAM: γ_0	-0.49[b]	-1.63	-0.07	-0.15	-0.55*	-2.47	-0.09	-0.39
FP*HR	change in CPT: μ_0	0.40*	2.24	0.03	0.08	0.68*	4.60	-0.16	-0.95
HR period (07/2003-12/2010)									
Constant+HR	FAM: $(\alpha_0+\gamma_0)$	1.83*	7.41	1.65*	4.92	2.37*	12.95	2.94*	15.28
FP+FP*HR	**CPT: $(\beta_0+\mu_0)$**	**0.84***	6.38	**0.77***	3.63	**0.71***	6.68	**0.34***	2.65
R2		47%		20%		57%		21%	

Number of observations is 132. FAM is a fixed absolute markup. CPT is a cost pass-through.

T-ratios are calculated using autocorrelation-adjusted standard errors based on Newey-West approach.

[*] The estimated coefficient (EC) is statistically significant from zero at the 10% significant level using a two-tailed T-test. Ho: EC=0, and Ha: EC≠0; the T statistic rejection regions are (-∞; -1.65] and [1.65; +∞).

[a] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC>0; the T statistic rejection region is [1.28; +∞).

[b] The estimated coefficient (EC) is statistically significant from zero at the 10% significance level using a one-tailed T-test. Ho: EC=0, and Ha: EC<0; the T statistic rejection region is (-∞; -1.28].