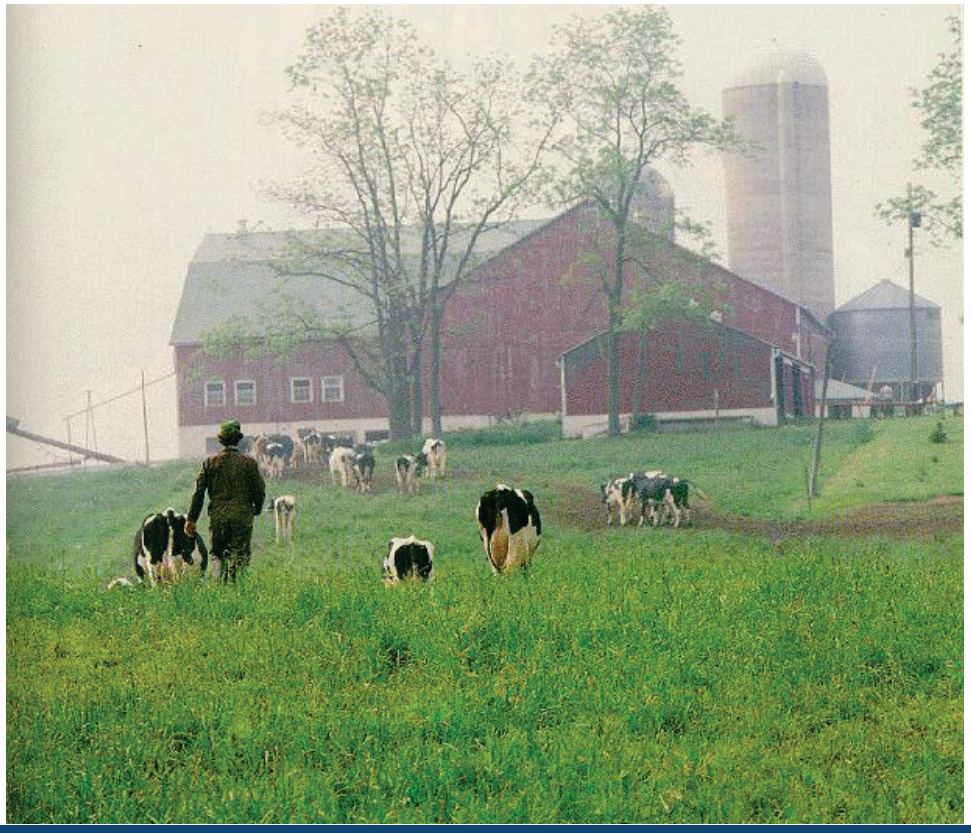

Economic Impact of Elimination of Pennsylvania's Minimum Milk Pricing System

For the Pennsylvania Milk Marketing Board

November 2023

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Abbreviations used in this study:

% = percent.
AMS = Agricultural Marketing Service
bil = billion.
coop= cooperative.
cwt = hundred pounds.
gal = gallon
lb = pound.
lbs = pounds.
MARS = Milk Accounting and Regulatory System.
mil = million.
NASS = National Agricultural Statistics Service
OOP = over-order premium.
PA = Pennsylvania.
PMMB = Pennsylvania Milk Marketing Board.
USDA = U.S. Department of Agriculture

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Executive Summary

The objective of this report is to present the results of a study on the economic impact of eliminating the Commonwealth's minimum milk pricing structure. More specifically, it explores what would happen if the Pennsylvania Milk Marketing Board (PMMB) no longer set a) minimum farm milk prices, b) an over-order premium on Class I milk produced, processed and sold in the state, and c) minimum wholesale and retail prices.

Pennsylvania is a unique dairy state in that it has a large population of close to 13 mil, is ranked as a top 10 dairy state in the U.S. (based on milk production) and is ranked #2 in terms of numbers of dairy farmers (see table 3.1, section 3). Also, Pennsylvania is unique in terms of the number and size of dairy processors in the state. For example, in 2023, the PMMB reported there were 41 licensed fluid milk processors in the state, six of which were cooperative-owned fluid processing plants. Other similar size states have fewer but larger fluid milk plants.

This study addressed the following research questions,

1. Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?
2. Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?
    a. If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?
3. Would the elimination of Pennsylvania's minimum milk pricing structure have an impact on rural communities and businesses?
4. How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?
5. How would the overall economy in Pennsylvania be impacted by elimination of its minimum milk pricing structure?

Section 1 introduces the study and an outline of the research methodologies to be utilized.

Section 2 provides an introduction to milk production, pricing, and processing in the state of Pennsylvania. Pennsylvania milk pricing law works in conjunction with federal order pricing. A minimum PMMB over-order premium (OOP) and a cooperative charge are set after a hearing process. The PMMB OOP and cooperative charge are in addition to minimum federal order Class I pricing that recognizes higher costs for Pennsylvania farmers and their cooperatives to service the fluid market. Pennsylvania law is unique in that minimum milk prices are set for producers, wholesalers (milk "dealers"), and retailers. The over-order premium and cooperative charge are included in the calculation of the wholesale price, and the wholesale price is included in the calculation of the retail price. **Some farmers benefit from dollars generated**

from the OOP, and processor/dealers and retailers are able to recoup their out-of-pocket costs via minimum state pricing.

Section 3 reviews Pennsylvania's milk production and processing. The state has many small dairy farms, as well as a diversity of processing. Pennsylvania produces just under 10 bil pounds of milk per year from over 474,000 cows and is ranked 8th in the U.S. in terms of milk production. Pennsylvania is also ranked second in the U.S. in terms of number of licensed farms at 5,200. The PMMB reported there are 41 licensed fluid milk processors in the state in 2023, six of which are cooperative-owned fluid processing plants. The balance of 35 are independent fluid processors. The state processes more milk and dairy products than are needed for in-state consumption. As a result, Pennsylvania exports a significant volume of milk to other states.

Section 4 introduces the complex world of milk pricing. The farm price of milk in Pennsylvania and surrounding markets is heavily influenced by federal milk marketing orders which set the "minimum" price of farm milk. In Pennsylvania the state mandated over-order premium is an addition to the farm price, but only applies to a subset of farm milk (milk produced, processed, and sold in the state for Class I fluid milk purposes). PMMB mandated minimum prices for retail milk sets a floor below which milk cannot be sold in the state, even if it is processed out of state and sold within Pennsylvania. Also, the PMMB minimum retail price does not set a ceiling. In fact, there are many retail outlets in Southeast Pennsylvania, primarily large and popular convenience stores, that since the COVID-19 pandemic have set retail prices $0.70 - $1.00/gal above state mandated minimum retail prices. Our analysis shows that retail prices as surveyed by USDA in Philadelphia and Pittsburgh are higher than surrounding urban markets, and the farm share of the retail price is lower. **However, if retail prices in Pennsylvania were set at the PMMB minimum retail price levels, fluid milk prices in Pennsylvania would be on par with surrounding states. Thus, our analysis indicates that PMMB minimum milk pricing did not result in higher retail milk prices in Pennsylvania than in surrounding markets for the period investigated.**

Section 5 reviews the key trends in U.S. fluid milk consumption since the 1960s. The findings are clear: every year since the 1970s the average U.S. resident consumed less packaged fluid milk. Another finding after a review of the literature is that fluid milk consumption is highly "inelastic." That means changes in retail prices have had very little impact on actual consumption; other factors drove that (less cereal consumption, greater competition, etc.). The U.S. trend towards reduced fluid milk consumption accelerated after 2009. Other trends after 2009 were: a) slightly more fluid milk consumption was organic, and b) there was a shift in consumption from lower fat to full fat milk. The section also reviewed industry consolidation for fluid milk processors since the 1960s. Most industry consolidation at the plant level was complete by the 1980s. Later, both Suiza Foods and Dean Foods in the 1990s went on a buying spree to consolidate ownership of fluid milk processing plants. Interestingly, this was also during a period of rapid decline in per capita fluid milk consumption. In the end, Suiza Foods acquired Dean Foods, and Dean Foods then ultimately ended up in bankruptcy. **This review of**

industry consolidation lays the foundation for a better understanding of trends facing the Pennsylvania dairy industry.

Sections 6 and 7 provide the economic modeling and analyses that are required to address the research questions posed for this study.

Question 1 – Would Pennsylvania Consumers Buy More Milk?

So, would Pennsylvania consumers buy more milk if minimum milk pricing in the state is eliminated? This question was addressed in section 6. The answer is yes, but the increase in consumption shown in our study results was very modest. A demand model was estimated to simulate per capita consumption of fluid milk in Pennsylvania. Once the demand model was estimated, an "alternative scenario" was constructed and simulated to examine the impact of eliminating Pennsylvania minimum milk pricing. The difference between the baseline and the scenario quantifies the policy impact.

Generally speaking, lower milk prices result in increased fluid milk consumption. A review of USDA monthly data on retail fluid milk prices by major city shows that since 2020 Philadelphia and Pittsburgh retail milk prices have been higher than in surrounding markets (see figure 4.1). **However, this study concludes that any fluctuations or increase in PMMB minimum milk pricing did not contribute to the post-pandemic rise in milk prices in these cities (see section 4.6).**

The study started with USDA's monthly estimates of U.S. per capita fluid milk consumption (whole, reduced fat, and other). This was assumed to be a proxy for Pennsylvania per capita consumption. To validate this proxy, we examined data from the Northeast federal order for fluid milk processing. The USDA data formed the "dependent variable." The other data required to estimate the model (independent variables) were the monthly retail fluid milk price for Philadelphia, the CPI index for all urban consumers in the Northeast (a measure of inflation), and Pennsylvania nominal per capita personal consumption expenditures in dollars (a measure of income).

The estimated models for per capita consumption of whole, reduced fat, and other milk for Pennsylvania were statistically significant. The signs for the retail milk price (own price elasticity) had the theoretically correct negative sign.

To simulate the impact of eliminating minimum milk pricing in Pennsylvania on fluid milk consumption, the models were rerun using a lower retail milk price to simulate the impact of eliminating minimum retail milk pricing and the impact of retail price wars. This study used the USDA retail milk prices for Baltimore, Maryland as a proxy that represents a milk price in a neighboring state that does not regulate minimum farm, wholesale, and retail milk prices. **The results indicate that the retail price of milk in Pennsylvania would decline 5.2%- 8.3% from the baseline if minimum pricing were eliminated, but consumption of fluid milk in Pennsylvania would increase only by a modest 1.3%, or an average of 23.3 mil lbs per year.**

Question 2 – Would Retail Outlets Engage in Bidding Wars?

The answer is yes, they would. Many retailers in the U.S. use milk as a "loss leader" to drive traffic to their stores and maximize sales. If minimum milk pricing in Pennsylvania is eliminated and retailers no longer have a floor on their retail prices, they would engage in competitive bidding between fluid milk suppliers (processors/dealers). Aggressive bidding would create pressure on fluid milk processors to lower their costs (and margins). This is reviewed in section 5.

Elimination of minimum milk pricing in Pennsylvania and an initiation of bidding wars between retailers and fluid milk processors/dealers would have a significant impact on fluid milk processing capacity in the state. To estimate this impact a survey of milk dealers was conducted, and financial data from select milk dealers were collected and analyzed.

The survey of Pennsylvania dealers/fluid milk processors was conducted in July 2023 by the PMMB. The survey asked dealers what impact elimination of minimum milk pricing in the state would have on their businesses. More than half of the respondents said their business would be negatively impacted if minimum milk pricing is eliminated. More specifically, the survey results indicate that 67% of diversified fluid milk processors (those who process non-milk products such as tea, lemonade, etc.), who accounted for 77% of all responses, felt that elimination of minimum milk pricing would make them financially vulnerable and force them out of business.

In addition to the survey study, a more quantitative approach was used to simulate the impact of eliminating minimum milk pricing in Pennsylvania on dealers/fluid milk processors. We examined financial data from a select group of processors that was supplied by the PMMB. These data are used by PMMB to quantify the cost buildup used in setting minimum wholesale and retail prices. The PMMB eliminated the identity of individual dealers for this study and supplied select financial data, production volume, and their calculation of the Ohlson O-score. The Ohlson O-score is a multi-factor financial formula used to predict the probability of financial stress and bankruptcy for individual companies.

The results of this analysis indicate that if minimum milk pricing regulations in Pennsylvania are eliminated, and if a retail bidding war erupted which causes reduced margins for all Pennsylvania dealers, roughly 57% of dealers and 66% of the volume of fluid milk processing in the state would be vulnerable to bankruptcy. We valued this processing loss at $542 mil from fluid processing, $138 mil from lost cream processing, and $37 mil from lost sour cream processing for a total direct loss of $717 mil.

Question 3 – How Would This Impact Rural Communities and Businesses?

A direct economic loss of $717 mil by fluid processors/dealers in Pennsylvania would have negative indirect economic impacts on dairy farmers, rural communities, and other businesses.

In section 6 we estimated that dairy farmers would lose $182 mil if 66% of the volume of fluid milk processing is lost due to bankruptcy caused by elimination of minimum milk pricing. Pennsylvania dairy farmers would lose over-order premiums ($18 mil), some would face higher hauling costs ($1.1 mil), and some would reduce their milk supply and lose markets entirely (Section 6). This would result in less economic activity for local communities and businesses. But that is only the tip of the iceberg.

In section 7 we derived impact multipliers from an IDFA study of the economic impact of the U.S. dairy industry.[1] That study is based on an Input-Output model called "IMPLAN." It traces the impacts of economic activity throughout an economy.

Our analysis indicates that the loss in fluid milk processing in Pennsylvania of $717 mil would result in an indirect or supplier loss to agriculture of $364 mil. The broader category "agriculture" includes not just milk production but also dairy cattle, feed, etc. And there would be other losses in rural communities. **Indirect losses on transportation, communication, mining, construction, manufacturing, finance, insurance, real estate, travel & entertainment, business & personal services, and government would total $934 mil**. Fluid processors purchase milk, hire labor, and purchase equipment and supplies. This has indirect or "supplier" impacts on the local economy. If fluid milk processors go bankrupt, this economic spending stops.

Question 4 – How Would Pennsylvania's Dairy Industry Be Impacted?

Section 3 reviews milk production and processing in Pennsylvania. The state is unique in terms of the large numbers of small family farmers, and large numbers of fluid milk processors/dealers. Smaller independent dairy farmers that supply fluid milk dealers in the state would be impacted the most if minimum milk pricing is eliminated. That is because the dollars from the PMMB's over-order premium are distributed to individual dairy farmers based on the proportion of fluid milk processing at the plant the dairy farmer ships their milk to. So, if an independent dairy farmer ships milk to a large fluid milk plant, the milk check would be impacted more than say farmers who supply milk to milk processors who have little fluid milk processing.

Section 5 reviewed the historical trends in fluid milk processing in the U.S. There are currently many more small fluid milk processing plants in the Commonwealth when compared to the U.S. totals and averages. While Pennsylvania has 341,369 residents per fluid milk plant processing on average 73 mil lbs of milk per year, the U.S. on average has 712,514 residents per fluid milk plant, processing an average 96 mil pounds per year.

The point is, if minimum milk pricing in Pennsylvania is eliminated and 66% of the volume of fluid milk processing in Pennsylvania is lost due to bankruptcy, the structure of the Pennsylvania dairy industry would undoubtedly change drastically. Fluid milk processors

[1] See John Dunham and Associates, "2023 Economic Impact Study."

would no longer be able to pay their farm milk suppliers an over-order premium above minimum federal order prices. There would be less milk production and fewer dairy farmers as the industry contracts, and less economic activity in rural communities. Businesses that supply dairy farmers and processors would be negatively affected**. And finally, a retail price war and contraction by fluid milk processors would likely result in fewer and larger remaining processing plants in Pennsylvania.**

Question 5 – How Would the Overall Pennsylvania Economy Be Impacted?

This is addressed in section 7 using the impact multipliers derived from the IDFA study on the U.S. dairy industry that was based on the IMPLAN model. That model, classified as an Input-Output model, quantifies the dollar flows between inputs and outputs across industries and sectors in a defined location and time frame. The model quantified economic activity across an economy by recognizing that a dollar injected into one sector is spent and re-spent in other sectors of the economy, generating waves and waves of economic activity. This is called the "economic multiplier effect." In this study we calculated these "multipliers" based on the IDFA industry study for Pennsylvania.

The total impact of reduced economic activity due to a $717 mil loss from fluid milk processors would not only have indirect or "supplier" impacts but would also result in "induced" impacts due to reductions in household spending. There are many jobs that are dependent on processing fluid milk in Pennsylvania that go well beyond those in a particular milk plant. The IMPLAN model traces all jobs related to direct economic activity. The IDFA model in particular identified all jobs related to dairy processing including those indirectly related such as dairy farmers, consultants (veterinarians and nutritionists), equipment suppliers, packaging companies, and others indirectly employed by the dairy industry.

Including direct, indirect, and induced effects, this study finds that the total statewide impact of eliminating minimum milk pricing in Pennsylvania would be a total economic loss of $2.8 bil, lost wages of $683 mil, and lost jobs of 10,047. In addition, business taxes totaling $146.8 mil for federal and $115.3 mil for the state would also be lost.

Summary and Conclusions

There are some that conclude that less regulation always results in greater competition and better outcomes. Others may say that economic regulations that had their origins in the 1930s are no longer necessary today. But generally speaking, the U.S. attempts to balance economic regulations with free markets and positive outcomes. Examples that come to mind are banking, insurance, and housing.

Milk pricing is very complex and so are milk pricing regulations. So, it is natural to consider what would happen with less regulation. Some believe that elimination of Pennsylvania's minimum

milk pricing laws and regulations would result in greater fluid milk consumption in the state and higher prices to dairy farmers**. This study concludes that yes, fluid milk consumption in the Commonwealth would rise a modest 1.3% on average. But farm milk prices would clearly go down. That's because elimination of minimum milk pricing could also result in the bankruptcy and loss of 66% of the volume of fluid milk processing in the state and reduced total state-wide economic activity by $2.8 bil along with losses of $683 mil in wages.**

To conclude, the policy choice to eliminate minimum milk pricing in Pennsylvania would create some very modest benefits for fluid milk consumers, would not increase dairy farm income, and would come with a heavy price tag of $2.8 bil in reduced state-wide economic activity along with a loss of $683 mil in wages and 10,047 jobs.

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Part I – Theoretical and Conceptual Frameworks

Background

Pennsylvania has a long history in the dairy industry. Milk production in 1934, the first year that Pennsylvania enacted legislation on milk pricing, was 4.4 bil lbs of milk.[2] Production has grown since then to over 10 bil lbs of milk by 1986. In 2022, Pennsylvania was ranked eighth in the U.S. in terms of milk production. The state is unique in terms of 1) number of dairy farms producing milk, 2) size and number of dairy processors that manufacture fluid milk, ice cream, and storable dairy products, 3) access to high quality land and water, 4) a large agribusiness community that supports farmers and processors, and 5) location within the high population Northeast corridor of the U.S.

Pennsylvania is also unique in terms of milk pricing regulation. Like many states, Pennsylvania created milk control laws in the early 1930s due to chaotic milk marketing conditions resulting from the fallout from the Great Depression. As a result of this law, the Pennsylvania Milk Control Commission was established as a permanent and independent state agency. Several improvements to that original legislation have been made since then with the goal of creating stability in the marketing of milk and supporting the interests of both farmers and consumers.

In 1985, the Pennsylvania General Assembly re-established the Pennsylvania Milk Marketing Board (PMMB) as an independent administrative agency. The PMMB has three main functions:

1. Bonding of milk dealers: bonds are required of milk dealers that purchase milk from Pennsylvania farmers. The PMMB holds over $87.5 mil worth of bonds that ensure payments to farmers.[3]
2. The PMMB regulates milk weigher/samplers in order to ensure that milk is weighed accurately, and milk components sampled properly. This ensures that Pennsylvania farmers are paid for the milk they ship.
3. The PMMB establishes minimum producer, wholesale, and retail prices for milk in Pennsylvania. As part of the minimum producer price, the PMMB establishes premiums in excess of federal order Class I prices (called over-order premiums) on fluid milk sales. These premiums are established based on evidence presented to the PMMB at public hearings.

[2] Source: National Agricultural Statistics Service, USDA.

[3] For the license year July 1, 2022 to June 30, 2023 the PMMB held $87,536,2255 in dealer bonds to protect Pennsylvania producers. In addition, the PMMB held bonds for sub-dealers purchasing milk from Pennsylvania dealers that totaled $5,053,569.

Introduction to the Study

There are some in the state that have voiced concerns that minimum milk pricing at the farm, wholesale, and retail levels and the establishment of over-order premiums on Class I fluid milk have resulted in reduced fluid milk consumption in the state. They strongly believe that eliminating Pennsylvania's minimum milk pricing regulations would increase per capita fluid milk consumption and thereby raise the farm-gate milk price in Pennsylvania.

Others argue that minimum milk pricing as operated through the PMMB has maintained a unique structure in Pennsylvania with many small, independent family farms and family-owned milk processing plants. These plants not only process fluid milk, but also Class II products such as creams, sour creams, and ice cream. Many believe that eliminating minimum milk pricing would result in a rapid consolidation of these processors as has already occurred in many other states. With fewer independent milk processors, and with large regional cooperatives unable to pick up more milk, many Pennsylvania dairy farmers would simply go out of business.

The objective of this report is to present the results of a study on the economic impact of eliminating the commonwealth's minimum milk pricing regulations. More specifically, it explores what would happen if the PMMB no longer set minimum wholesale and retail milk prices and an over-order premium on Class I milk produced, processed, and sold in the state. This study addresses the following research questions:

1. Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?
2. Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?
    a. If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?
3. Would the elimination of Pennsylvania's minimum milk pricing structure have an impact on rural communities and businesses?
4. How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?
5. How would the overall economy in Pennsylvania be impacted by elimination of its minimum milk pricing structure?

The Theoretical and Conceptual Frameworks

We developed the theoretical and conceptual frameworks to address the research questions in sections one through five of this report. We focused on a review and analysis of the following topics: federal and state milk control legislation, milk production and processing in Pennsylvania, milk pricing, and trends in fluid milk consumption. The sections are outlined as follows:

Section 1: Introduction and Analytical Methodologies

Section 2: Background to Milk Pricing

Section 3: Milk Production and Processing in Pennsylvania

Section 4: Introduction to Milk Pricing

Section 5: Trends in Fluid Milk Consumption

Research Methodologies

In looking at the five research questions stated above, separate methodologies will be needed to address different questions. Whenever possible, economic theory and quantitative methods will be employed to provide analytical rigor.

To address the first question, a fluid demand model for Pennsylvania is required. Per capita fluid milk consumption will be estimated as a function of the retail price of milk, a measure of real personal disposable income, and changes in tastes and preferences over time. Once the model is estimated, it will be used to estimate the impact of eliminating the minimum milk pricing structure on consumption. In other words, if minimum pricing at the producer, dealer, and retail levels is eliminated, would Pennsylvania fluid milk consumption increase?

To quantify this, a baseline will be established based on historical data for fluid milk consumption and retail milk prices. Then the model will be employed to create an alternative scenario with retail milk prices that would reflect elimination of minimum milk prices in the state. The difference between these two scenarios will represent the estimated impact.

Question 4 will be addressed in part by the estimation of a milk supply model. A baseline, an econometric model, and an alternative scenario based on milk prices impacted by the elimination of minimum milk pricing in the state will be developed. For the econometric model, annual milk production will be estimated as a function of the price of milk and other variables in Pennsylvania. The model will then be used to address the policy questions. If the average price of milk in Pennsylvania is reduced due to elimination of minimum milk pricing, what impact would this have on milk production? Would Pennsylvania milk producers supply less milk as a result? How much less?

Questions 3 and 5 will be addressed using an Input-Output economic model. This type of model quantifies the interdependencies of various sectors of the economy. It measures how output from one sector of the economy (i.e., milk processing) affects other sectors (i.e., milk production, feed purchases, consulting services, etc.) and related employment. An Input-Output model traces the economic impact throughout the economy as dollars trade hands.

There have been a number of studies that used Input-Output models to estimate the impact of the dairy industry on a particular state's economy. The basic output of these studies are the multiples that trace dollars from one sector to the next. For this study, the key question would

be to directly estimate the impact of eliminating minimum milk pricing at the farm, wholesale, and retail levels, which then become the input into this modeling framework. Multiples derived from prior studies will then be used to quantify the impact of these policy changes on farmers, processors, the rural economy, and the entire Pennsylvania state economy.

Finally, question number 2. It will be challenging to develop a methodology to address this question. There isn't an economic model one can cite to quantify whether a bidding war would break out between milk retailers and processors in Pennsylvania if minimum milk pricing is eliminated. Also, traditional economic models may not be helpful in estimating how many fluid milk processors may go bankrupt as a result of this policy change. Thus, a two-step process will be used to address these questions. First, a review of the literature to compare dairy industry consolidation in the U.S. and Pennsylvania will be conducted. There has been a long history of dairy plant consolidation and retail price bidding wars in the U.S. Second, we will review the accounting and finance literature to examine factors that lead firms to bankruptcy. This approach can provide insights into how the Pennsylvania dairy industry would respond to an elimination of minimum milk pricing.

Part II of this report contains the scenarios and data analysis used to address the research questions.

Section 1 Introduction and Analytical Methodologies

1.1 Project Background

Pennsylvania has a long history in the dairy industry. Milk production in 1934, the first year that Pennsylvania enacted legislation on milk pricing, was 4.4 bil lbs of milk.[4] Production has grown since then to over 10 bil lbs of milk by 1986. In 2022 Pennsylvania was ranked eighth in terms of largest US milk producer. The state is unique in terms of 1) number of dairy farmers producing milk, 2) size of dairy processors that manufacture fluid milk, ice cream, and storable dairy products, 3) access to high quality land and water, 4) a large agribusiness community that supports farmers and processors, and 5) location within the high population Northeast corridor of the U.S.

Pennsylvania is also unique in terms of milk pricing regulation. Like many states, Pennsylvania created milk control laws in the early 1930s due to chaotic milk marketing conditions resulting from the fallout from the Great Depression. As a result of this law, the Pennsylvania Milk Control Commission was established as a permanent and independent state agency. Several improvements to that original legislation have been made since then with the goal of creating stability in the marketing of milk and supporting the interests of both farmers and consumers.

In 1985, the Pennsylvania General Assembly re-established the Pennsylvania Milk Marketing Board (PMMB) as an independent administrative agency. The PMMB has three main functions:

1. Bonding of milk dealers: bonds are required of milk dealers that purchase milk from Pennsylvania farmers. The PMMB holds over $87.5 mil worth of bonds that ensure payments to farmers.[5]
2. The PMMB regulates milk weigher/samplers in order to ensure that milk is weighed accurately, and milk components sampled properly. This ensures that Pennsylvania farmers are paid for the milk they ship.
3. The PMMB establishes minimum producer, wholesale, and retail prices for milk in Pennsylvania. As part of the minimum producer price, the PMMB establishes premiums in excess of federal order Class I prices (called over-order premiums) on fluid milk sales. These premiums are established based on evidence presented to the PMMB at public hearings.

[4] Source: National Agricultural Statistics Service, USDA.

[5] For the license year July 1, 2022 to June 30, 2023 the PMMB held $87,536,2255 in dealer bonds to protect Pennsylvania producers. In addition, the PMMB held bonds for sub-dealers purchasing milk from Pennsylvania dealers that totaled $5,053,569.

1.2 Project Objectives

The objective of this report is to present the results of a study on the economic impact of eliminating the commonwealth's minimum milk pricing regulations. More specifically, it explores what would happen if the PMMB no longer set minimum wholesale and retail milk prices and an over-order premium on Class I milk produced, processed and sold in the state. This study addresses the following research questions:

1. Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?
2. Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?
    a. If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?
3. Would the elimination of Pennsylvania's minimum milk pricing structure have an impact on rural communities and businesses?
4. How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?
5. How would the overall economy in Pennsylvania be impacted by elimination of its minimum milk pricing structure?

1.3 Research Methodologies

In looking at the above research questions, separate methodologies were needed to address different questions. Whenever possible, economic theory and quantitative methods were employed in order to provide analytical rigor and are thoroughly outlined with each analysis.

Section 2 Background to Milk Pricing

The purpose of this section is to provide the reader background as to why Pennsylvania adopted minimum pricing, how state mandated minimum pricing interacts with federal obligations, and how cooperatives and independent processors in surrounding states react to Pennsylvania's over-order premiums. Basically, this section is an introduction to milk production, pricing, and processing in the state of Pennsylvania.

2.1 Federal and State Milk Control Legislation

Milk marketing laws in Pennsylvania have their origins in the 1930s, as did other state orders and federal milk pricing legislation. Prior to the Great Depression, farm cooperatives made progress in implementing voluntary classified pricing plans.[6] Such plans segregated milk into two uses: one for fluid milk sales, and the balance for processing into storable products such as cheese, butter, and dry milk. As a result, cash receipts from marketing dairy products rose 31% between 1924 and 1929. But this system collapsed during the Great Depression when milk prices declined between 1929 and 1932 due in part to reduced consumer purchasing power. And some milk dealers who specialized in fluid milk sales found it profitable to go around the cooperatives and buy directly from independent farmers at a price lower than what the cooperatives were charging. The result was very chaotic marketing conditions for dairy farmers whose livelihoods were suddenly turned upside down.

It was during this period that state and federal milk laws were enacted to support dairy farmers, cooperatives, and consumers. With an economy in free fall, it was generally recognized that for dairy, competition without any regulatory bumper guards could become so destructive that it could permanently damage the economy. So, laws for Federal Milk Marketing orders were created in 1933 (Agricultural Adjustment Act, P.L. 73-10), and amended in 1935 (P.L. 74-320) and 1937 (P.L. 75-137).[7] In addition, many states enacted laws to support their dairy industries as well. In Pennsylvania, the first Milk Control Law was enacted on January 2, 1934, was amended on April 30, 1935, and replaced on April 28, 1937. The Pennsylvania Milk Control Commission was created and became a permanent state government agency. Over time, several amendments and improvements were made to more effectively manage the marketing of milk and promote the interests of Pennsylvania consumers. In 1968, milk legislation in the state was amended and renamed the Milk Marketing Law. In 1985, the General Assembly amended existing dairy legislation and reestablished Pennsylvania's Milk Marketing Board (PMMB) after conducting an extensive review of its functions pursuant to the Sunset Act.

Today the PMMB is an independent administrative agency. The purpose of the PMMB is to create stability in the marketing of milk and to provide dairy farmers a fair and equal

[6] See Bailey, "Marketing and Pricing of Milk and Dairy Products in the United States," pp. 110-11.
[7] Bailey, pp. 112-15.

opportunity to market their milk, thus ensuring an adequate supply of fresh milk for the commonwealth's citizens.

2.2 Geographic Overlap Between Pennsylvania and Federal Laws

Individual states were quick to support their dairy industries in the 1930s after enacting legislation. Pennsylvania, like New York, Maine, Virginia, Montana, California, etc., created a regulatory structure from their state laws to set minimum pricing. Federal Milk Marketing Orders (FMMO's), which cover more than just one individual state, were enabled in the Agricultural Adjustment Acts of the 1930s. But individual federal orders were slow to be adopted and implemented. In 1947 federal order data indicate there were just 29 federal orders covering 991 processors (called "handlers") and 135,830 milk producers representing 21% of all milk produced in the US.[8] That grew to 83 federal orders in 1962 representing 2,258 handers and 186,468 milk producers representing 47% of all milk produced in the US. Thereafter, federal orders grew in size and shrank in numbers to 11 orders by 2020. In 2022, federal orders accounted for 67% of all milk produced in the US.

The PMMB is organized around six marketing areas in the state (see figure 2.1). Three of the six milk marketing areas geographically overlap two federal milk marketing orders. The Northeast order no. 1 overlaps areas 1 and 4 in the southeast.[9] The Mideast order 33 covers area 5 in the west.[10]

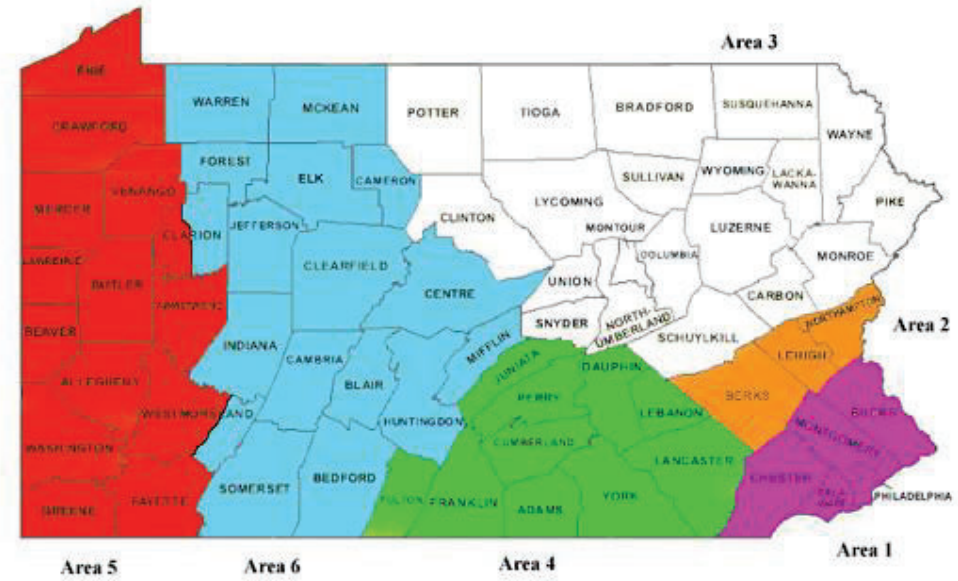

Figure 2.1 Pennsylvania Milk Marketing Areas

[8] USDA, Agricultural Marketing Service, "Measures of Growth in Federal Orders," December 20, 2021.
[9] Northeast Federal Milk Marketing Order 1, www.fmmone.com/Maps.htm.
[10] Mideast Federal Milk Marketing Order 33, www.fmmaclev.com/Maps.htm.

State orders typically coordinate their minimum pricing structures around price announcements from federal orders. In the case of Pennsylvania, minimum state class prices (including Class I prices) reflect minimum federal order prices. As an example, the PMMB minimum Class I prices for area 1 for January 2023 reflect the federal order Class I differential of $3.05/cwt (cwt=hundred pounds) of milk plus the base class I prices for fat and skim milk. Pennsylvania over-order premiums and fuel adjustments are added on top of these federal order minimums.

2.3 Interstate Commerce and Pennsylvania Milk Price Control

State milk marketing orders must operate within the federal disciplines of the interstate commerce clause (ICC). The commerce clause of the U.S. Constitution specifically delegates to the federal government the responsibility for regulating interstate commerce.[11] Therefore, the PMMB limits its regulation on minimum pricing to transactions that occur "within Pennsylvania."

2.4 Pennsylvania Minimum Milk Pricing

Pennsylvania's milk law requires the PMMB to establish minimum producer, wholesale, and retail prices for milk in the state. The law requires the PMMB to set those prices based on evidence presented at public hearings. As discussed above, the ICC only allows the PMMB to regulate transactions within the state. Pennsylvania cannot regulate milk prices on sales that take place out of state; it's illegal.

By law the PMMB is required to set minimum wholesale and retail prices for milk sold in the state. The logic here is that retailers must pay the Pennsylvania dealers (who receive and process Pennsylvania milk) a wholesale price that will allow dealers to a) recover their costs and earn a profit, and b) pay Pennsylvania farmers the mandated minimum state prices. Retailers in turn cannot sell milk in Pennsylvania below a minimum retail price that is set at an amount above the wholesale price. Without such a law, Pennsylvania dealers could be pressured from retailers to lower their sales price below costs. That would in turn force them to lower their farm price of milk. This cycle could lead to destructive competition, which occurred prior to the present milk law in the 1930s. Dairy farmers depend on having a local processing plant to send their milk to each day. If destructive competition were to put a local plant out of business, they would have to send their milk farther away, which would require them to pay more for hauling. Worse yet, they could end up without a home for their milk, effectively putting them out of business.

The PMMB enhances producer revenue for Pennsylvania Class 1 fluid milk utilization by setting a minimum price consisting of the federal order Class I price plus an "over-order premium." For example, the minimum Class I over-order premium for January 2023 was $1.66/cwt which included a fuel adjustment of $0.66 plus an OOP of $1.00 (table 2.1). Given a Class I

[11] For more details, see Bailey pp. 208-09.

Table 2.1 Pennsylvania Milk Marketing Board Minimum Producer Price for Area 1-0 for January 2023

	Fat ($/lb)	Skim ($/cwt)	Price ($/cwt)
FMMO Base Class I Price	$3.2827	$11.32	$22.41
Southeastern PA Milk Marketing Area:			
Class I differential			$3.05
Over-order premium[1]			$1.66
Minimum milk price	$3.3298	$16.03	$27.12

Note: cwt = hundredweight, or a price for a hundred pounds of milk.

Source: minimum producer price data, released February 2, 2023, PMMB.

[1]The over-order premium is $1.00/cwt and the fuel adjustment is $0.66/cwt.

federal order differential of $3.05/cwt for Southeastern Pennsylvania and announced FMMO Prices, Class I dealers in Pennsylvania are required to pay Pennsylvania dairy farmers at least $3.3298/lb for fat and $16.03/cwt for liquid skim milk used for Class I purposes in Southeastern Pennsylvania.

An example buildup from minimum producer prices to wholesale and retail prices is provided in table 2.2. This example looks at a gallon of reduced fat milk sold in Southeastern Pennsylvania in January 2023. The minimum farm cost of raw milk ingredients that dealers must pay includes the federal order minimum price of Class I milk plus the PMMB board mandated over-order premium. The buildup to the minimum wholesale price reflects average per gallon costs for processing, selling, delivery, container, energy, and a rate of return of 2.5% to 3.5% for dealers as outlined in Section 801 of the Milk Marketing Law. Retail costs are then added onto the wholesale cost to arrive at the minimum retail price for a gallon of milk.

One can observe that the fat and skim prices from table 2.1 for producers do not match the fat and skim prices in table 2.2 used in the calculation of the wholesale price buildup. That's because the raw ingredient costs in the wholesale calculation include the following adjustments:

- The wholesale price buildup includes a cooperative charge of $0.2416/cwt to reflect the costs that cooperatives face in servicing the Class I market in Pennsylvania (more about this below).
- In some months the announcement of Pennsylvania Class I prices is set before the actual USDA announcement. For example, the January 2023 announced Pennsylvania price for the Class I mover was $11.28/cwt for skim milk, whereas the actual USDA announcement that came later was 4 cents higher.

Table 2.2 Minimum Resale Prices for January 2023 for One Gallon of Reduced Fat Milk Sold in Area 1-0 Southeastern Pennsylvania

Description	$/gal	lbs/gal[1]	$/lb
Farm milk ingredient costs:			
Milk fat	$0.5515	0.1683	$3.2762
Skim milk	$1.3895	8.4517	$0.1644
Raw milk costs[2]	**$2.0085**		
Processing costs	$1.4100		
Container costs	$0.2346		
Other costs[3]	$0.6116		
Minimum wholesale price	**$4.2647**		
Retail costs[4]	$0.2153		
Minimum retail price[5]	**$4.4800**		

[1]Assumes one gallon of reduced fat milk weighs 8.62 pounds. The weighting between fat and skim assumes 1.9527% of a gallon of reduced fat milk is fat, and the balance is skim milk.
[2]Includes a bulk adjustment rate of $0.0076/lb. and non-dairy ingredient costs of $0.0002/lb.
[3]Other costs include energy and delivery adjustments, and profit at 3.5%.
[4]Retail costs includes deepest discounts at 15%, in store handling costs, and retail profit at 2%.
[5]Rounded to two digits.

- The current month Class I price may include an adjustment or correction based on the prior month's early announcement. For example, in January an adjustment of $0.02/cwt was applied to the skim price as a correction for the December announced skim prices.
- A 20-cent/cwt assessment was added to reflect fluid milk promotion.[12]
- An over-price premium was added to reflect on average the voluntary premiums made by some dealers (e.g., milk quality premiums for milk utilized as Pennsylvania Class I). For January that adjustment was 3 cents per cwt of milk which was specific to Area 1 in this example.

The wholesale markup for Class I milk in Pennsylvania starts with the raw ingredient costs for milk in the area in which it will be sold. While the over-order premium applies to all areas in a given month, the Class I differential as published by USDA varies by county. Next, the volume of components is calculated by type of milk product (whole milk vs. reduced fat milk) and size of container. For example, reduced fat milk contains 2% fat and 98% skim milk, and a gallon of reduced fat milk is assumed to weigh 8.62 pounds. Once the raw milk costs are arrived at the PMMB adds in promotion costs, average area specific over-price premiums, and other adjustments to compute the final cost of milk components paid for by dealers.

Next, container and processing costs are added in. Processing costs include the following:

[12] See Commonwealth of Pennsylvania, Milk Marketing Board, Official General Order No. A-989, December 3, 2014.

- Receiving, lab and field work.
- Standardization and pasteurization.
- Bottling.
- Cold room.
- Delivery costs for dealers.
- Selling costs.

To arrive at the wholesale price before profits, a few adjustments in the wholesale price are made:

- Small container adjustments.
- Cost update adjustment established at a Cost Replacement Hearing.
- Energy add-on to reflect changes in diesel fuel costs that impact delivery costs.

Next, a rate of return of 2.5% - 3.5% is added onto the wholesale price, specific to each marketing area. To arrive at the final proposed wholesale price, the average delivery cost for all dealers is included. Finally, the wholesale-to-retail markup is added onto the wholesale price to arrive at the minimum retail price of fluid milk in Pennsylvania.

Under certain circumstances, the Pennsylvania law allows dealers to offer their customers various discounts on their sales of packaged fluid milk.[13] Price discounts are allowed by marketing area based on the following major factors:

- Level of service provided.
- Number of price-controlled quarts per delivery.
- Type of customer.

Many dealers in certain areas can provide price discounts since the delivery costs embedded in the announced wholesale price (discussed above) reflect the most expensive costs for small deliveries. Thus a "deep discount" is computed in the retail price markup to reflect the largest discount available to retailers. For Area 1 January 2023, the "deepest discount" deducted in calculating retail prices was 15.0%.

Next, in-store handling costs are announced by the board based on studies of a cross-section of stores in PMMB areas to determine in-store handing costs for each area. They look at all costs in each area from receiving to sale to the customer. They examine four cost categories: 1) labor, 2) building, 3) equipment, and 4) other. These costs are then allocated to milk display and checkout. Total in-store handling costs are then calculated for the different container sizes.

Thus, the Area 1 minimum retail price is equal to the minimum wholesale price minus the 15% deepest discount plus in-store handing costs, plus a retail rate of return as allowed by law.

[13] Commonwealth of Pennsylvania, Milk Marketing Board. "An Order Establishing Wholesale Discounts." Order No. A-985, April 2, 2014.

Note that the PMMB does not collect and remit the over-order premium to Pennsylvania dairy farmers. Rather the milk dealer pays the farmer the minimum producer price of milk knowing that they will receive the minimum wholesale price from the retailer. The retailer in turn can afford to pay the dealer the minimum wholesale price for milk (which includes the OOP) since their minimum retail sales price includes reimbursement for the wholesale cost of milk plus in-store handling costs, and a retail rate of return.

2.5 Pennsylvania Over-order Premium

Federal milk marketing orders were designed to set minimum prices for milk used for different class purposes (e.g., Class I for fluid use). The actual cost of servicing a market, however, is often higher than these federal order minimums. The farm cost of producing milk may exceed the pool prices computed in federal orders. Low milk prices have led to rapid consolidation in the U.S. dairy industry over time. Also, to service fluid milk customers in a given geographic area, milk must be delivered to fluid milk plants only on specific days of the week to meet schedules for retail customers (e.g., schools). For the rest of the time, milk must be "balanced" across markets since it is produced every day and is highly perishable. In other words, milk must be redirected to other manufacturing plants that are often farther away. There are significant transportation costs associated with moving milk. Farmers pay the cost of delivering their milk to the nearest plant. But when that plant is shut down, does not need the milk, or when a fluid milk plant needs more milk, farmers' milk must be diverted.

Cooperatives often bear this cost of balancing the everyday needs of a milk shed. There are also higher costs for processing milk and staffing that aren't always reflected in minimum federal order prices which have not changed since 2008. Therefore, an "over-order" premium (OOP) attempts to recognize the realities of higher costs that farmers face but may not always recognize all of the costs that cooperatives face (more about this below under "farmer cooperatives").

The PMMB sets the over-order premium on fluid milk sales only after receiving industry testimony regarding costs, milk supplies, and supply/demand in neighboring markets. If the premium is set too low, farm costs will exceed their revenues, adversely impacting the supply of milk in Pennsylvania. If set too high, the state could attract out of state milk supplies since Pennsylvania cannot block imports or regulate the price of milk beyond its borders. As a result, there is a balance that must be followed.

In each PA milk marketing sales area, the Class I differential for that area is added to the FMMO Class I base price. The OOP is then added to this figure. The resulting amount is the minimum Class I producer price for sales into that area.

Figure 2.2 illustrates the OOP over time and compares it to the minimum announced federal order Class I base price. The data for May and June 2020 illustrate the impact of a near short term collapse in U.S. commodity prices and the Class I milk price due to the shutdown of food service demand in the U.S. as a result of COVID lockdowns. With many restaurants and

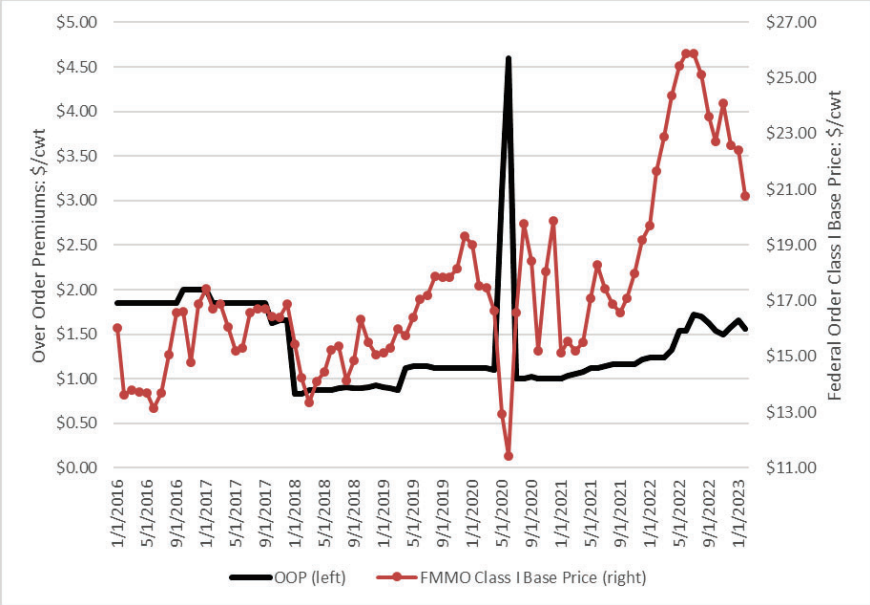

Figure 2.2 Pennsylvania Milk Marketing Board Over-order Premiums Plus Fuel Adjusters 2016-2023

Source: Pennsylvania Milk Marketing Board, and USDA's Agricultural Marketing Service.
Note: cwt = hundredweight, OOP = over order premiums.

colleges/universities closing temporarily, food service demand came to a halt and commodity prices fell. But farm milk production continued since cows need to be milked every day. No one could have imagined a modern-day market meltdown on the order of what occurred in the 1930s. But it did happen in 2020. The PMMB stepped in and prevented an economic disaster by significantly raising the over-order premium in May and June 2020.

Figure 2.3 illustrates the mapping of the PMMB over-order premium from announcement through to the retail price of milk. The process starts with commodity prices which drive federal order pricing formulas. The OOP price for a given month applies to all Class I milk produced, processed, and sold in Pennsylvania. It becomes part of the wholesale price buildup (which includes the raw milk cost). The wholesale price in turn becomes part of the retail price buildup.

Retailers sell milk to consumers and pay milk dealers the regulated wholesale price of milk. Wholesale milk dealers in turn pay farmers for the milk they deliver. Dealers must calculate the portion of their processing that is subject to the PMMB over-order premium and must pay this premium to their farm suppliers. The PMMB over-order premium becomes part of the wholesale and retail price buildup. In terms of cash flow, retailers pay wholesalers, who in turn pay their farm suppliers. Thus, the PMMB over-order premium is paid for by consumers.

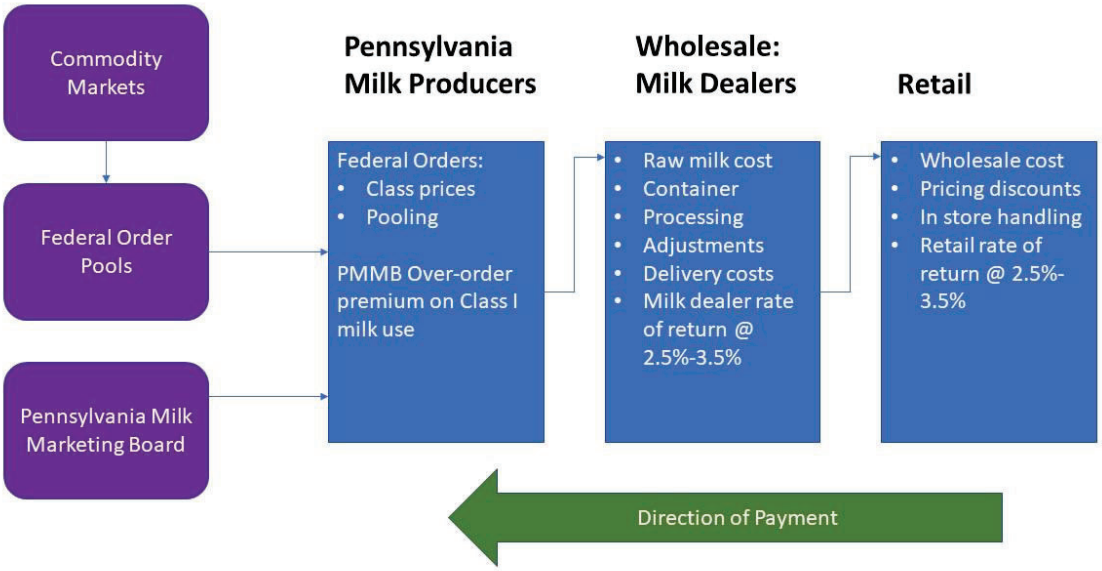

Figure 2.3 Pennsylvania Milk Marketing Board Over-order Premium and the Farm-to-retail Markup

2.6 Pennsylvania Milk Subject to Minimum Pricing

Pennsylvania milk subject to minimum state pricing at the wholesale and retail level is only applied to sales of packaged Class I fluid milk and Class II creams and sour cream that are sold in the state. Non-regulated Class II production and sales (other Class II sales such as cottage cheese, ice cream, etc.), Class III milk (used for cheese production) and Class IV milk (used for butter and dried milk) are not subject to minimum resale pricing. The PMMB also enforces producer prices on Pennsylvania farms marketing milk in non-federally regulated areas in the state.

USDA reports annual milk production numbers for Pennsylvania. And the PMMB records the purchase of Pennsylvania farm milk used in regulated processing by independent dealers, cooperatives, and producer-dealers (see table 2.3). There is a small volume of milk that is not reflected in the PMMB's volume of licensed processors (about 86 to 328 mil lbs per year).

There is no data source on Pennsylvania sales of packaged fluid milk. Data sources that are available for purchase note that big box stores (i.e., Costco, Walmart, and Sam's Club) are not included in their datasets. In this report, Pennsylvania fluid milk sales were approximated in table 2.3 by multiplying Pennsylvania population by the USDA's Economic Research Service estimate of annual U.S. per capita fluid milk consumption.

Table 2.3 Pennsylvania Milk Production and Sales Subject to Minimum Pricing, mil lbs

	2017	2018	2019	2020	2021	2022
Pennsylvania milk production:						
Supplies to independents[1]	2,560	2,213	2,166	2,239	2,188	1,905
Cooperatives[1]	8,017	8,163	7,735	7,879	7,571	7,641
Producer-dealers[1]	65	63	64	76	76	74
Other	251	217	142	86	280	328
USDA total for Pennsylvania[2]	10,893	10,657	10,108	10,279	10,114	9,949
Estimated PA fluid milk sales[3]	1,881	1,815	1,788	1,808	1,736	1,686
PA regulated Class I & II sales[4]	1,853	1,737	1,668	1,714	1,719	1,772
less PA tolling sales[5]	417	391	338	326	334	356
less other non-regulated sales[6]	10	5	9	8	8	9
Net PA milk subject to min. pricing	1,425	1,341	1,321	1,379	1,377	1,407
Est. vol. not regulated by the PMMB and not subject to min pricing[7]	456	474	467	429	359	280
PA Class I sales relative to PA produced milk	17.3%	17.0%	17.7%	17.6%	17.2%	17.0%
Percent of PA fluid milk sales not subject to minimum pricing	24.2%	26.1%	26.1%	23.7%	20.7%	16.6%

[1]Source: Pennsylvania Milk Marketing Board.

[2]Source: USDA, National Agricultural Statistics Service.

[3]Estimate equal to the ERS estimate of U.S. per capita fluid milk consumption times PA population.

[4]Reflects sales of packaged fluid milk and regulated Class II sales (creams and sour cream) to subdealers and retailers (Part 3). Does not reflect dealer to dealer or out of state sales.

[5]Tolling sales (when a dealer processes milk for another dealer at a fixed cost per unit) do not set a minimum price. Therefore, it is not considered a minimum price sale by the PMMB. However, the volume of milk that is tolled is subject to the over-order premium.

[6]On farm and Federal sales not subject to minimum pricing.

[7]Estimated volume of Class I sales in Pennsylvania not subject to minimum pricing. Reflects tolling, other non-regulated sales, and out of state packaged fluid milk sold in Pennsylvania.

Note: PA = Pennsylvania.

For Dealers located in Pennsylvania, the PMMB collects milk receipt and milk utilization data for all Pennsylvania and non-Pennsylvania activity. For Dealers not located in Pennsylvania, the PMMB only collects milk receipt and milk utilization data on Pennsylvania activity. The PMMB only enforces minimum producer pricing on Pennsylvania producer milk purchased by a Pennsylvania Dealer. The PMMB does set minimum retail prices for fluid milk sold in the state but does not enforce minimum producer pricing on a) Pennsylvania producer milk processed out of state, and b) non-Pennsylvania milk processed in state.

The volume of Pennsylvania fluid milk sales subject to minimum pricing is further reduced by any tolling sales by Pennsylvania processors/dealers; the PMMB does not technically consider that a minimum price sale. Typically, tolling is a two-party arrangement whereby the processor/dealer buys the milk and provides services (bottling milk) for a fee, or toll, to a retailer. In that arrangement, the volume of milk used for tolling for a fluid milk sale is subject to the over-order premium (OOP). In other words, dealers pay the OOP on the volume of milk tolled directly to Pennsylvania dairy farmers. And, since the OOP is part of the cost of the milk, and the processor/dealer cannot provide services below cost, they must charge it as part of the tolling fee. The retailer in turn pays the OOP to the dealer and collects the OOP from consumers via Pennsylvania minimum retail pricing. Thus, while tolling sales are not technically subject to wholesale minimum prices, they are subject to retail minimum pricing if sold within Pennsylvania.

Data for milk subject to minimum pricing for 2017-22 are provided in table 2.3. Three numbers of interest were calculated. The first is a rough estimate of the volume of "stranded" Pennsylvania fluid milk sales. This is milk sold at state minimum retail prices, but Class I OOPs are not collected and paid back to Pennsylvania dairy farmers. This was approximated by subtracting the volume of PMMB net milk subject to minimum state pricing from our estimate of Pennsylvania fluid milk sales. That volume declined from 474 mil lbs in 2018 to 280 mil lbs by 2022. It was equivalent to 16.6-26.1% of total estimated Pennsylvania fluid milk sales (second number of interest).

Our observation here is that some volume of stranded sales is to be expected given Pennsylvania milk laws are subject to limitations imposed by the Federal Commerce Clause. This volume will also ebb and flow with the volume of surplus milk and general milk pricing in surrounding states.

The third number of interest is the percent of Pennsylvania milk that was sold as Class I milk. This was estimated using ERS per capita data times PA population for the numerator. The ratio of estimated Pennsylvania fluid milk sales to Pennsylvania milk production was 17-17.7% in 2017-22. That implies that the majority of milk in the state is processed into non-regulated dairy products, a portion of which is sold out of state. Also, as per capita fluid milk sales declined over time and Pennsylvania milk production declined less, this ratio continued to go down. Thus, the OOP was collected on a smaller portion of a Pennsylvania farmers milk sales.

2.7 Pool vs. Non-Pool Plants in Pennsylvania

As stated in the last section, the PMMB only regulates a portion of a Pennsylvania farmer's milk check. It enforces minimum pricing on the fluid milk portion (the federal order minimum prices plus over-order premiums) of a farmer's milk deliveries which are both produced and processed in the state of Pennsylvania.

For milk not pooled under a federal order, the PMMB enforces minimum producer pricing on all classes of milk utilization. Regarding the OOP, if a fluid milk processor located in Pennsylvania

buys 100% of its producer milk from Pennsylvania dairy farmers and only processes and sells 75% of that milk as Pennsylvania Class I milk (sold in state), then the over-order premium would apply to 75% of the milk used in the plant.

Also, for Pennsylvania dairy farmers that sell milk to a Pennsylvania plant located in a federal order (called a "pool plant") in either SE or Western Pennsylvania, the PMMB over-order premium (paid only on the Class I portion) is added to the federal order mandated "pool price."[14] In other words, the PMMB does not interfere with federal order pricing and pooling.

On the other hand, the board does mandate minimum class prices for Pennsylvania dairy farmers that sell to Pennsylvania plants which market milk outside of federal orders. These plants are called "non-pool" plants. In this case, the plant must pay farmers the over-order premium plus a blend of federal order class prices (classes I-IV) depending on the plant's utilization. For example, suppose a dairy plant located in State College, Pennsylvania, processes half its milk for Class I purposes and half for Class III purposes to make aged cheeses. Farmers that supply that plant would be paid a regulated price for Class I milk plus the OOP on 50% of their milk deliveries, and the state Class III price for the other 50% of their milk (set at the federal order Class III price).

2.8 Farmer Cooperatives

Farmer cooperatives play a very important role in the dairy industry in Pennsylvania and throughout the Northeast. First, cooperatives (coops) are owned by members. One benefit is that coops provide dairy farmers a reliable market for their milk. Many coops in the Northeast operate plants, both fluid and manufacturing plants, to create a market for their members. Second, cooperatives operate to meet the needs of all their members. That includes large farms producing tanker loads of milk each day, as well as many smaller farms that may be located farther away from city centers. Third, coops often market a portion of their milk to independent fluid milk processors (dealers). That means they must provide a balancing function since milk is produced every day and the coop must divert and ship milk far away on days a fluid plant does not need milk. Fourth, unlike many smaller independent processors, coops often take on the responsibilities of milk testing, laboratory costs, payroll, and other procurement costs. The bottom line is that cooperatives today must meet the needs of all their members and their customers who are located over large geographic areas. As one can imagine, there are significant costs associated with these responsibilities.

The PMMB recognizes the costs facing cooperatives that service the Pennsylvania market. As of December 2020, the PMMB established a cooperative charge of $0.2416/cwt of milk. It applies to all Pennsylvania producer milk purchased from cooperatives which was processed in Pennsylvania and utilized as Pennsylvania Class I milk.[15] As such, minimum producer prices

[14] An introduction to milk pricing, pooling, and Federal Orders is provided in section 3 of this report.
[15] PMMB, "Cooperative Procurement Cost," December 2, 2020.

announced by the PMMB for all marketing areas now include two sets of producer prices: one with the cooperative charge and one without the cooperative charge. This cooperative charge is also reflected in the minimum wholesale price.

A final unique feature of cooperatives is how they pay their members, particularly in Pennsylvania when it comes to the state mandated over-order premium. Some of a cooperatives' milk is regulated under federal orders and some is regulated by the PMMB. Cooperatives then pool all these receipts, deduct transportation and other costs needed to balance the market, and pay individual members quality and quantity premiums.

One question that has come up is how do Pennsylvania coops track PMMB over-order premiums (either receipts from raw milk sales to independent processors, or on their own fluid milk sales) and account for those premiums on milk checks for Pennsylvania producers? In other words, how much of a member's gross milk check consists of the PMMB's over-order premium? Unlike independent dealers, which must report the over-order premium on their producers' milk checks, the board by law is precluded from mandating how coops pay their members.

The board also lacks auditing authority to enforce over-order premium payments to coop members. That said, several hearings were called to address this issue. One outcome was a new regulation that requires Pennsylvania cooperatives to show a line item or footnote/memo on member milk checks that identifies the specific amount of the Pennsylvania over-order premium that is being paid on a cents per hundred pound basis.[16] Conceptually, the over-order rate on the milk check should be calculated by dividing the total Pennsylvania over-order premium paid to the coop by the total pounds of milk marketed by coop members in Pennsylvania. The rate would then apply to the pounds of milk delivered by the individual member.

2.9 PMMB Auditing

Auditing is an important function of any regulatory framework for milk pricing. It is one thing to set a price, and it's another to enforce it. The PMMB regularly conducts monthly audits of dealers to ensure that they are complying with minimum price regulations.

Pennsylvania dealers must submit monthly reports regarding milk receipts and utilization. These reports must include information on federal order classification of the milk use (if applicable), and all sales of packaged regulated Class I & II products. Plants must also report other class uses for the milk and inventory. The data are then entered into the Milk Accounting and Regulatory System (MARS) which computes shrinkage, utilization, pool obligations, and pool value. From there the MARS system computes each plant's over-order obligation to

[16] The calculation is mandated in Section B of the regulation
7 Pa. Code § 143.15. Cooperative communication of over-order premium. (pacodeandbulletin.gov).

producers. Auditors confirm that the data submitted to the MARS system are accurate. They also compare the over-order premium obligations calculated by MARS to the amounts actually paid by the dealer. The auditor would also enforce restitution of any underpayment of any component or other mandated PMMB premium to Pennsylvania farmers.

2.10 Other Functions of the Pennsylvania Milk Marketing Board

The PMMB enforces the Milk Producers' Security Act, which provides for milk dealer bonding to secure producer milk sales to dealers. If a milk dealer purchases milk from a Pennsylvania dairy farmer and subsequently files for bankruptcy, the bond (or other valid security) they have on file with the PMMB can be used to ensure that Pennsylvania dairy farmers are paid for the milk they delivered.

State bonding became a visible issue when Dean Foods filed for bankruptcy in November 2019. Dean Foods owned four processing plants in Pennsylvania. The PMMB licensed these plants plus three Dean plants out of state. When Dean Foods filed for bankruptcy in November 2019, Pennsylvania farmers were paid by Dean Foods up until the sale of Dean Food assets on April 30, 2020. The final payment to Pennsylvania farmers for April delivered milk was not made.

PMMB worked directly with Dean Foods offices in Texas to guarantee that the final payments to Pennsylvania independent farmers for April 2020 would be made. This payment was made by Dean and verified by PMMB staff.

Unfortunately, Dean was not able to pay monies owed to cooperatives at that time. As a result, the PMMB proceeded to collect on Dean's bond, as guaranteed by the Pennsylvania Milk Producers' Security Act. Bond funds were subsequently released and paid to the cooperatives by the board.[17] According to board member Jim Van Blarcom, "We have bonds to take care of situations like this."

2.11 Section Summary

Pennsylvania's first Milk Control Law was implemented one year after Federal Milk Marketing Orders were established with the Agricultural Adjustment Act of 1933. Pennsylvania milk pricing law works in conjunction with federal order pricing. A minimum Pennsylvania Milk Marketing Board (PMMB) over-order premium (OOP) and a cooperative charge are set after a hearing process. The PMMB OOP and cooperative charge are in addition to minimum federal order Class I pricing to recognize the higher costs for Pennsylvania farmers and their cooperatives to service the fluid market. Pennsylvania law is unique in that minimum milk prices are set for producers, wholesalers (milk "dealers"), and retailers. The over-order premium and cooperative charge are (as applicable) included in the calculation of the wholesale price, and the wholesale price is included in the calculation of the retail price.

[17] PMMB, "Pennsylvania Milk Marketing Board Confirms Dean Foods Payments to Independent Pennsylvania Producers," June 10, 2020.

Farmers receive dollars generated from OOPs, and processor/dealers and retailers are able to recoup their out-of-pocket costs via minimum state pricing.

2.12 Section References

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Section 3 Milk Production and Processing in Pennsylvania

The purpose of this section is to review Pennsylvania's milk production and processing. The state has many small dairy farms, as well as a diversity of processing. The state produces more milk and dairy products than are needed for in-state consumption and, as a result, Pennsylvania exports a significant portion of milk to other states.

Pennsylvania is unique as a dairy state in the U.S. in that it has a large population base, a large number of small dairy farms, and a very diverse processing base for fluid milk and other dairy products. The data in table 3.1 indicate that Pennsylvania produces around 10 bil pounds of milk per year from over 474,000 cows and is ranked eighth in the U.S. in terms of milk production. Pennsylvania also ranked second in the U.S. in terms of licensed farm numbers at 5,200. Not only is Pennsylvania a major dairy state, but with a population of just under 13 mil, it is a major consumer of dairy products. According to USDA, Pennsylvania in 2021 had 40 plants processing cheese and over 30 processing ice cream. Additionally, 2023 data from the Pennsylvania Milk Marketing board indicate that there are 35 independent and 6 cooperative-owned Class I fluid milk plants in the state processing over 1.7 bil pounds of milk into fluid beverage products.

Table 3.1 Characteristics of the Pennsylvania Dairy Industry

	2021	Units	State Ranking	No. Plants
Milk production	10,114	mil lbs	8	na
Cow numbers	474	thou hd	6	na
Dairy herds with licenses	5,200	no.	2	na
In-state packaged fluid milk sales[1]	1,720	mil lbs		45
Dairy product production:				
Cheese, excluding cottage cheese	435,217	thou lbs	6	40
Butter	89,428	thou lbs	na	6
Nonfat dry milk	173,956	thou lbs	na	3
Ice cream, regular hard	37,937	thou gal	2	31
Ice cream, mix regular	26,477	thou gal	3	19
Sour cream	2,353	thou lbs	3	6

Sources: USDA, NASS, "Milk Production." February 22, 2023; USDA, NASS, "Dairy Products: 2021 Annual Summary." April 2022.

[1]Fluid milk sales by Pennsylvania dealers to subdealers and retailers. Source: PMMB.

3.1 Farmers and Milk Production

As stated earlier, Pennsylvania is a large dairy state, with milk production in virtually every county in the state. Of the six marketing areas in the state, production is heaviest in marketing areas which lie to the south and southeast.

Milk production in Pennsylvania started to grow significantly following WWII when GIs returned and started up dairy farms (figure 3.1). Cow numbers peaked in the state in 1945 at 943 thousand head. Cow numbers declined thereafter to 468 thousand head by 2022. Over this same period, milk production in Pennsylvania grew 85% due to production efficiencies. Better genetics, feed, facilities, and management meant more milk could be produced from each cow.

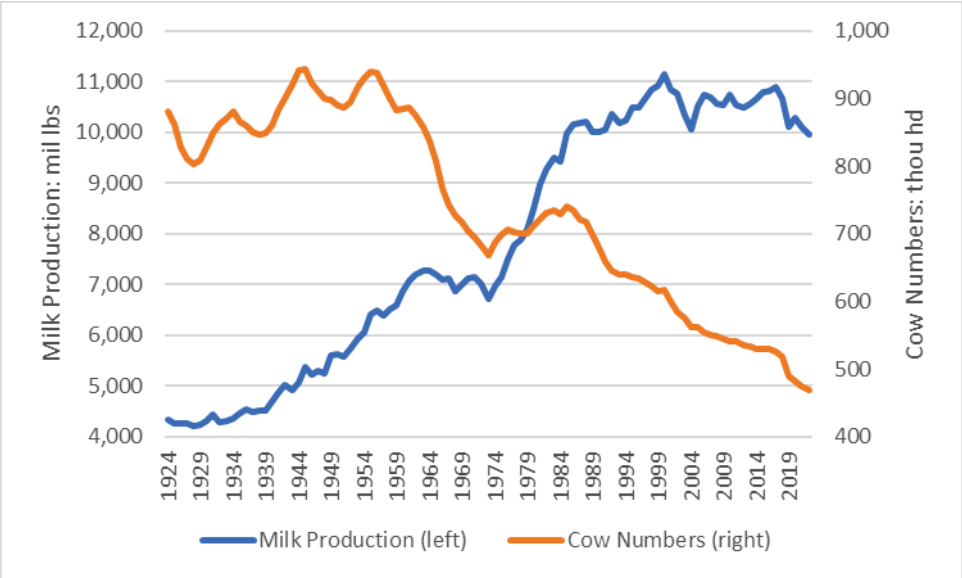

Figure 3.1 Pennsylvania Milk Production and Cow Numbers

Source: USDA, National Agricultural Statistics Service.

The structure of milk production in Pennsylvania is unique among top 10 dairy states in the U.S. (see table 3.2). Pennsylvania's average herd size per farm in 2022 was 94 cows, fairly small compared to other states. New Mexico, which ranked ninth in the U.S. in milk production, averaged 2,618 cows per farm. New York, Minnesota, and Wisconsin had herd sizes at least double that of Pennsylvania.

Comparing 2022 to 2003 (19 years), Pennsylvania's milk production was down 3.8% and the number of cows was down 18.6%. Farm size grew 48.6% in terms of cow numbers per farm, whereas the number of farms (licenses) fell 45.2%. The decline in the number of Pennsylvania licensed dairy farms 2003 to 2022 was similar to the percent decline in other top 10 dairy states, but the growth in farm size in these other states was much greater when compared to

Table 3.2 Structure of Top 10 U.S. Dairy States: 2003 & 2022

2022	Production	Cow No.	No. Licensed	Avg Farm Size
	bil lbs	thou hd	Farms	no. cows
California	41.787	1,722	1,115	1,544
Wisconsin	31.882	1,272	6,350	200
Idaho	16.628	656	410	1,600
Texas	16.524	646	320	2,019
New York	15.660	624	3,210	194
Michigan	11.740	428	1,010	424
Minnesota	10.477	453	2,035	223
Pennsylvania	**9.949**	**468**	**5,000**	**94**
New Mexico	7.148	288	110	2,618
Washington	6.239	259	310	835

2003	Production	Cow No.	No. Licensed	Avg Farm Size
	bil lbs	thou hd	Farms	no. cows
California	35.437	1,688	2,060	819
Wisconsin	22.266	1,256	16,400	77
Idaho	8.774	404	775	521
Texas	5.630	319	850	375
New York	11.952	671	6,700	100
Michigan	6.375	302	2,840	106
Minnesota	8.258	473	6,235	76
Pennsylvania	**10.338**	**575**	**9,130**	**63**
New Mexico	6.666	317	170	1,865
Washington	5.581	245	640	383

Source: USDA, National Agricultural Statistics Service.

Pennsylvania. Texas, Michigan, and Idaho, for example, grew 438%, 299%, and 207% in number of cows per farm. Only Pennsylvania stood out in terms of being a) a large dairy state, b) large number of licensed dairy farms, and c) low average farm size. In 2022, Minnesota was comparable to Pennsylvania in terms of production and cow numbers but had less than half the number of licensed dairy farms and was 138% larger in terms of farm size (number of cows per farm).

3.2 Fluid Milk Processing

Pennsylvania is a large state in terms of population (just under 13 mil in 2021) with large urban population centers (Philadelphia- 1.6 mil, Pittsburg – 300,431, Allentown- 125,944). In 2021 it was estimated that 1.7 bil lbs of fluid milk was sold to consumers in Pennsylvania. The state has a large milk processing sector. The Pennsylvania Milk Marketing Board reported in 2023 there are 41 licensed fluid milk processors in the state, six of which are cooperative-owned fluid processing plants. The balance of 35 are independent fluid processors. Most of these fluid milk plants are located in the southern portion of the state (south of I-80), with a strong concentration in the high population counties in the southeast.

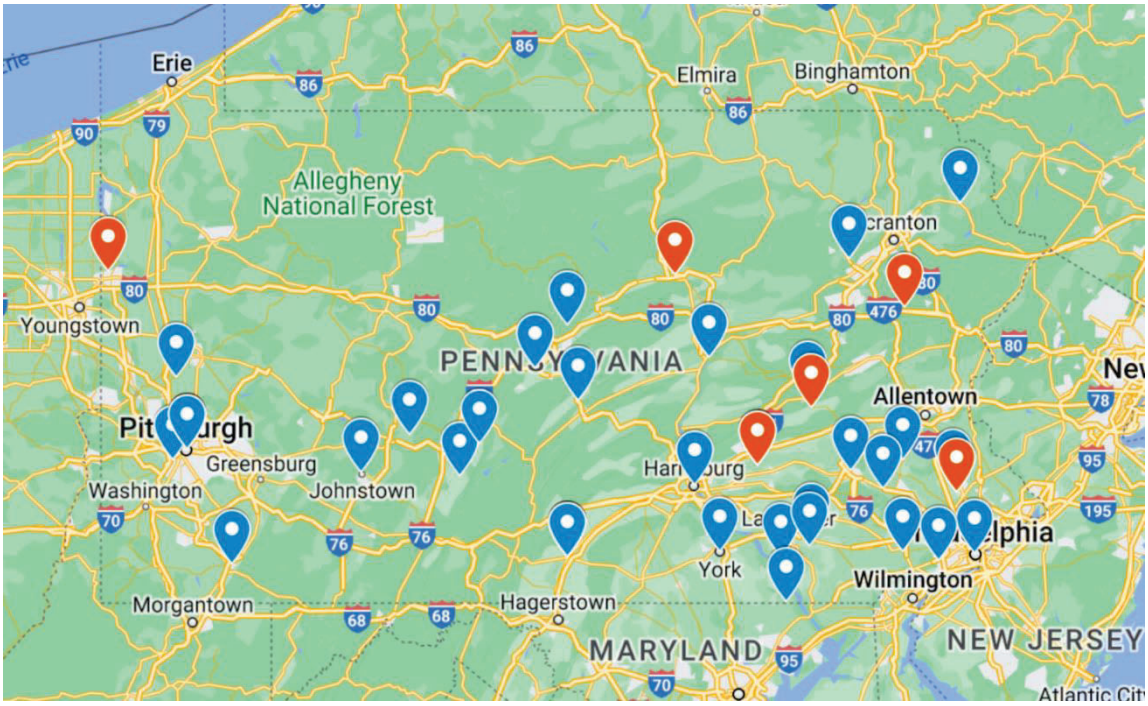

Figure 3.2 Pennsylvania Licensed Fluid Milk Processors in 2023 (N=41)

3.3 Class I Plants with Class II Processing

A number of Pennsylvania fluid milk processors also process other products including other beverages (i.e., teas, coffee beverages, and juices), and Class II regulated products such as creams (used in coffee products) and sour cream, or non-regulated Class II products such as ice cream and cottage cheese. The PMMB reported that 33 Class I dealers in the state co-produce

Class II products, with three of these also producing Class III and IV products. Producer-dealers also co-produce Class II, III, and IV products as well.

USDA data reported in table 3.1 indicate that Pennsylvania is a large regional processor of ice cream and ice cream mix, ranked second in the nation. This is an important use of Pennsylvania cream.

3.4 Structure of Pennsylvania Fluid Milk Processing Plants

Data in table 3.3 report the volume of milk processed by regulated fluid milk plants in Pennsylvania. This volume includes regulated Class II products and may reflect imported milk as well. The data are separated into independent vs. cooperative-owned plants in Pennsylvania,

Table 3.3 Volume and Milk Processed by Pennsylvania Regulated Fluid Milk Processing Plants: Independent vs. Cooperative-owned

	2020[1]	2021	2022
	-------- mil lbs --------		
Pounds of milk processed:			
Independent processors	2,135	1,661	1,667
Cooperative-owned processors	900	1,114	1,105
Total	3,035	2,775	2,772
percent independent	70.4%	59.8%	60.1%
percent cooperative	29.6%	40.2%	39.9%
Independent/coop plant size:			
Large plant, mil lbs	2,587	2,458	2,382
number	15	13	12
percent	85.2%	88.6%	85.9%
Medium plant, mil lbs	372	236	310
number	8	5	6
percent	12.3%	8.5%	11.2%
Small plant, mil lbs	74	77	75
number	2	7	7
percent	2.4%	2.8%	2.7%
Very small plant, mil lbs	1.4	4.3	4.6
number	11	12	13
percent	0.05%	0.15%	0.17%
Total, mil lbs	3,035	2,775	2,772
number	36	37	38
percent	100%	100%	100%

Source: Pennsylvania Milk Marketing Board.

[1]Includes both Dean Foods and Dairy Farmers of America-owned plants.

and are further allocated by plant size. In 2021 and 2022, roughly 60% of the milk processed at these plants was handled by independent dealers, compared to 40% processed by cooperative-owned plants. The split was lower for cooperatives in 2020. After 2020, Dairy Farmers of America assumed ownership of the Dean plants in the state, raising the percent of fluid milk processed by cooperatives.

The data in table 3.3 also identify the size and number of plants. In 2022, 12 plants processed 2.4 bil lbs of milk or 86% of all regulated milk in the state. A total of 6 plants processed 310 mil lbs of milk or 11% of the regulated milk. A balance of 20 plants, ranging in size from small to very small, processed the remaining 3% of regulated milk in the state. Clearly there are a lot of plants today in Pennsylvania that process small volumes of milk. As a point of comparison, the new MCW cheese plant in St. Johns, Michigan processes over 2.9 bil lbs of milk per year.[18] All from one large modern plant.

3.5 Manufacturing Plants

PMMB data from 2023 show 37 plants in the state that manufacture dairy products other than Class I fluid beverages (see figure 3.3). Of these, 15 produce Class II unregulated products, 4 produce Class II unregulated and Class III (cheese) products, 12 are solely Class III plants, and 6 are Class IV plants.

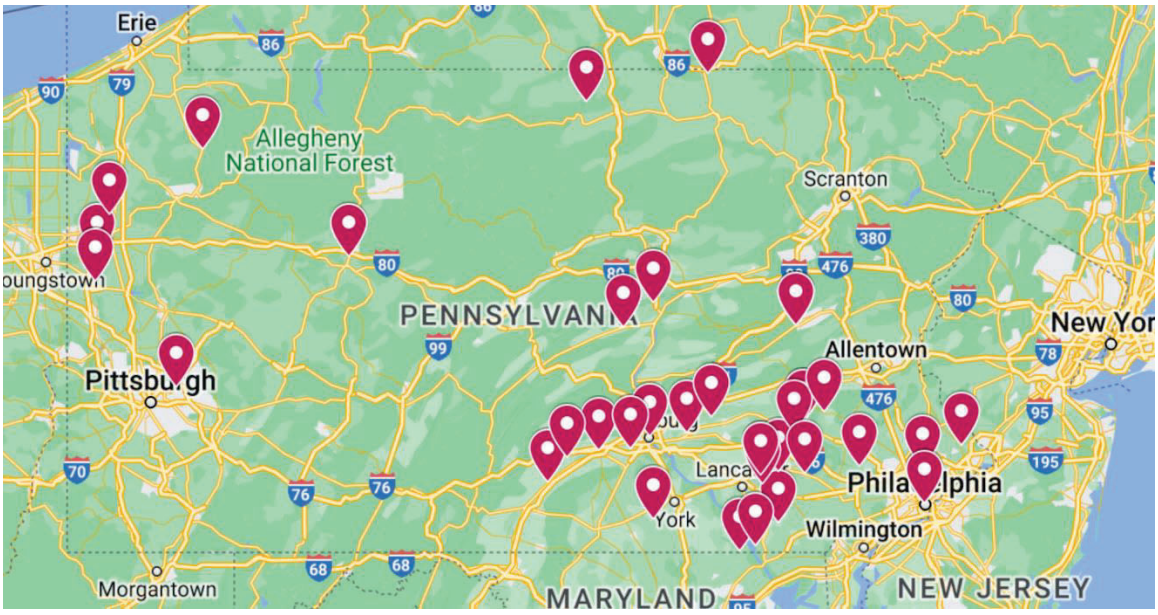

Figure 3.3 Pennsylvania Licensed Manufacturing Plants in 2023 (N=37)

The PMMB collects information on Pennsylvania plants that process non-regulated products (see table 3.4). The largest volume is milk used for hard cheese and powder such as nonfat dry

[18] https://mwcmichigan.com/our-business/ .

milk. Hard cheeses are cheeses that are storable such as cheddar, whereas soft cheeses are mainly fresh cheeses such as mozzarella or ricotta cheeses. Pennsylvania also has a large volume of milk that is used to produce fresh Class II products such as cottage cheese, yogurt, and ice cream. Another class II application is milk used to manufacture commercial food products such as chocolate candies.

Table 3.4 Processing of Non-controlled Milk Reported to the Pennsylvania Milk Marketing Board, mil lbs (2018-2022)

	2018	2019	2020	2021	2022
Class II:					
Cottage cheese	14	12	11	10	10
Yogurt	271	333	344	305	287
Ice cream mix	150	183	189	187	193
Sherbert/ice milk mix	92	95	83	92	94
Commercial food processing	487	449	461	459	476
Other Class II	na	na	na	na	2.0
Class III:					
Hard cheese	1,838	1,606	1,810	1,793	1,772
Chip dip	0.3	0.3	0.5	0.4	0.3
Other soft cheeses	209	242	160	195	333
Class IV:					
Butter	106	109	117	108	108
Powder, manufactured	2,190	2,247	1,030	1,919	2,019
Livestock feed	6	6	5	6	8
Total	5,363	5,282	4,210	5,074	5,301

Source: Pennsylvania Milk Marketing Board.

3.6 Pennsylvania Producer-Dealers

A producer-dealer (called a producer-handler in federal order language) is a business that operates a dairy farm, has milk processing equipment, and a route distribution in a marketing area of fluid milk products sold directly to retail customers or retail businesses. In federal orders, they cannot exceed three mil lbs a month in order to maintain producer-handler status.

Table 3.5 details the volume and size of producer-dealers in the state of Pennsylvania. One large producer-dealer accounted for roughly 66% of all the milk volume in 2020-22. Thereafter, there are 30-34 producer-dealers that each accounted for a much smaller volume. While this volume is small when compared to the coop-owned or independent dealers, producer-dealers are important to the state in that they represent a direct connection between the farm and consumer.

Table 3.5 Pennsylvania Producer-dealers by Size, mil lbs

	2020	2021	2022
Large	38.4	42.0	38.1
No. plants	1	1	1
% of total	66.1%	67.6%	65.9%
Medium	13.3	14.0	11.4
No. plants	7	8	6
% of total	23.0%	22.5%	19.8%
Small	5.9	5.8	7.9
No. plants	12	15	18
% of total	10.2%	9.3%	13.7%
Very small	0.44	0.37	0.38
No. plants	10	10	8
% of total	0.76%	0.59%	0.66%
Total	58.1	62.2	57.8
No. plants	30	34	33
% of total	100.0%	100.0%	100.0%

Source: Pennsylvania Milk Marketing Board.

There is a rather wide gap between Pennsylvania milk production as reported by USDA and Pennsylvania milk use reported by the PMMB for controlled (Class I fluid and Class II creams and sour cream) and non-controlled milk. For example, in 2022 USDA reported Pennsylvania milk production of 10 bil lbs, and the PMMB reported regulated milk use of 2.8 bil lbs for regulated Class I and II uses, 5.3 bil for non-controlled uses (Class II-IV), and 58 mil lbs for producer-dealers. The difference between reported production and use in processing was 1.8 bil lbs, or 18.3% of production. A significant portion of this balance is likely to be milk exported to a neighboring state. And a small volume could simply be milk not reported to the PMMB (e.g., on-farm use or farms that sell raw milk on-farm directly to consumers).

3.7 PMMB Licensed Plants in Surrounding States

Pennsylvania is physically situated in the population dense Northeast corridor. There are numerous milk sheds (farms producing milk) and manufacturing plants just outside the borders of the Commonwealth. These plants serve multiple purposes. First, they may buy surplus Pennsylvania milk. Second, they process dairy products that are imported into the state and effectively compete with Pennsylvania produced products. And third, these plants could also serve as future competitors for Pennsylvania plants.

A map of out of state plants in 2023 is provided below. A majority of these plants are located in New York and Eastern Ohio, but there are also a number of plants in neighboring Maryland, New Jersey, and Connecticut.

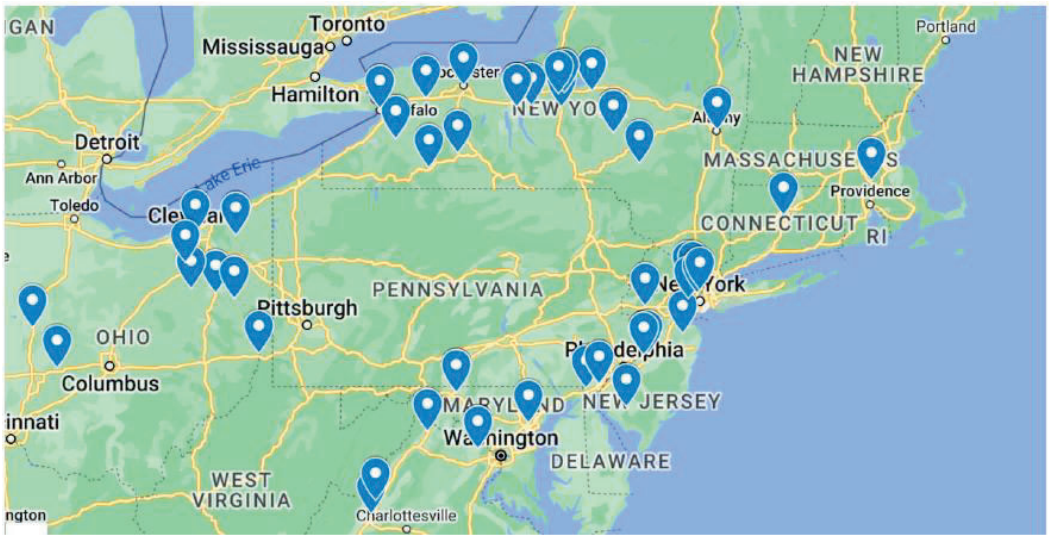

Figure 3.4 Pennsylvania Milk Marketing Board Regional Licensed Cooperatives, Dealers and Manufacturers in 2023 (N=60)

Section 4 Introduction to Milk Pricing

4.1 Section Introduction

This section is an introduction to the complex world of milk pricing. It explains both federal and state milk pricing. In particular, the section reviews the basics of federal order pricing and Pennsylvania minimum milk pricing. This provides a better understanding of the pricing elements of a typical Pennsylvania dairy farmers milk check.

When purchasing a gallon of whole milk from the store, there is one price for the entire gallon. It looks very similar to what comes out of the cow and into a dairy producer's refrigerated bulk tank. So, shouldn't the price of milk paid to dairy producers be just as simple? The answer of course is no, it is not, and there are a few reasons for this.

First, dairy producers are paid both on a volume basis (the pounds of milk picked up by the milk truck, measured in hundredweights) and a component basis (the pounds of milk components contained in the milk). Second, dairy producers may also get quality premiums on a volume basis if their milk meets certain test indicators. And finally, they would also get a volume-based premium for the Pennsylvania over-order premium (OOP) on the portion of milk processed by the plant for fluid milk (Class I) purposes and if the milk was produced, processed, and sold in Pennsylvania.

The milk check for most Pennsylvania dairy producers reflects the following sources of revenue:

1. Proceeds from a federal milk marketing order.[19]
2. Proceeds from the PMMB's over order premium.
3. Processor premiums/incentives.

4.2 Federal Order Pricing

Most dairy producers in Pennsylvania market their milk through a federal order. A federal order consists of a specific geographic area, consumers that buy milk and farmers that supply the milk, plants or "handlers" that process and deliver the milk, and regulations that provide provisions for marketing and pricing of the milk. A federal order pool provides the majority of funds in a Pennsylvania dairy producer's milk check. Federal orders identify dairy producers who meet certain conditions and therefore qualify to market milk on the order (i.e., so many days milk sent to a pool plant).[20]

The order also includes plants that are regulated by the order, and consumers that purchase fluid milk products. These pool plants are either "distributing plants" that process and sell Class I fluid milk products to consumers, or "supply plants" which are manufacturing plants (cheese,

[19] Not all producer milk is pooled on a federal order. Some is pooled on a state order and some is unregulated.
[20] The exact conditions for qualifying on a particular order are set out in the orders' regulations.

butter, nonfat dry milk, etc.) that service the Class I market by diverting a set percentage of their farm milk supply (set by the individual order) to the Class I plants.

The "pool" is how the proceeds of all dairy farm milk sales in the order are shared. Typically, Class I plants pay into the pool and manufacturing supply plants draw funds out of the pool. All pool plants pay their dairy producers the average price computed by USDA each month, subject to individual component levels and location.

Pool plants must report how much milk they receive and how they use the milk. USDA has four classes of milk that they track:

- Class I – milk consumed in fluid form.
- Class II – fresh dairy products such as ice cream, sour cream, cottage cheese (spoonable dairy products).
- Class III – milk used to make cheese.
- Class IV – milk used to make butter and dried milk products (i.e., nonfat dry milk).

Each month the Market Administrator (MA), an agent of the USDA, collects plant data from handlers on how milk was used. The MA calculates prices for each class of milk (called classified pricing) based on formulas agreed to in a prior federal order hearing and then applies these class prices to all the milk used to derive the classified value for each handler and the entire pool. Some of these prices are high (e.g., Class I), and some are low (either Class III or IV, or both).

The MA averages, or "pools," all proceeds in a market-wide pool. The MA also enforces the payment of this average pool price in an equitable manner to all dairy producers who participated in the pooling process.

In order to pay dairy farmers, the MA will require the payment of the value of the milk components first (butterfat, True protein, other solids). Then, after calculating the value of these milk components, will subtract them from the total pool value based on the classified value of all handlers in the pool. The balance, called the "Producer Price Differential," or PPD, is paid next. In this way, the farmer gets the full value of the entire pool and is paid on a "multiple component" basis (butterfat, True Protein, other solids).

Market-wide pooling is the concept that every dairy farmer who participates in the pool gets the same average price. But an important part of federal orders is the location value of milk. Farms located far away from a city center will receive a lower price each month for their milk than farmers located closer to a city center.

For example, in the Northeast federal order no. 1, farmers close to Boston receive the announced milk price (the PPD plus value of milk components). But farmers in rural Pennsylvania receive a lower price to reflect the spatial value of milk. The difference is called a

"location adjustment." This pricing difference encourages the movement of milk from surplus rural areas to deficit urban areas.

4.3 Understanding the Milk Check

The example milk check in table 4.1 illustrates how dairy farmers in Pennsylvania are paid. The first two lines (after the volume of Grade A milk) reflect the dollars paid on the volume of milk delivered for a) the federal order PPD and b) the deduction for the location adjustment to New Holland, Pennsylvania. This is basically the value in the federal order pool that is above the Class III value.

The next line is the PMMB over-order premium that is also paid on a volume basis. For independent handlers, this is equal to the announced PMMB over-order premium multiplied by the plant's Class I utilization (the percent of milk processed in the plant and sold in Pennsylvania for Class I purposes). In this example, the plant's Class I utilization rate was 40%.

The last three lines of the milk check reflect the pounds of milk components delivered and their value. These components were valued in the federal order at Class III announced component prices.

Table 4.1 Example Milk Check for New Holland, Pennsylvania on March 20, 2023

	Pounds	$/100 lbs	$/lb	Value
Volume Grade A milk[1]	168,000			
FMMO PPD - Boston	168,000	$2.97	$0.0297	$4,989.60
New Holland Location Adjustment	168,000	($0.45)	($0.0045)	($756.00)
PMMB over-order premium[2]	168,000	$0.66	$0.0066	$1,115.52
Component values:				
Butterfat	7,006		$2.7178	$19,039.82
True protein	5,376		$2.3650	$12,714.24
Other solids	9,710		$0.2101	$2,040.16
Total		$23.30		$39,143.33

[1]Assumes a 100-cow dairy producing 60 pounds of milk per day over 28 days.

[2]The announced PMMB over-order premium was $1.66/hundred pounds of milk. The plant's Class I utilization rate was 40%.

4.4 Comparison of Pennsylvania Milk Prices to Surrounding Markets

A natural question to consider is how retail milk prices in Pennsylvania compare to similar milk prices in surrounding states. Given that Pennsylvania has minimum milk pricing and other surrounding states do not, is the difference in retail milk prices due to government intervention (e.g., Pennsylvania minimum milk pricing)?

There are several factors one must consider when comparing retail milk prices. First, there are different types of milk (whole, reduced fat, low-fat, skim, lactose free, etc., plus organic versions of these). Second, we know that the farm cost of milk used to process packaged fluid milk will vary by plant location due to different federal order Class I differentials. Third, retail outlets will have different prices. A convenience store may have relatively high retail prices, whereas a "big box" store may have the lowest. These and other factors must be taken into account when comparing retail milk prices.

USDA's Agricultural Marketing Service conducts regular monthly surveys of retail milk prices by city for whole and reduced fat milk, and for conventional vs. organic milk.[21] They use the same survey methodology each month.[22]

Figure 4.1 illustrates the results of the USDA whole milk survey for two major urban markets in Pennsylvania: Philadelphia and Pittsburgh. Other urban markets in the Northeast were selected as a comparison. The data show that retail prices for whole milk in Philadelphia and

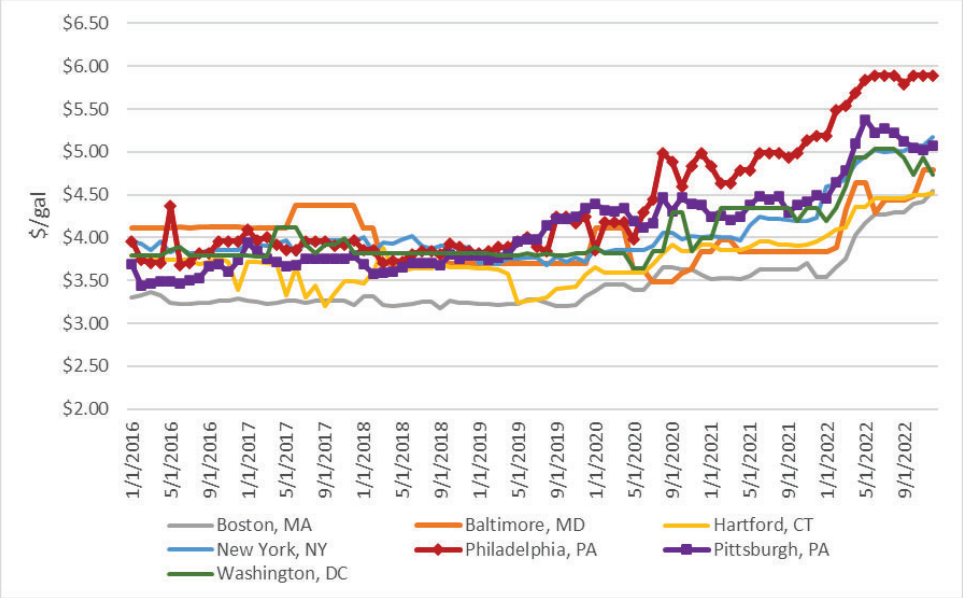

Figure 4.1 Comparison of Retail Whole Milk Prices for Packaged Fluid Milk in Pennsylvania and Surrounding Urban Markets

[21] Source: USDA, Agricultural Marketing Service, "Dairy Market News," various issues.

[22] As collected by Federal milk order market administrators based on a survey conducted one day between the 1st and 10th of each month (excluding Fridays and weekends) in selected cities or metropolitan areas. One outlet of the largest and second largest food store chains and the largest convenience store chain are surveyed. The price represents the most common brand in nonreturnable containers.

Pittsburgh are the highest of all cities that were surveyed. In fact, starting in 2020, Philadelphia prices rose well above all other city prices, including Pittsburgh. But why? Did PMMB minimum state pricing have anything to do with this?

Figures 4.2 and 4.3 compare the Class I federal order price of milk to the USDA survey price of whole milk and the PMMB minimum retail price of whole milk for Philadelphia (Area 1) and Pittsburgh (Area 5) measured in dollars per gallon over the period 2016-2022. There are two obvious conclusions. First, the PMMB "minimum" retail price tracks the federal order Class I price over time. As the federal order cost of Class I milk rises and falls, so does the PMMB minimum announced retail prices. Second, the USDA survey price, which depends on their unique survey method, illustrates a growing gap between the reported price and the PMMB minimum retail price starting in 2020. This is especially true in Philadelphia.

Retail stores in Pennsylvania are free to set their retail milk prices at or above the state minimum retail price. Some stores set prices at the PMMB announced minimum, whereas many large popular convenience stores near Philadelphia regularly set prices $0.70 - $1.00/gal above the PMMB announced minimum retail prices. So, while Pennsylvania state law and regulations require retailers to set retail milk prices at least to the announced PMMB retail minimums, the law does not dictate how they set retail price points above these minimums.

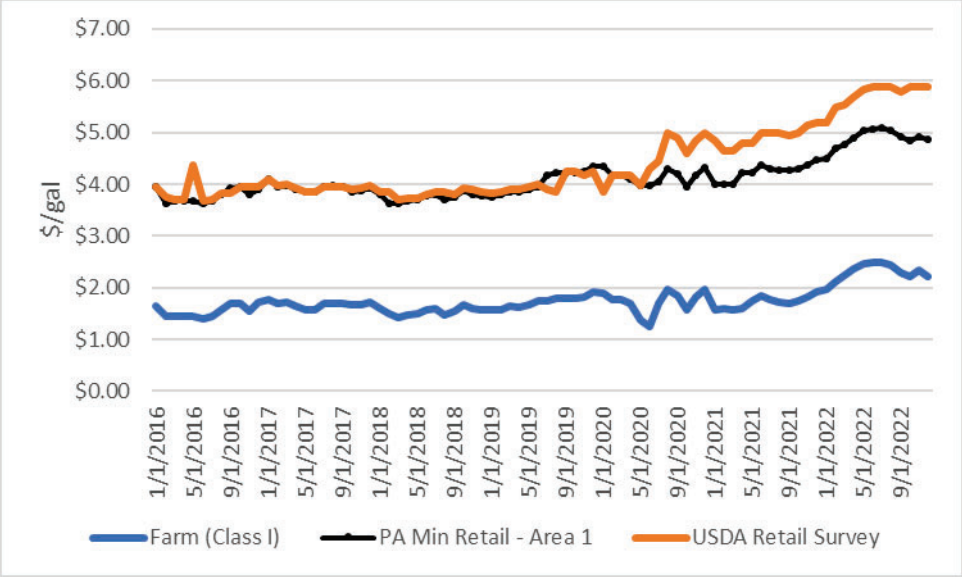

Figure 4.2 Farm and Retail Fluid Milk Prices for Philadelphia - Whole Milk

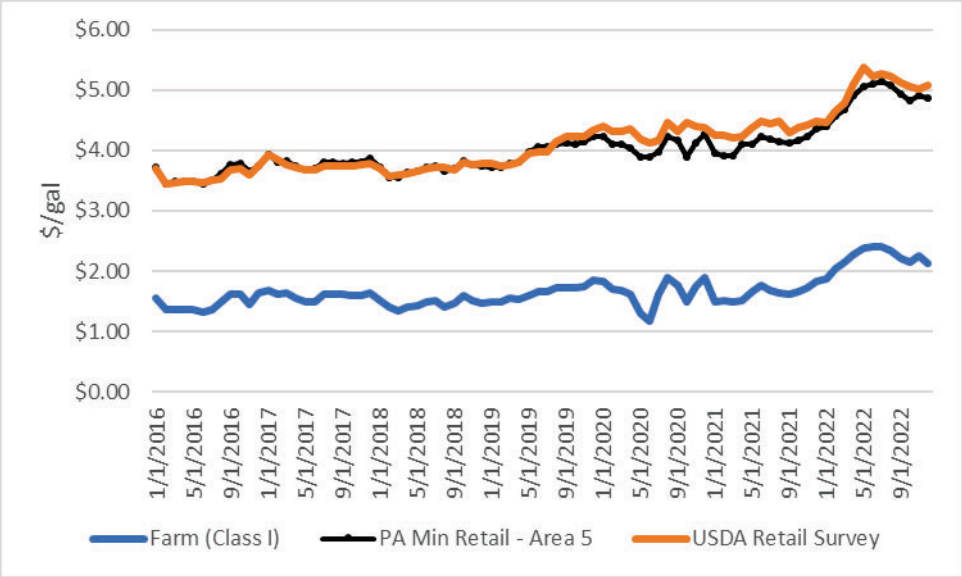

Figure 4.3 Farm and Retail Fluid Milk Prices for Pittsburgh - Whole Milk

4.5 Historical Retail and Wholesale Costs for Pennsylvania Fluid Milk

Figure 4.1 clearly indicates that USDA's survey of retail milk prices for major cities in Pennsylvania were above that of similar size cities in surrounding states. Figures 4.2 and 4.3 illustrate that the retail prices for whole milk in USDA's surveys for Philadelphia and Pittsburgh were well above the PMMB announced minimum retail prices. Prices rose significantly above state minimums starting in 2020. For example, the average retail price of whole milk in Philadelphia averaged 61 cents/gal above USDA's PA minimum retail price survey for 2020-22.

To illustrate what impact PMMB minimum pricing may have had on rising retail milk prices in Pennsylvania, two markets and two time periods were selected for review: Philadelphia and Pittsburgh for September 2019 and September 2022. The data are in table 4.2.

Table 4.2 Breakdown of Minimum Pennsylvania Milk Prices in Areas 1 and 5 for Whole Milk

	Philadelphia		Pittsburgh	
	Sept 2019	Sept 2022	Sept 2019	Sept 2022
Raw milk cost	$ 1.8911	$ 2.4759	$ 1.8103	$ 2.3401
Wholesale price	$ 3.5519	$ 4.2338	$ 3.3994	$ 4.1917
Minimum retail price	$ 4.23	$ 4.92	$ 4.12	$ 4.93
Raw milk cost as % of retail	44.7%	50.3%	43.9%	47.5%

Source: Pennsylvania Milk Marketing Board.

One can immediately reach three conclusions. First, the farm cost of milk components (federal order Class I) in each market rose about 30% from September 2019 to September 2022. Second, the ratio of the farm cost of milk components to the PMMB announced minimum retail price rose in each market from September 2019 to September 2022. Third, Philadelphia minimum retail prices set by the PMMB in September 2022 were lower than in Pittsburgh. In other words, PMMB minimum wholesale/retail pricing was very consistent between markets and over time and did not contribute to the post-pandemic rise in USDA's survey of retail milk prices in Philadelphia and Pittsburgh above similar prices in surrounding urban markets.

4.6 Farm Share: Pennsylvania Compared to Other States

Another point of comparison is how Pennsylvania's farm share of the retail milk price compares to surrounding states. This is an important indicator of how much of the retail price of milk is kept by dairy farmers. The farm price is basically the federal order mandated Class I price for the plant in a particular county. The retail price is the USDA survey price. For Pennsylvania, the PMMB mandated over-order premium (OOP) was included in the farm Class I price. The results in table 4.3 indicate that the farm share of the retail price is lowest in Philadelphia and Pittsburgh, and highest in Baltimore, Hartford, and Boston.

Table 4.3 Average Farm and Retail Milk Prices for Urban Markets in Pennsylvania and Surrounding Urban Markets in 2022

Cities/Units	Base Class I Price	Class I Differential	PMMB OOP [1]	Farm (Class I) [2]	PMMB Min Retail	USDA Retail	Farm vs Retail
	$/cwt	$/cwt	$/cwt	$/gal	$/gal	$/gal	%
Philadelphia	$23.66	$3.05	$1.48	$2.430	$4.890	$5.740	42.3%
Pittsburgh	$23.66	$2.10	$1.48	$2.348	$4.869	$5.029	46.7%
New York City, NY	$23.66	$3.15	na	$2.311	na	$4.923	46.9%
Washington, DC	$23.66	$3.00	na	$2.298	na	$4.790	48.0%
Baltimore MA	$23.66	$3.00	na	$2.298	na	$4.419	52.0%
Hartford, CT	$23.66	$3.15	na	$2.311	na	$4.358	53.0%
Boston, MA	$23.66	$3.25	na	$2.320	na	$4.135	56.1%

[1]PMMB = Pennsylvania Milk Marketing Board; OOP = over order premium.

[2]Includes the PMMB mandated over order premium.

Note: cwt = hundred pounds of milk.

One explanation for the relatively low farm share calculation for Pennsylvania is that the USDA survey including both Philadelphia and Pittsburgh reflects survey prices that are above the state mandated minimum retail price. In other words, market forces in these urban markets elevated the retail price in effect lowering the farm share. Recall the Class I price of milk is set by the federal orders. If both Philadelphia and Pittsburgh, on the other hand, would have sold milk at

the lower PMMB minimum retail price, then the farm share of the retail price would have been 48-50%, which is more in line with farm share results in Washington, DC and Baltimore.

So, our summary for this section is that the farm price of milk in Pennsylvania and surrounding markets is heavily influenced by federal milk marketing orders which set the "minimum" price of farm milk. In Pennsylvania, the state mandated over-order premium is an addition to the farm price, but only on a subset of the milk produced, processed, and sold in the state for Class I fluid milk purposes.

PMMB mandated minimum prices for retail milk set a floor below which milk cannot be sold in the state, even if it is processed out of the state and sold within Pennsylvania. And finally, the PMMB minimum retail price does not set a ceiling. In fact, there are many retail outlets in Southeast Pennsylvania, primarily large and popular convenience stores, that since the pandemic have set retail prices $0.70 - $1.00/gal above state mandated minimum retail prices. As a result, retail prices as surveyed by USDA in Philadelphia and Pittsburgh are higher than surrounding urban markets, and the farm share of the retail price is lower. **Our review indicates that PMMB minimum milk pricing did not result in higher retail milk prices in Pennsylvania than in surrounding markets for the time period investigated.**

Section 5 Trends in Fluid Milk Consumption

Section Introduction

This section reviews the key trends in U.S. fluid milk consumption since the 1960s. It examines the factors that drive fluid milk consumption. A theoretical model for fluid milk consumption is reviewed. The section also explores the historical consolidation that has occurred in the U.S. fluid milk industry. This history of consolidation has implications for the Pennsylvania dairy industry.

Despite a steady increase in U.S. population each year, spending on farmer and processor checkoff programs, and funding for school lunch programs, annual per capita consumption of fluid milk products in the U.S. has been steadily decreasing for the past seven decades (see figure 5.1). It has been a steady uninterrupted decline year after year. This is likely due to changing lifestyles, dairy alternatives like yogurt for breakfast, and competition from plant-based alternatives.

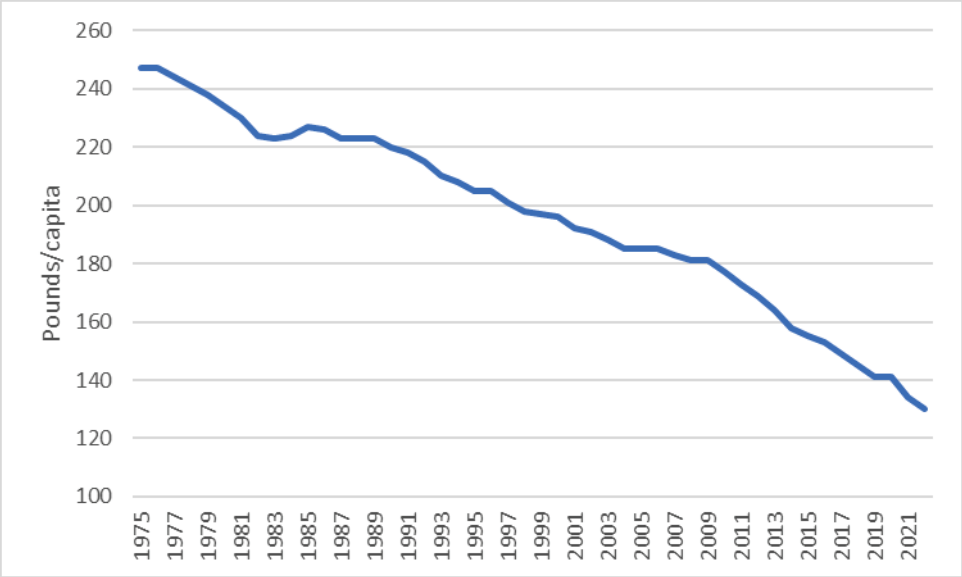

Figure 5.1 Per Capita Fluid Beverage Consumption, 1975-2022

Source: USDA, Economic Research Service.

That said, many individuals in the U.S. are not consuming enough dairy products to meet federal dietary recommendations.[23] The other concern is that federal order pool values are declining over time as there is less pooling of Class I differentials.

[23] Hayden Steward et al., "Why Are Americans Consuming Less Fluid Milk?" USDA, Economic Research Service.

There are two other trends that are occurring in the fluid milk space. Organic milk consumption has grown 25% from 2.3 bil lbs in 2013 to 2.8 bil lbs by 2022 (figure 5.2). Despite that growth, it is still a minor component of total fluid milk consumption, accounting for just 6.6% of total fluid milk consumption in 2022. The other trend is for more consumption of higher fat whole milk (average 3.25% fat) and less consumption of lower fat products (2% reduced fat milk, 1% milk, skim milk). The U.S. has experienced a general trend towards full fat dairy products and a reduction in "reduced fat" products due to greater consumer interest in butter and butterfat (figure 5.3).

There have been many studies that examined the reasons for declining fluid milk consumption including 1) generational changes in consumption, 2) changes in breakfast choices for school age children, 3) increased consumption of sugar-sweetened beverages, 4) a switch to plant-based beverages, and 5) convenience of packaging, etc. A recent USDA study confirmed that only some of the decline in fluid milk consumption can be attributed to plant-based alternatives.[24]

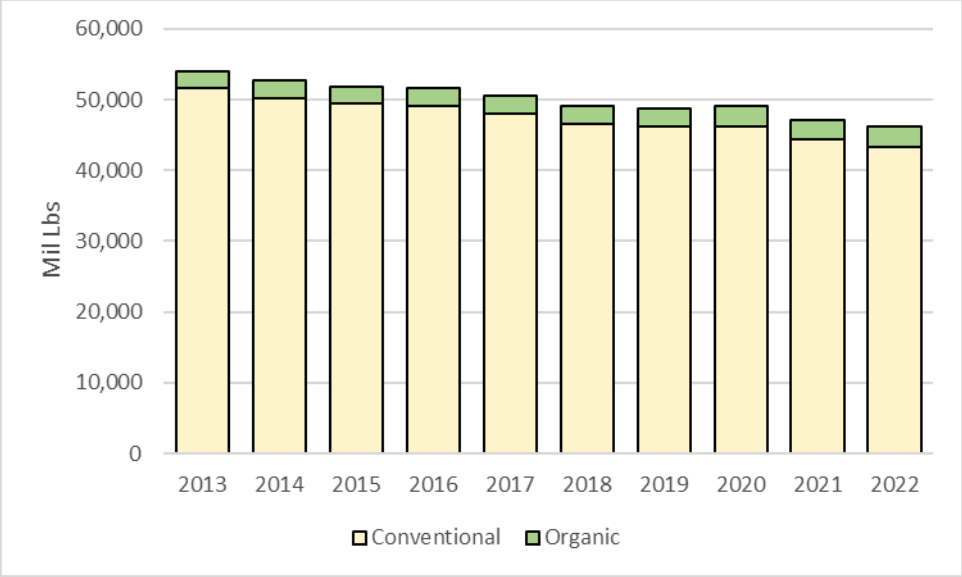

Figure 5.2 Annual Fluid Milk Sales: Conventional vs. Organic

Source: USDA, Agricultural Marketing Service.

[24] Steward Hayden and Fred Kuchler, "Fluid Milk Consumption Continues Downward Trend," Amber Waves, USDA, Economic Research Service.

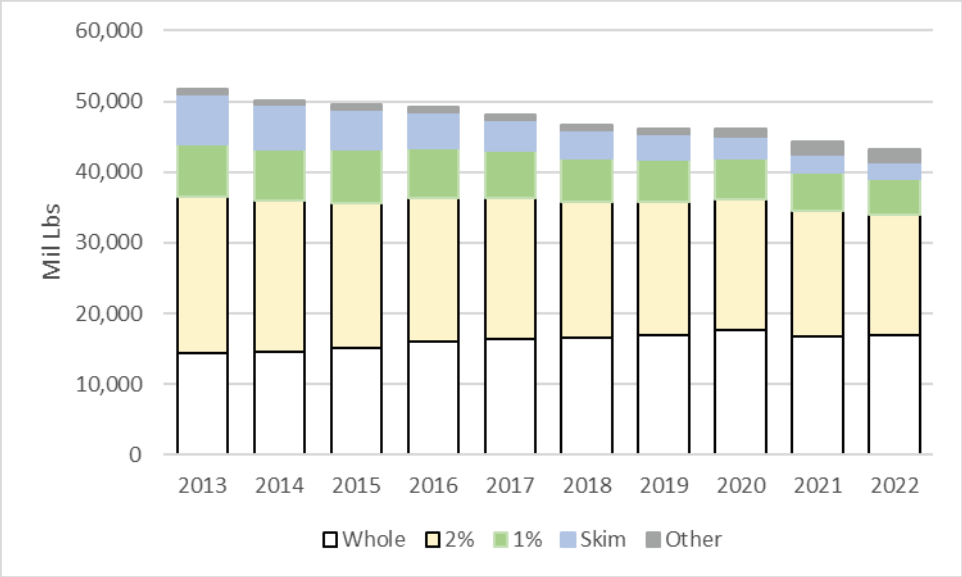

Figure 5.3 Annual Fluid Milk Sales by Product Category

Source: USDA, Agricultural Marketing Service.

5.1 Drivers of Per Capita Fluid Milk Consumption

Econometric models have been specified in the past to explain most, but not all, of the period-to-period changes in fluid milk consumption. Such models are based on traditional economic demand models and are specified as follows:

Demand is a function of: own price, cross price, income, and tastes & preferences

The demand for a product is inversely related to the "real" price of that product (adjusted for inflation). As prices rise, demand declines and vice versa. For example, U.S. butter consumption declined in Q4 2023 after wholesale prices peaked at over $3/lb. Rising wholesale butter prices pushed consumer-facing retail prices to record high levels. Demand may also "shift" or decrease, all else the same, if the price of a substitute goes down. There aren't a lot of clear substitutes for dairy products (i.e., cheese). One example would be if unit retail prices of planted-based products were to decline while prices for bovine milk held steady. In that case, economists would expect demand for bovine fluid milk to decline.

Income or measures of consumer purchasing power are not always positively correlated with demand. Economists note that demand can be positively or inversely correlated with income over time. In other words, per capita consumption of fluid milk products may decline over time just as real income (adjusted for inflation) goes up. The two can and often are inversely related even though beverage milk is a very nutritious product.

Economists explore the relationship between demand and prices by looking at the percent change in demand (quantity) with respect to the percent change in price. This relationship is called "the price elasticity of demand" and is specified below:

Price Elasticity of Demand = $\frac{\%\ change\ in\ Quantity}{\%\ change\ in\ Price}$

Elasticities greater than one are termed "elastic." Elasticities less than one are "inelastic." Fluid milk consumption is generally considered inelastic since most econometric models estimate an own price elasticity of demand less than one. That means price does have an inverse impact on demand, but it's minimal.

A recent example of an econometric model of fluid milk consumption is the model published by USDA's Agricultural Marketing Service and used in analyzing federal order proposals during federal order reform in the late 1990s.[25] That model employed a double log specification whereby the dependent variable was the log of per capita consumption (whole and low-fat milk) and the independent variables were the log of the CPI for fluid milk and non-alcoholic beverages, the log of personal consumption expenditures, and trend. The coefficients (price and income) for the double log specification are in fact the estimated elasticities and were negative 0.15 for whole milk and low-fat milk consumption.

The econometric model of per capita fluid milk consumption is specified as follows:

$$\text{Per Capita Consumption}_{i,t} = a + b*(\text{own price}_{i,t}/CPI_t) + c*(\text{cross price}_t/CPI_t) + d*\text{income}_t/POP_t/CPI_t + e*TREND_t$$

where

i = WM for whole milk, RF for reduced fat or 2%, LF for low fat or 1%, SM for skim milk, and OT for other

t = time period (monthly or annual)

own price = retail price of fluid milk

cross price = an index for other fluid beverages

CPI = a measure of inflation

income = income

POP = population, and

TREND is a proxy for tastes and preferences

One would expect *a priori* the coefficient "b" to be negative and less than one, the coefficient "c" (if statistically significant) to be positive, and the coefficient "d" for real per capita income to be either positive or negative. A negative coefficient would indicate that the good (in this

[25]USDA, Agricultural Marketing Service, "Federal Order Reform: Regulatory Impact Analysis," March 1999, pg. 86.

case milk) is an "inferior good." For economists, that means that as a consumer's income goes up, they purchase less of the product.

5.2 How Fluid Milk Plants Invoice Retail Customers

It's helpful to understand how fluid milk processors handle and process fluid milk and invoice their customers. This is important later when discussing recent structural changes in the fluid milk industry. One may assume that fluid milk processors simply markup from cost, add a "profit margin," and pass this along to retailers who are willing to pay the full amount. But that is not always the case, especially in states that do not have "loss leader" laws (making it illegal to sell packaged fluid milk below cost) or in situations where large retail chains have enormous market power.

Raw farm milk is received at the plant and is tested before it is unloaded into the plant's silo. It is tested to ensure proper quality (temperature of the milk, free of additives and antibiotics, etc.). Once pumped into the plant silo it is typically sent to a separator which separates the milk into skim and cream. From there it is pasteurized, recombined into specific proportions (e.g., whole milk vs 2%), homogenized to keep the cream stabilized in the milk, and bottled. It is then held for a few days in order to test for quality before shipping off to a distribution center or directly to a retail location.

Most fluid milk processors bill their retail customers for cost recovery plus a gross margin. The basic pricing model has the following elements:

- Farm cost of milk ingredients (Class I fat, Class I skim)
- Packaging (container,cap, etc.)
- Variable plant costs (utilities, chemicals, repairs/maintenance, etc.)
- Fixed plant costs (depreciation)
- Labor
- Distribution costs

Fluid milk processing plants typically negotiate annual contracts with their retail customers. Outside of Pennsylvania, which enforces minimum state milk pricing laws, these plants attempt to recover all of their fixed and variable costs plus earn a gross margin on the sale when negotiating contracts.

Fluid processors are often successful in recovering the farm cost of milk ingredients regulated by federal orders. And they can most often fully recover all of their variable costs, including the proportion of labor allocated to fluid milk processing, as well as distribution costs. But in recent years, given declining fluid milk sales and increased competition, many fluid milk processors outside of Pennsylvania are not successful in recovering all of their fixed costs and their target gross margin. Many times they must make the painful choice to accept contracts with full recovery for farm milk ingredients and variable costs, but realize only a partial contribution to fixed costs. So, if the plant is not well diversified (manufacturing products other than Class I

fluid milk) they could at some point not be able to budget for plant upgrades and repairs and will eventually become financially insolvent. Plants wear out over time, expensive boilers must be replaced, bottling equipment breaks down, etc.

In Pennsylvania, the financial pressure from large retail customers to accept fluid milk processing contracts below total cost is alleviated by providing minimum milk pricing at the farm, wholesale, and retail levels.

5.3 Consolidation of Fluid Milk Plants in the US and Pennsylvania

Like dairy farms, fluid milk processors in the U.S. have been consolidating over time. For decades the U.S. fluid milk processing industry was small, local, and fragmented. Small area dairy cooperatives supplied local family-owned fluid processors raw milk that was packaged and sent to local retail outlets.

As stated earlier, consolidation of the U.S. fluid milk industry started in the 1960s and 1970s and accelerated further in the 1990s. Later, competition for ownership of fluid milk plants was intensified by two publicly traded dairy companies: Dean Foods and Suiza Foods. Suiza Foods was a dairy startup that had its roots as an ice company in Puerto Rico. Suiza started buying fluid processing companies and their brands across the U.S. After purchasing a number of plants, they would then consolidate operations over a larger geographic area in order to increase plant size and more efficiently distribute milk.[26]

Suiza Foods was incorporated in 1994 and by 2001 had acquired Dean Foods (the new company was called Dean Foods). By 2012 Dean Foods spun off WhiteWave and Morning Star to refocus on its core business.[27] However, due to lawsuits, leveraged debt, loss of sales to vertically integrated retailers, and declining fluid milk sales, Dean Foods filed for bankruptcy by 2019.[28]

Shields reported in his Congressional Research Service report on consolidation in the U.S. dairy industry that the number of dairy manufacturing plants in the U.S. declined dramatically from just under 4,000 in the 1970s and then stabilized at around 1,100 facilities by 2000.[29] In 2008 the ten largest dairy processing companies operated from 9-81 plants each, with Dean Foods the largest.

USDA's Economic Research Service (ERS) publishes annual data on the number of fluid milk product plants in the U.S. and the average volume processed each year. The data are relevant for this study since they focus exclusively on just fluid milk processors (as opposed to "dairy" plants that also include cheese, butter, dry milk, and other fresh dairy processing). Those data clearly illustrate consolidation in the U.S. fluid milk processing industry.

[26] John Siebert et al., "Suiza Foods Corporation," International Food and Agribusiness Management Review.
[27] See Arun Nagabhairava, "Turnaround of Dean Foods: A Strategy to Milk a Shrinking Industry."
[28] See Yuliya Bolotova, "Market Power in the Fluid Milk Industry."
[29] Shields, Dennis A. "Consolidation and Concentration in the U.S. Dairy Industry."

Using an older original survey method, ERS reported data from 1960 through 2011. ERS then created a more updated survey method and now reports data from 2008 through 2021. As illustrated in figure 5.4, using both survey methods, the number of fluid milk processing plants fell from over 5,300 in 1960 to around 400 by 2008, and then slowly rose to 466 by 2021.

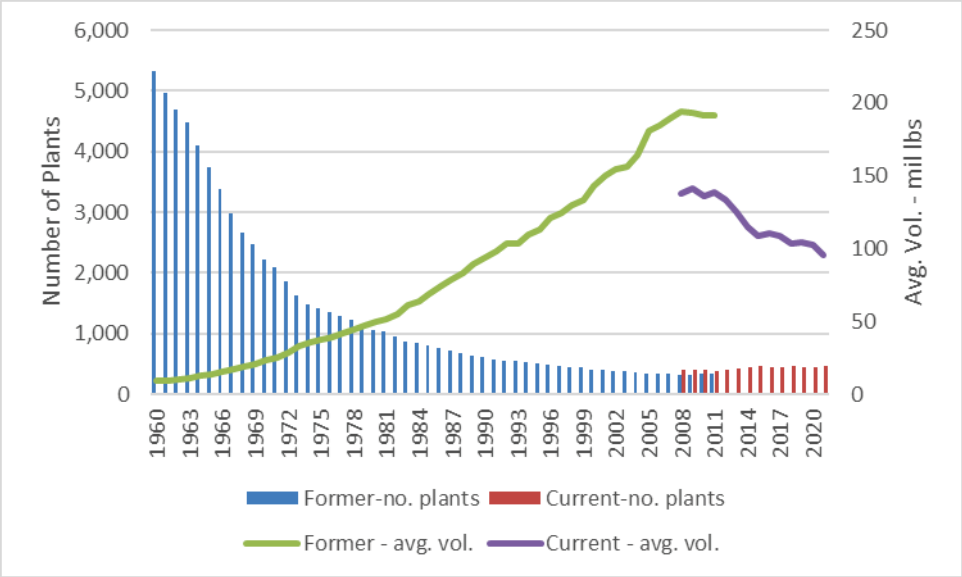

Figure 5.4 Number and Annual Average Processing Volumes for Fluid Milk Plants Under Two Survey Methods - Former and Current

Source: USDA, Economic Research Service. www.ers.usda.gov/data-products/dairy-data/

The average annual volume processed by these plants, a measure of plant size, rose dramatically from 8.8 mil lbs in 1960 to around 143.2 mil lbs in 2000, and then gradually declined to just under 100 mil lbs by 2021. One can conclude that most of the concentration in plant numbers and size for fluid milk processors occurred during the period 1960-80. That consolidation continued to advance after 1980, but at a much slower rate. Also, the slight increase in the number of fluid milk plants and year-to-year reduction in average plant size and processing capacity 2000–2021 was likely due to growth in the number of smaller plants that accounted for less than the majority of fluid milk processing in the industry.

Pennsylvania is unique in the U.S. dairy industry in that it is a populus state with many fluid milk processors. It was reported in section 3 that in 2022 there were 38 licensed fluid milk processors (cooperatives and independent processors) in the Commonwealth. That compares to 41 licensed fluid milk processors twenty years earlier in 2003. Thus, the number of fluid milk processors declined at a compounded annual growth rate of just 0.4% over this twenty-year period. So, there was not much structural change in terms of just plant numbers.

Pennsylvania's population in 2022 was just under 13 mil, fluid milk consumption for the state in 2022 was estimated at 1.7 bil pounds, 38 licensed fluid milk processors (cooperatives and independents) operated within the state (see table 3.3), and each Pennsylvania plant on average processed 73mil lbs of milk per year. Of that total, 12 large plants processed 86% of all fluid milk in the state, processing on average 199 mil pounds of milk per plant per year. On average, the state has one fluid milk plant per 341,369 residents. We conclude that the state is exporting packaged fluid milk to other states since total output from licensed plants exceeds our estimate of total fluid milk consumption for Pennsylvania residents.

Now, compare that to the USDA, Economic Research Service data on fluid milk plant size for 2021 (the most recent survey year). A total of 466 plants serviced a U.S. resident population of 332 mil. Thus 712,514 residents were serviced on average by each fluid milk plant in the U.S. Also, for the U.S., each plant processed on average 96mil pounds per year.

So, what can one conclude regarding the structure of Pennsylvania's fluid milk processing sector? First, there are many more small fluid milk processing plants in the Commonwealth when compared to the U.S. totals and averages. While Pennsylvania has 341,369 residents per fluid milk plant processing an average 73 mil lbs of milk per year, the U.S. on average has 712,514 residents per fluid milk plant, processing an average 96 mil pounds per year.

Second, a relatively small number of fluid milk plants in Pennsylvania processes a large portion of the state's fluid milk. Twelve large processors in Pennsylvania accounted for 86% of all fluid milk processing in 2022, and these plants averaged 198.5 mil pounds per year. They process 7.9% more fluid milk per year than the average U.S. plant. And these figures don't account for producer-handlers in the state. So, it is possible that Pennsylvania is competitive in terms of size and efficiency of fluid milk plants when comparing these 12 large plants to the rest of the U.S. And, Pennsylvania is also very unique in terms of having a large number of much smaller plants.

A question to be discussed later in this report is whether this efficiency and large number of smaller fluid milk plants is due in part to state minimum milk price regulations.

5.4 Impact of the Bankruptcy of Fluid Milk Processors in the U.S.

Dean Foods and Borden Dairy, both large fluid milk processors, filed for bankruptcy protection in 2019 and 2020, respectively. This was directly related to the changing structure of the U.S. dairy industry. The fluid milk industry consolidated in the 1990s, meaning a few large companies purchased and operated more plants on a larger scale. But this consolidation resulted in greater debt and was premised on the assumption that greater operational efficiencies could be realized, which would offset the gradual negative trend in consumer demand. This became a problem when the decline in per capita fluid milk consumption accelerated, and these companies struggled with high fixed costs including funding for worker pensions. They also faced strong competition from large retail customers and excess plant capacity in the industry.

5.4.1 Dean Foods

Shields reported that in 2008 Dean Foods Co. was the largest North American dairy processor operating 81 plants with sales of $12.5 bil.[30] Prior to bankruptcy Dean Foods tried to reduce costs by closing plants and trimming staff. Sales were further reduced when their largest customers – Kroger Co., Albertsons Cos., and Walmart Inc. – opened their own plants to supply private label milk to their customers.[31] When Dean Foods eventually filed for bankruptcy it created many problems in the U.S. dairy industry that harkened back to problems thought long gone from the 1930s.

The Penn State Center for Agricultural and Shale Law reported that after filing for bankruptcy, a law firm hired by Southern Foods Group, LLC (formerly d/b/a Dean Foods) sent demand letters to a number of dairy farmers who were paid by Dean Foods for their milk within 90 days preceding Dean's filing for bankruptcy (between August 14, 2019 and November 12, 2019).[32] The law firm asserted that individual dairy farmers, who delivered milk to Dean Foods and expected to be paid for this milk, were no longer entitled to this money under the bankruptcy code. Penn State noted that across the U.S., 2,500 such "demand letters" were sent.

Excluding letters sent to cooperatives, it was estimated that 1,000 – 1,500 demand letters were sent to independent dairy farmers selling to Dean Foods. In Pennsylvania alone, 50-75 independent producers sold to Dean Foods at the time. Both the American Farm Bureau and the Pennsylvania Milk Marketing Board, with assistance from the Pennsylvania Office of Attorney General, offered varying forms of advice and legal assistance to those who received such letters. The issue of producer payments for milk already delivered is critical when milk processing companies file for bankruptcy.

The other issue that was created by the Dean Foods bankruptcy was funding of USDA's producer settlement fund. When a fluid milk plant is pooled on a federal milk marketing order, they have an obligation to pay into the pool (technically the producer settlement fund) the difference between the classified value of the milk used in that plant and the plant's producer payroll obligation. The Market Administrator then has the obligation to send those funds to other supply plants/producers that qualified on the order and performed their obligations.

When Dean Foods filed for bankruptcy protection on November 12, 2019, it had 43 plants regulated on federal milk marketing orders. USDA noted that Dean Foods failed to make payments to the Agricultural Marketing Service of USDA for milk marketed from April 1, 2020, to May 4, 2020 totaling $32 mil.[33] That meant that USDA could not remit monies to other participants in these pools. Thus, USDA had the task of recovering these funds from the

[30] Dennis A. Shields, "Consolidation and Concentration in the U.S. Dairy Industry," see table 5, pg. 13.
[31] Jacob Bunge, "Dean Foods Files for Chapter 11 Bankruptcy," Wall Street Journal.
[32] Brook Duer, "Dean Foods Bankruptcy Attempts to Recover Payments," Penn State.
[33] USDA, Agricultural Marketing Service. "Stipulation and Agreed Order Requires Dean Foods to Pay 90 Percent of its Post-Bankruptcy USDA Milk Marketing Obligations." URL: ams.usda.gov.

bankruptcy court. This lack of timely payment created problems for USDA in meeting their pooling requirements.

5.4.2 Borden Dairy

Two months after Dean Foods filed for bankruptcy, Borden Dairy filed for Chapter 11 bankruptcy protection on January 5, 2020. Some of the same reasons were given for their bankruptcy including high debt levels for the company, reduced per capita fluid milk consumption, increased vertical integration of fluid milk operations in the retail grocery industry, and increased competition from plant-based alternatives.[34]

Borden Dairy, the 150-year-old dairy company with the mascot Elsie the cow and sales focused in the Southeast, employed 3,300 people at the time of its bankruptcy filing and cited debt in relation to the size of the company as a big problem.[35] Eroding margins and the high cost of pensions also contributed. It was likely that industry consolidation and vertical integration made it difficult to negotiate contracts with other retailers that would allow them to recover their actual fixed and variable costs and realize a positive return on their investments.

What is clear from both the Dean Foods and Borden Dairy bankruptcy filings is that the combination of difficult marketing conditions (reduced consumer demand for fluid milk, increased competition from plant-based alternatives, loss of sales to vertical integration of large retailers, and higher costs of inputs and distribution costs) and high company debt created very difficult financial conditions for both companies.

Most of the fluid milk plant consolidation needed to increase individual plant efficiency occurred in the 1970s through 2000. Plant closures were needed thereafter as consumer demand for packaged fluid milk created surplus plant capacity. But the nail in the coffin for both these companies, other than their enormous debt, was the incredible market pressure from retailers to lower their cost of packaged fluid milk purchases. Many of these retailers were promoting their stores by offering milk as a loss leader to increase traffic and sales values. There are some states that consider this practice as predatory and leading to reduced competition. As a result, some states outlawed the practice.[36] Fluid milk processors, in negotiations with retailers, were required to pay the cost of Class I milk purchased from farmers in federal orders but were under enormous pressure to lower all other costs. When that wasn't enough, some large retailers invested in their own fluid milk plants and ended their contracts with Dean Foods and Borden Dairy, leaving them stranded with high pension obligations and surplus plants.

The point is, if one abstracts from a company's debt, pension obligations and reduced market demand for fluid milk, extreme pressure from retailers to purchase packaged fluid milk from

[34] Louis Biscotti, "Why Borden Dairy's Bankruptcy Filing Might Be A Glass-Half-Full Scenario." Forbes.
[35] Niraj Chokshi, "Dairy Giant Borden Files for Bankruptcy Protection," The New York Times.
[36] Chris Fleisher, "Loss-leaders: predatory or practical?" American Economic Association.

processors with surplus processing capacity can lead to very anti-competitive practices. This includes accepting below cost annual contracts. But companies can only do this for so long before they become financially insolvent.

5.5 Section Summary and Key Findings

This section reviewed the key trends in U.S. fluid milk consumption since the 1960s. The focus here is on consumption of milk in the bottle, not milk converted into other dairy products such as cheese, butter, or yogurt. The findings are clear: every year the average U.S. resident consumed less packaged fluid milk. That trend towards reduced fluid milk consumption accelerated after 2009. Other trends after 2009 were a) slightly more fluid milk consumption was organic, and b) there was a shift in consumption from lower fat to full fat milk.

The section also reviewed an econometric specification for estimating per capita fluid milk consumption. It separates the drivers between,

- retail price (for milk and competitors),
- income (average disposable income for consumers, and
- tastes and preferences.

A literature review of econometric models for fluid milk clearly identified two key findings. First, fluid milk consumption is highly "inelastic," meaning the volume of fluid milk consumption is barely impacted by the retail price of milk (over the historical period). Second, other factors imbedded in a trend variable explain the downward trajectory of fluid milk consumption.

This section also provided a historical review of industry consolidation for fluid milk processors over time. From the 1960s to the early 2000s the number of fluid milk plants declined significantly, whereas the annual volume processed by these plants grew each year. Fewer and larger plants are processing more fluid milk each day. The consolidation in these plants accelerated through the 1960s and 1970s. By the 1990s most of the plant level consolidation was complete.

The next stage of industry consolidation was that of ownership. Both Suiza Foods and Dean Foods in the 1990s went on a buying spree to consolidate ownership of fluid milk processing plants. Interestingly, this was also during a period of steady rapid decline in per capita fluid milk consumption. In the end, Suiza Foods acquired Dean Foods, and Dean Foods then ultimately ended up in bankruptcy.

Section 5 laid the foundation for a better understanding of trends facing the Pennsylvania dairy industry.

This review of fluid milk consumption will be used in the next section to specify and estimate a Pennsylvania per capita fluid milk consumption model. That model in turn will be used to address the research question:

- *Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?*

Section 5 also clearly addressed the historical consolidation issues that faced the U.S. dairy industry since the 1960s. It quantified the average plant numbers and plant size with regards to pounds of milk processed each year. The reviews of Dean Foods and Borden's bankruptcies also illustrate just how vulnerable the fluid milk industry is today. What was once considered impossible – the bankruptcy of the largest fluid milk processors in the U.S. – actually occurred.

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PART II – Scenarios and Data Analyses

Introduction

Part II presents scenarios, utilizing baseline data, economic models and other sources, for analyses to address the following research questions:

- Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?
- Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?
    - If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?
- How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?

The scenarios and analyses build on information presented in Part I of this report and respond to the three research questions above by simulating the impact of eliminating minimum milk pricing in Pennsylvania. To address these questions, a research methodology was developed that starts with a baseline that describes economic conditions "as they are." From there an alternative scenario was simulated for the Pennsylvania dairy industry that assumed elimination of minimum milk pricing. The "impacts" were computed by comparing each scenario to the historical baseline and computing the differences.

Part II computes the direct economic impacts of such scenarios on Pennsylvania dairy farmers, dealers/processors, and consumers. The indirect economic impacts from such a scenario on the broader Pennsylvania economy will be quantified from these results. Part II is organized as follows:

Section 6: Impact on Pennsylvania Consumers, Farms, and Fluid Milk Processing

Section 7: Economic Impacts of Changes

Section 8: Summary and Conclusions

Broader Economic Impact of Eliminating PMMB Minimum Pricing

The Pennsylvania dairy industry has operated with state price regulations since the 1930's. The purpose of these regulations was to not only support Pennsylvania dairy farmers, but also to support fluid milk processors (dealers), retailers, and consumers in the commonwealth. Part of this regulatory framework is to set minimum pricing for farm milk, wholesale prices for processors/dealers, and retail milk prices. But what would happen if minimum milk pricing in

Pennsylvania were to disappear? What is the broader economic impact? Part II provides an analysis of the impacts of eliminating minimum milk prices on the dairy industry and focuses on the value chain starting with Pennsylvania dairy farmers through to Pennsylvania consumers. The indirect impacts of this scenario on the broader Pennsylvania economy will subsequently be evaluated.

Section 6 Scenarios and Analyses

6.1 Introduction

This section addresses the following research questions:

- *Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?*
- *Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?*
    - *If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?*
- *How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?*

This section builds on prior sections and addresses the three research questions above by simulating the impact of eliminating minimum milk pricing in Pennsylvania. To address these questions, a research methodology was developed that starts with a baseline that describes economic conditions "as they are." From there an alternative scenario was simulated for the Pennsylvania dairy industry that assumed elimination of minimum milk pricing. This section estimates the direct economic impacts of such a scenario on Pennsylvania dairy farmers, dealers/processors, and consumers. The indirect economic impacts from such a scenario on the broader Pennsylvania economy will be quantified in the next section.

6.2 Impact of Eliminating PMMB Minimum Pricing

The Pennsylvania dairy industry has operated with state price regulations since the 1930's. The purpose of these regulations was to not only support Pennsylvania dairy farmers, but also to support fluid milk processors (dealers), retailers, and consumers in the commonwealth. Part of this regulatory framework is to set minimum pricing for farm milk, wholesale prices for processors/dealers, and retail milk prices. But what would happen if minimum milk pricing in Pennsylvania were to disappear? What is the economic impact? This section provides an analysis of the impacts of eliminating minimum milk prices on the dairy industry and focuses on the value chain starting with Pennsylvania dairy farmers through to Pennsylvania consumers. The indirect impacts of this scenario on the broader Pennsylvania economy will be evaluated in the next section.

6.3 Impact on Pennsylvania Consumers: Would They Purchase More?

One of the key questions that is to be addressed by this study is whether consumers in Pennsylvania would buy more packaged fluid milk if the state's minimum milk pricing structure is eliminated. The underlying hypothesis to be tested is if minimum milk pricing is eliminated, and retail milk prices in Pennsylvania decline, would consumers purchase more packaged fluid milk? If that were to occur, one would assume that there would be more federal order Class I differential dollars in the pool, thus raising the price of milk to Pennsylvania dairy farmers.

To address this question, an econometric demand model was estimated using data and a theoretical model to simulate per capita consumption of fluid milk in Pennsylvania. Once the demand model was estimated, an "alternative scenario" was constructed and simulated to examine the impact of eliminating Pennsylvania minimum milk pricing.

6.3.1 Data Used in the Econometric Model

We begin with the data needed to estimate the fluid demand model. Unfortunately, survey data to estimate historical per capita fluid milk consumption in Pennsylvania do not exist. However, a proxy for this would be national per capita data. We hypothesized that average fluid milk consumption in Pennsylvania is very close to the national average. To test this, annual fluid milk use in the Northeast federal order (the milk processed in Class I plants) was divided by USDA's population estimate for the same order to approximate per capita consumption in the Northeast.[37] The annual results were on average 7.2% higher than the USDA's Economic Research Service data for U.S. per capita consumption for the period 2000-22. This could easily be explained by the fact that fluid milk processing in the Northeast order is regularly exported to neighboring counties outside the order. The Northeast order data reflects processing, and the USDA estimate for the US reflects actual consumption. Also, the two annual estimates of per capita production/consumption over the period 2000-22 had a correlation coefficient of 99.2%.

Fortunately, USDA's Agricultural Marketing Service conducts a detailed monthly national survey of fluid milk product sales for conventional and organic milk for the U.S.[38] The survey is broken down to whole milk, reduced fat (2%), low fat (1%), fat free (skim), flavored, and other. The sales data reflect fluid milk consumption in federal orders which covers 92% of all consumers. The remaining 8% is approximated to derive an "estimated U.S. sales of fluid milk products."

For this study, the monthly national sales data from January 2013 to December 2021 were aggregated across conventional and organic milk into whole milk, reduced fat, and "other." Per capita U.S. fluid milk consumption for whole, reduced fat, and "other" was then computed by dividing each by monthly U.S. residential population.[39] Once the per capita data were estimated, they were used as a proxy for Pennsylvania per capita fluid milk consumption.

The other data required to estimate the model were monthly retail fluid milk prices, the CPI index for non-alcoholic beverages, the CPI index for all urban consumers in the Northeast (a

[37] The source for Class I fluid milk in the Northeast order number one was the "Northeast Milk Marketing Area Statistical Handbook: January 2000 – Present," tab A4, downloaded May 22, 2023. The data for population in the Northeast order was provided by the market administrator. The source for U.S. per capita consumption was USDA's Economic Research Service, Dairy Data, "Dairy Products: Per Capita Consumption, United States (Annual), downloaded May 22, 2023.

[38] USDA, Agricultural Marketing Service, "Estimated Fluid Milk Products Sales Reports," URL: https://www.ams.usda.gov/resources/marketing-order-statistics/estimated-fluid-milk-sales.

[39] An estimate of monthly U.S. and Pennsylvania residential population from 2013-21 was provided by the St. Louis Federal Reserve, URL: https://fred.stlouisfed.org.

measure of inflation), and Pennsylvania nominal per capita personal consumption expenditures in dollars (a measure of income). The retail price data for whole milk and reduced fat milk in Pennsylvania and surrounding markets were discussed earlier in section 4 (USDA survey of retail milk prices). The CPI indexes were provided by the U.S. Bureau of Labor Statistics. Annual data for Pennsylvania per capita personal consumption expenditures were also sourced from the U.S. Bureau of Labor Statistics.

Next, we considered whether to specify an annual or monthly model. Rather than aggregating monthly data into an annual data set, a monthly model was selected for two reasons. First, more data provide for a more statistically robust estimation. Second, the results of the model are more focused on the short run to intermediate run time frame which is of most interest in this study.

6.3.2 The Model

The statistical model specified for estimation was discussed earlier in section 5 and is presented below. A double log specification was used in order to directly estimate elasticities.

$$\text{Ln(per capita consumption}_{i,t}) = a + b*\text{Ln(own price}_{i,t}/\text{cpi}_t) + c*\text{Ln(cross price}_t/\text{cpi}_t) + d*\text{Ln(income}_t/\text{POP}_t/\text{CPI}_t) + e*\text{TREND}_t + f*\text{Seasonal Dummy Variables}$$

where

i = WM for whole milk, RF for reduced fat or 2%, and OT for other milk
t = months
own price = retail price of fluid milk
cross price = the cpi for other fluid beverages
income = personal consumption expenditures
POP = population, and
CPI = consumer price index, a measure of inflation.

Note: a, b, c, d, e and f are parameter estimates. [40]

In terms of the own price, the USDA retail prices of whole milk and reduced fat milk for Philadelphia were selected since it is the largest urban market in Pennsylvania. **The whole milk price was used to estimate Pennsylvania per capita consumption for whole milk, and the reduced fat price was selected for both the reduced fat and "other" per capita consumption estimations.** The own price was divided by the CPI for all urban consumers in the Northeast so as to convert from nominal to real dollars. The CPI for non-alcoholic beverages was found to be statistically insignificant in all model estimations and was therefore dropped from the specifications. Annual data for Pennsylvania personal consumption expenditures were used for each month since a) monthly estimates were not available, and b) standard methodologies to

[40] Parameter estimation computes a model's parameters (descriptive measures of an entire population) from measured data.

convert from annual to monthly estimates would not result in improved econometric results. The TREND variable was simply 1 for January 2013 and increased by one each month to reach 108 by December 2021. Seasonal dummy variables were used to estimate the repeatable seasonal trends in fluid milk consumption (e.g., less fluid milk consumption in Q3 during the summer, more consumption in Q4 when children return to school). The season dummy variables use "1" for the representative quarter and "0" for all other months.

6.3.3 Statistical Results

The parameter estimates of the statistical model are presented in table 6.1 for all three dependent variables: per capita whole milk consumption, per capita reduced fat milk consumption, and per capita consumption for "other" milk. All three models have the correct sign for the own price, have statistically significant parameter estimates (based on the t statistic), and have reasonable multiple R-square estimates. The estimated own price

Table 6.1 Parameter Estimates of Monthly Pennsylvania Fluid Milk Consumption

	Dependent Variables: ln(per capita consumption)		
	Whole	Reduced Fat	Other
Right Hand Side Variables:			
Intercept	2.350	11.417	21.460
ln(retail milk price/CPI Index)[1]	-0.274	-0.140	-0.115
t stat	***-4.931***	***-1.877***	***-0.943***
ln(PA personal consumption expenditures/CPI Index)[2]	-0.427	-2.032	-4.077
t stat	***-1.948***	***-12.035***	***-14.827***
TREND	0.002	na	na
Q2 dummy variable	-0.030	-0.074	-0.094
Q3 dummy variable	-0.013	-0.080	-0.128
Q4 dummy variable	0.022	na	-0.051
dum_Mar2020	0.115	na	na
Multiple R square	0.834	0.795	0.836

[1]The retail milk price was for Philadelphia, Pennsylvania. The whole milk model was estimated using the whole milk price for Philadelphia; the other models used the reduced fat milk price.
[2]Per capita.
Note: given the double log specification of the model, the parameter estimates for both the own price and income variables are also estimated elasticities of demand.

elasticities are similar to the USDA study reviewed in section 5.[41] While the USDA study estimated an own price elasticity of a negative 0.15 for both whole milk and low-fat milk

[41] USDA, Agricultural Marketing Serviced, "Federal Order Reform: Regulatory Impact Analysis," March 1999, pg. 86.

consumption, this updated study using monthly data estimated elasticities of demand that were higher (in absolute terms) for whole milk, and lower for reduced fat and "other" milk products. The updated results suggest that higher fat fluid milk products are slightly more sensitive to milk prices than lower fat products. Not surprisingly, this study estimated negative income elasticities, whereas the older USDA study had positive elasticities. While it was difficult to sort out what impact income had vs. TREND (a proxy for tastes and preferences), it is clear that per capita consumption declined over time as income levels were rising.

Overall, the new updated monthly demand models were judged to be specified correctly, had correct signs based on economic theory, and had statistically significant coefficients.

6.3.4 The Scenario

So how would one construct a scenario to reflect the elimination of minimum milk pricing in Pennsylvania? Such a scenario would no longer set minimum retail and wholesale prices. There would no longer be a way for cooperatives operating in Pennsylvania to be directly reimbursed for their higher procurement costs related to balancing daily plant needs (i.e., fluid vs. cheese, butter, or nonfat production). And there would no longer be a regulatory method for passing along the cost of any over-order premiums to retailers. Large retailers would also no longer be bound by minimum retail pricing and would likely initiate a bidding war on retail prices and exert pressure on fluid milk processors to lower costs, as they have done in other states over time. That said, farmers would still be able to enforce minimum Class I pricing in federal order pooling.

One could construct numerous scenarios to model the effects of eliminating minimum milk pricing. But for modeling the impact on fluid milk consumption, it boils down to what impact would it have on retail milk prices? It was already reviewed in section 4 that Pennsylvania fluid milk prices were higher than those in surrounding states, with Hartford and Boston at the lower range, and Philadelphia at the highest range. Also, many popular convenience stores in Pennsylvania regularly set their retail prices $0.70 - $1.00/gal above the state minimum prices. And state minimum pricing is designed to allow processors and retailers to recover their costs and realize a small return on their investments. By eliminating regulated minimum pricing, the "free market" would likely pressure retail milk prices lower. There would be no state minimum pricing regulations to prevent retailers from pressuring fluid milk processors to supply milk at below cost. And it is possible that increased competition could also eliminate the premiums that some retailers in the state currently charge consumers above PMMB minimum retail pricing.

To simulate the elimination of minimum pricing, we assumed that Pennsylvania milk prices would decline to retail prices in surrounding states. Thus, Pennsylvania retail milk prices without PMMB minimum pricing could fall to levels as reported by USDA in Boston, Hartford, Baltimore, and Washington, DC. But recall that federal order minimum pricing would still prevail. So, looking at the map below, we eliminated all cities reported by USDA that had Class I

differentials that were higher than those in Pennsylvania. We settled on using the USDA survey price for milk in Baltimore as a proxy for what retail milk prices would be in Pennsylvania if state minimum pricing were eliminated. Over the period of simulation 2017-21, the retail price of whole milk and reduced fat milk in Baltimore was 8.3% and 5.2% lower, respectively, then in Philadelphia. Thus, while the Philadelphia prices for whole and reduced fat milk were used in the estimation of the model, the prices of whole and reduced fat milk in Baltimore were used as a proxy for lower prices under an elimination of minimum PMMB pricing for the "alternative scenario."

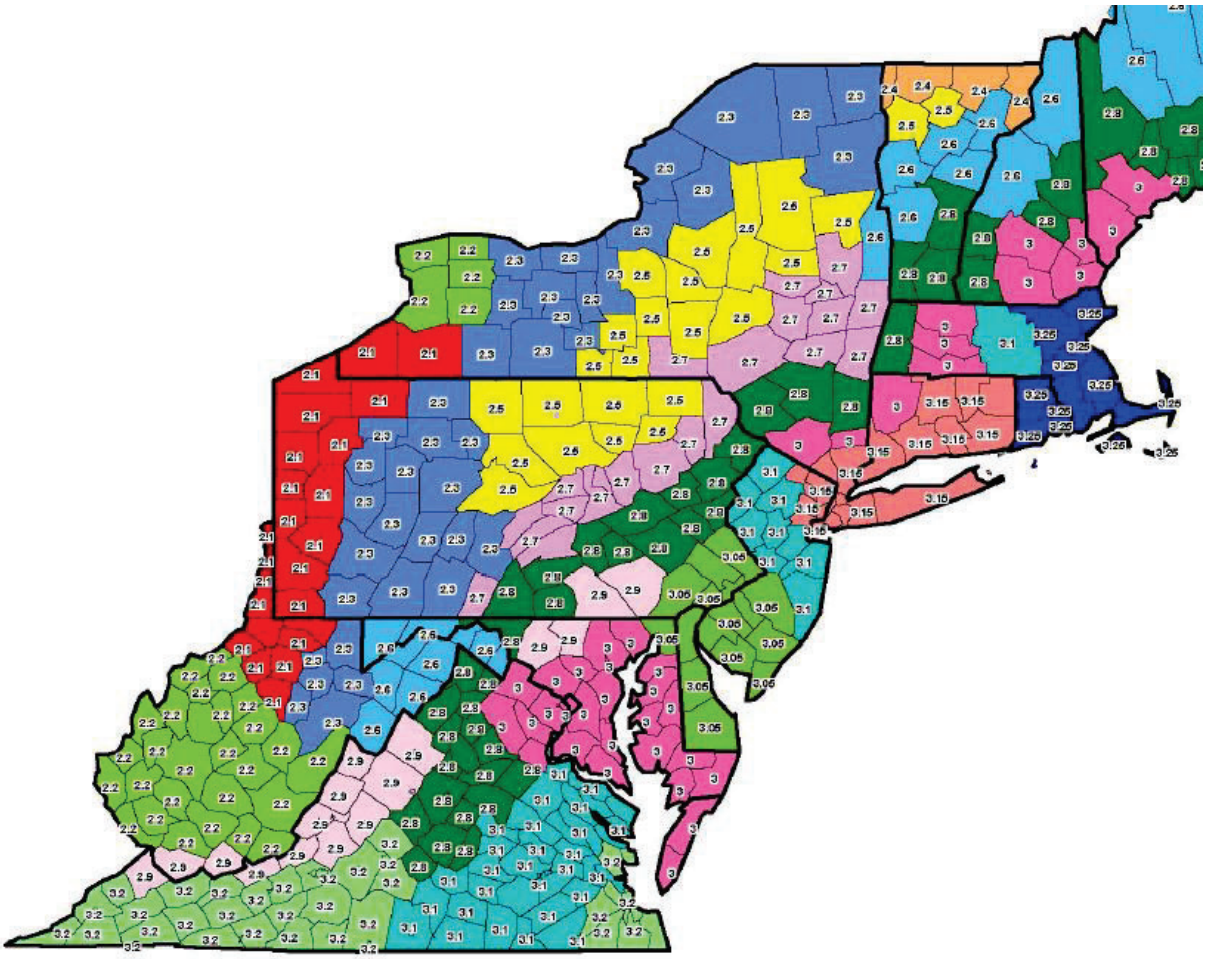

Figure 6.1 Northeast Federal Milk Marketing Order Class I Differentials by County

6.3.5 Scenario Results

The period of analysis was 2017-21. We created the baseline by multiplying USDA per capita consumption of whole, reduced fat, and "other" milk by monthly estimates of Pennsylvania population. The alternative scenario was constructed by simply replacing the higher

Philadelphia retail milk prices with the lower Baltimore retail prices and resolving the model. The results of this simulation and the comparison to the baseline are presented in table 6.2.

The scenario results show that if PMMB minimum pricing is eliminated, the retail price of milk over the study period 2017-21 would decline 8.3% for whole milk and 5.2% for reduced fat milk, but that total demand for fluid milk in Pennsylvania would increase a modest 1.3% or an average of 23.3 mil lbs per year. These results make sense given the inelastic parameter estimates from the model. In terms of retail value in dollars, the reduced retail price would have some offset in a slightly higher volume of sales. **Together, the simulation results indicate that retail sales values would decline by an average of $63.2 mil per year.**

Table 6.2 Impact of Eliminating Minimum Milk Pricing in Pennsylvania on Fluid Milk Consumption

Year	---------- Baseline ----------				
	whole	red.fat	other	total	own price[1]
	thou lbs	thou lbs	thou lbs	thou lbs	$/gal.
2017	643,194	778,151	459,835	1,881,180	$3.948
2018	646,576	745,397	423,325	1,815,298	$3.818
2019	658,955	729,801	399,522	1,788,278	$4.003
2020	689,737	728,160	389,963	1,807,860	$4.451
2021	656,679	696,311	382,979	1,735,969	$4.911
Sum 2017-21	**3,295,142**	**3,677,821**	**2,055,623**	**9,028,585**	**$4.226**
	----- Scenario: Eliminating PA Min Pricing -----				
	whole	red.fat	other	total	own price[2]
	thou lbs	thou lbs	thou lbs	thou lbs	$/gal.
2017	629,647	762,835	453,091	1,845,574	$4.268
2018	649,065	744,406	423,482	1,816,953	$3.768
2019	673,240	735,484	402,754	1,811,478	$3.700
2020	721,462	741,054	396,523	1,859,040	$3.772
2021	701,346	717,465	393,205	1,812,016	$3.863
Sum 2017-21	**3,374,761**	**3,701,246**	**2,069,055**	**9,145,062**	**$3.874**
	---------- Percent Change ----------				
	whole	red.fat	other	total	own price[2]
2017	-2.1%	-2.0%	-1.5%	-1.9%	8.1%
2018	0.4%	-0.1%	0.0%	0.1%	-1.3%
2019	2.2%	0.8%	0.8%	1.3%	-7.6%
2020	4.6%	1.8%	1.7%	2.8%	-15.3%
2021	6.8%	3.0%	2.7%	4.4%	-21.3%
Sum 2017-21	**2.4%**	**0.6%**	**0.7%**	**1.3%**	**-8.3%**

[1]Retail price of whole milk in Philadelphia, Pennsylvania.

[2]Retail price of whole milk in Baltimore, Maryland.

Source for retail prices: USDA, Agricultural Marketing Service.

In our estimation, farmers, processors, and retailers would likely absorb the loss in retail value. Some retailers, perhaps convenience stores, would lose the premium they currently charge customers over the minimum PMMB pricing. However, given the market power and size of processors and retailers today, most of this loss would likely be passed down the value chain and would come out of the farmer's pockets. **Thus, we would conclude that eliminating PMMB minimum pricing for milk would lower retail milk prices and result in a very modest increase in fluid milk consumption. Overall, farm income would not increase.**

6.4 Impact on Pennsylvania Dairy Farmers and the Milk Supply

In this section, the impact of eliminating minimum milk pricing in Pennsylvania on farm milk production in the state is simulated. One could hypothesize that the impact would vary by individual dairy farmer since the plants that dairy farmers ship their milk to have different Class I utilization rates. Dairy farmers marketing milk to local regional plants owned and operated by a large cooperative may see a minimum amount of the PMMB over-order premium on their milk checks if very little of the cooperative's milk was processed as Class I sales. On the other hand, a Pennsylvania dairy farmer that is an "independent" and sells milk to a local dealer that has a very high Class I utilization rate for its plant would see a much higher dollar figure on a milk check from the PMMB over-order premium. For this analysis, the impact is averaged over all eligible Pennsylvania dairy farmers.

We modeled two impacts. The first is the **price impact** on the average Pennsylvania milk check from an elimination of minimum milk pricing. The second impact would be due to **changes in milk marketing opportunities** in the state. If fluid milk plants went out of business due to the elimination of minimum milk pricing, dairy farms that supplied those plants would either ship their milk farther, and thereby incur higher hauling costs, or would simply be denied a market and go out of business. Both impacts were simulated using 2022 data.

6.4.1 Price Impact

Under this scenario, a milk supply response model was developed to simulate how Pennsylvania milk production would respond to changes in the farm gate price of milk in the state if minimum milk pricing is eliminated. Without a minimum price structure, it would no longer be possible for Pennsylvania fluid milk processors to pass along the cost of over-order premiums to retail customers. Thus, the average farm gate milk price would be simulated under this scenario with no over-order premiums and would decline accordingly.

The first step in the analysis is to estimate an econometric model to simulate Pennsylvania milk supply. An annual Pennsylvania double log milk supply model was estimated as follows:[42]

[42] The model was estimated with OLS over the period 2005-22. The t-statistic was 1.94 for the lagged milk price and -2.60 for the price of alfalfa hay. The multiple R-square for the equation was 86.2%.

$$\ln(PRD_t) = 3.882 + 0.598 * \ln(PRD_{t-1}) + 0.054 * \ln(MP_{t-1}) - 0.06 * \ln(AP_t) - 0.00041 * TREND_t$$

where

t = year
PRD = annual Pennsylvania milk production, mil lbs.
MP = annual Pennsylvania mailbox milk price, $/cwt.
AP = annual average U.S. alfalfa hay price received by farmers, $/ton.
TREND = 6 for 2005, 7 for 2006, . . ., and 23 for 2022.

Note that the coefficient for the milk price under the double log specification is an elasticity of supply of 0.054. This coefficient is statistically significant at the 95% level but is a very small coefficient. That implies a supply response that is very "inelastic," meaning changes in the lagged milk price will have very little impact on changes in milk supply.

Data for Pennsylvania milk production were from USDA's National Agricultural Statistics Service; the Pennsylvania mailbox price[43] and alfalfa hay price was provided by USDA's Agricultural Statistics Service.

The mailbox milk price is defined as the net price received by producers for milk, including all payments received for milk sold, and deducting the costs associated with marketing the milk. Included in all payments for milk sold are state-run over-order pricing pools. Thus, the Pennsylvania mailbox milk price includes the PMMB over-order premiums (OOP).

To simulate the direct price impact of eliminating minimum milk pricing, we constructed a baseline over the study period 2017-21 and an alternative Pennsylvania mailbox price that eliminated all over-order premiums on the volume of eligible Class I fluid milk sales in Pennsylvania. The baseline included a state-wide weighted average PMMB OOP that was calculated by first multiplying the PMMB OOP by the volume of milk subject to the OOP, then dividing the result by Pennsylvania milk production. For the alternative scenario, this weighted average OOP was subtracted from the Pennsylvania mailbox milk price and simulated in the milk supply model.

Table 6.3 illustrates the baseline and alternative scenario. The weighted average PMMB OOP was $0.169/cwt over the period 2017-21. This was subtracted from the annual Pennsylvania mailbox milk price and represented an average 1.1% reduction in the milk price over the study period 2017-21. This was used in the model to simulate Pennsylvania milk production under the alternative mailbox price. The result was a 0.1% reduction in the milk supply. This is consistent with the estimated own price elasticity of supply of 0.054. **The results simulate an average loss in the milk supply over the period 2017-21 of 11.9 mil. lbs. and valued at $2 mil.**

[43] Source: USDA, AMS, Federal Milk Marketing Order 1, "NE Milk Marketing Area Statistical Handbook."

6.4.2 Changes in Milk Marketing Opportunities

As noted earlier, the direct impact of eliminating minimum milk pricing in Pennsylvania on the milk supply is just one part of the overall impact. The secondary impact is hypothesized to result in a restructuring of the fluid milk processing sector in the state. This impact, discussed later in this section, was estimated to result in a reduction of up to 66% of the volume of fluid milk processed in Pennsylvania. If fluid milk processors went bankrupt due to elimination of minimum milk

Table 6.3 Impact of Eliminating Pennsylvania Milk Marketing Board Minimum Milk Pricing on the Pennsylvania Milk Supply

	---------- Baseline ----------				
Year	PA Milk Production	PA Mailbox Milk Price	PMMB OOP	PA Milk Subject to OOP	PMMB OOP*100/ PA Milk Prd 1/
	mil lbs	$/cwt	$/cwt	mil lbs	$/cwt
2016	10,812	$16.071	$1.8875		
2017	10,893	$17.413	$1.8117	1,425	$0.237
2018	10,657	$15.636	$0.8800	1,341	$0.111
2019	10,108	$17.873	$1.0675	1,321	$0.139
2020	10,279	$16.827	$1.5158	1,379	$0.203
2021	10,114	$17.805	$1.1183	1,378	$0.152
Avg 2017-21		**$17.111**			**$0.169**
	---------- Scenario: Eliminate PMMB Minimum Pricing ----------				
Year	PA Milk Production	PA Mailbox Milk Price 2/	Impact on PA Milk Prd: % chng	change	Loss in Milk Production Value
	mil lbs	$/cwt		mil lbs	mil $
2016	na	$15.837	na	na	na
2017	10,884	$17.190	-0.1%	-9.7	-$1.66
2018	10,645	$15.525	-0.1%	-13.5	-$2.10
2019	10,097	$17.734	-0.1%	-11.5	-$2.04
2020	10,268	$16.623	-0.1%	-11.3	-$1.88
2021	10,101	$17.653	-0.1%	-13.3	-$2.34
Avg 2017-21		**$16.945**	**-0.1%**	**-11.9**	**-$2.00**

[1]Calculated by first multiplying the annual average PMMB over-order premiums by the volume of milk subject to the PMMB OOP, second dividing the result by Pennsylvania milk production, and finally multiplying by 100 to arrive at dollars per hundred pounds.

[2]Net of PMMB over-order premiums.

Note: PA = Pennsylvania; PMMB = Pennsylvania Milk Marketing Board.

pricing regulation in Pennsylvania, and fluid milk processing volume is reduced, there will be less outlets for Pennsylvania dairy farmers that ship milk to cooperatives or independent dealers/processors for processing fluid milk.

Some independent dairy farmers who shipped milk to Dean Foods became cooperative members when Dairy Farmers of America (DFA) assumed ownership of the four Dean plants in Pennsylvania. Each of the four plants made decisions on a plant-by-plant basis. In some cases, independent producers were offered the opportunity to become cooperative members.

For this analysis, it is possible that area cooperatives such as DFA will maintain their members even if the cooperative decides to consolidate fluid milk processing in the face of elimination of minimum milk pricing. However, it is very unlikely that cooperatives in the Northeast would take on new members if independent Pennsylvania dairy farmers no longer had a home for their milk due to consolidation of the fluid milk industry in the state. It is general knowledge that there is a limited balancing capacity for Class III and IV plants in the Northeast.[44] Thus, some Pennsylvania dairy farmers would either ship their milk longer distances or go out of business due to a lack of marketing opportunities.

Table 6.4 details the assumptions and analysis that reduced fluid milk processing capacity would have for Pennsylvania dairy farmers if minimum milk pricing is eliminated. The analysis starts with the volume of regulated Pennsylvania fluid milk and Class II products. Since the average fluid milk product is close to 2% butterfat and farm milk in Pennsylvania is closer to 4% butterfat, regulated fluid milk processors often co-produce high fat Class II products such as creams and sour cream, which are regulated by the PMMB. Thus, we computed the "milk equivalent" volume of Class I and II regulated milk products which totaled an estimated 1.9 bil lbs in 2022. The impact of elimination of minimum milk pricing would reduce this volume figure by 66% as fluid milk processor bankruptcies rise and arrive at a loss of 1.3 bil lbs in fluid milk processed in the state under this scenario. Of the reduced fluid milk processing volume, we assumed that 25% would find a new home for their milk either in state or out of state, most likely by membership in area cooperatives. These farmers would pay more for hauling milk

[44] Plant capacity across the U.S. for Class III and IV processing are limited for a couple of factors including: 1) stagnant "make allowances" in federal orders that have not changed since 2008, and the high cost of new plant expansions.

Table 6.4 Impact of Reduced Fluid Milk Processing on Pennsylvania Dairy Farmers in 2022

PA Milk Production	9,949	mil lbs
PA regulated milk sales (product lbs.)		
Class I fluid milk	1,609	mil lbs
Class II creams	123	mil lbs
Class II sour creams	40	mil lbs
Total ME equivalent fat basis[1]	1,920	mil lbs
% fluid milk reduction	66%	
volume fluid milk reduction	1,267	mil lbs
% PA milk production reduction	12.7%	
% of milk needing new home	25.0%	
% milk vol going out of business	75.0%	
PA milk shipped longer distances	317	mil lbs
PA milk with no home	950	mil lbs

[1] Assumes PA farm milk at 4.03% butterfat.

farther distances. The other 75% would not be able to find a new home and therefore would go out of business due to limited Class III and IV balancing capacity in the Northeast.

It is difficult to estimate how much more Pennsylvania dairy farmers would have to pay to haul their milk farther distances to a new plant. A detailed spatial equilibrium model of the U.S. dairy industry would be required for this analysis. However, a recent study by Nicolson, Stephenson and Novakovic on behalf of the Center for Dairy Excellence (CDE) provides estimates of changes in hauling costs using a spatial equilibrium model with a 2016 baseline. The CDE study estimated in one scenario that if milk supply points, dairy processing locations, and regional demand could be optimized for supply chain costs, 2,465 mil lbs of milk (or over 20% of total milk production) in Pennsylvania would move from being exported out of state to being processed in state, resulting in hauling cost savings of $8.841 mil. They estimated that hauling costs would be reduced an average $0.05/cwt for all Pennsylvania milk. The movement of milk and overall assembly costs for milk would be optimized under this scenario.

Using this same logic, our scenario simulates an increase of hauling costs on 317 mil lbs of milk under a baseline of 9.949 bil lbs. **Thus, we estimate that the average increase in hauling costs under this scenario would be $1.1 mil** ($8.841 mil/2,465 mil X 317 mil lbs.). In the CDE study 2,465 mil lbs of milk that normally would be shipped out of state would now be processed in state under their scenario, saving $8.8 mil. In this scenario we are assuming the reverse, that 317 mil lbs of Pennsylvania milk would need to be shipped further distances to find a home. It is recognized that hauling costs have increased from 2016 to our baseline of 2022, and that the CDE study is very location and plant specific. That said, this provides an acceptable estimate for increased hauling costs.

This scenario also simulates a loss of marketing opportunities on 950 mil lbs of milk. Using the average Pennsylvania all milk price of $16.945/cwt from table 6.4 under the alternative scenario, **we estimate a loss of $161 mil for Pennsylvania dairy farmers who would no longer have a marketing outlet for their milk if 66% of the volume of fluid milk processing in the commonwealth were eliminated**.

6.5 Impact on Pennsylvania Fluid Milk Processing

Next, we examine the impact of elimination of minimum milk pricing in Pennsylvania on fluid milk processing. This is a complex question as it requires an understanding of how retailers would react if they were no longer bound by minimum retail milk prices. And it would require an understanding of how the financial viability of Pennsylvania dealers/fluid milk processors would change under an elimination of minimum milk pricing. Thus, this section begins by conducting a survey of dealers to understand how this scenario would impact them. Next, a more detailed financial analysis is conducted to derive a more precise estimate of economic impact.

6.5.1 Dealer Survey

A survey was conducted of Pennsylvania dealers/fluid milk processors in July 2023 by the PMMB. The survey basically asked dealers what impact elimination of minimum milk pricing in the state would have on their businesses. The survey was conducted for all dealers which included both diversified and non-diversified fluid processors. Diversified plants jointly process non-regulated products such as bottled tea, ice cream, etc., and deliver those products along with regulated milk on their distribution routes. The detailed results of this survey are provided in an appendix to this section.

More than half of the respondents said their business would be negatively impacted if minimum milk pricing is eliminated. The percent of negative responses was higher for diversified fluid milk processors who noted in their comments that regulated milk sales were a significant portion of their income, and that their sales of non-regulated products were reliant on fluid milk volume for distribution and processing scale and efficiencies (see appendix).

More than half of the diversified respondents noted that elimination of minimum milk pricing would initiate retail milk price wars that would put their margins under pressure similar to what was experienced in the past in neighboring states. Many large, big box retail stores are extremely price sensitive when it comes to fluid milk. The comments in the appendix indicate concerns that a retail price war would cause fluid milk processors in Pennsylvania to ultimately undercut other dealers/fluid milk processors, lowering the profitability of all Pennsylvania dealers/fluid milk processors. Only dealers with a strong balance sheet and healthy margins would survive. As a result, the number of dealers/fluid milk processors and processing capacity in the state would be reduced.

Many diversified fluid milk processors felt especially vulnerable to bidding wars. If minimum milk pricing is eliminated, they would be forced to pay their farmers less, drivers who depend

on commissions would get paid less, and routes would have to be consolidated. The loss of milk volume would result in fewer distribution outlets and substantially higher costs per unit.

The survey results clearly state that 67% of diversified fluid milk processors, who accounted for 77% of all responses, felt that elimination of minimum milk pricing would make them financially vulnerable and force them out of business.

This survey is a qualitative assessment of the financial impact of eliminating minimum milk pricing in Pennsylvania. What is needed is a more rigorous and quantitative approach, which is discussed next.

6.5.2 O-Score Analysis

To quantify the impact of eliminating minimum milk pricing in Pennsylvania on dealers/fluid milk processors, we examined financial data provided by PMMB for a select group of processors. These data are used by PMMB to quantify the cost buildup used in setting minimum wholesale and retail prices. The PMMB eliminated the identity of individual dealers[45] and supplied select financial data, production volume, and a calculation of the Ohlson O-score which is used to measure financial distress.

The Ohlson O-score is a multi-factor financial formula used to predict the probability of bankruptcy for individual companies that is widely used in the financial sector today.[46] It is based on a 1980 journal article by Dr. James Olson. He used an econometric methodology of conditional logit analysis. While the final model used nine independent variables, Ohlson identified four basic factors as being statistically significant in affecting the probability of failure within one year. They are,

1. The size of the company (total assets),
2. Measures of financial structure,
3. Measures of performance, and
4. Measures of current liquidity.

Ohlson's formula is as follows:

$$O = -1.32 - 0.407\log(TA_t/GNP) + 6.03TL_t/TA_t - 1.43\ WC_t/TA_t + 0.0757\ CL_t/CA_t - 1.72X - 2.37NI_t/TA_t - 1.83FFO_t/TL_t = + 0.285Y - 0.521(NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$$

where

TA = total assets
GNP = Gross National Product price index level found at (https://fred.stlouisfed.org/series/A001RG3A086NBEA)
TL = total liabilities
WC = working capital = (current assets) – (current liabilities)

[45] No location data, no indication of convenience store sales, and the data was not listed in alphabetical order.
[46] James Ohlson, "Financial Ratios and the Probabilistic Prediction of Bankruptcy."

CL = current liabilities
CA = current assets
X = 1 if TL > TA, 0 otherwise
NI = net income after taxes
FFO = cash flow from operating activities
Y = 1 if a net loss for the last two years, 0 otherwise
t = most recent year data
t – 1 = prior year data

For this analysis, financial stress for an individual Pennsylvania dealer would be measured by an Ohlson O-score of 0.5 or higher.

The PMMB supplied end-of-year financial data for 2022 and computed the O-score for a select group of 15 dealers whose identities were eliminated. One dealer was deemed an outlier due to negative income and an O-score much larger than others. This dealer was eliminated from the sample dataset. For the remaining dealers, we correlated their O-scores with annual fluid milk volumes for 2022. We also noted whether the dealers operated a diversified plant (processing tea, fruit juices, ice cream, etc.), or just processed fluid milk.

The sample dataset was divided into two groups:

- Non-diversified fluid milk plants (2), and
- Diversified fluid milk plants (12).

Given Ohlson's identification of "size" as an important factor in forecasting bankruptcy, we correlated the O-scores with annual fluid milk sales for both the diversified and non-diversified plants. Of the 14 total dealers, there was one with an O score close to 40. Assuming this was an outlier, we observed that there was no clear correlation between annual plant volume and the O-score. The remaining 13 plants all had O-scores ranging from -10 to just over 10. Again, it appears annual plant volume had no bearing on the O-score (see figure 6. 2).

In summary, of the 14 plants analyzed, 8 plants or 57.1% had O-scores greater than 0.5. These plants represented 65.6% of the milk supply. And this cross section of 14 plants represented 72.6% of all the fluid milk processed in the state. **The results of this analysis indicate that if minimum milk pricing regulations in Pennsylvania are eliminated, and if a retail bidding war erupts to cause reduced profit margins for all Pennsylvania dealers, roughly 57% of dealers and 66% of the volume of fluid milk processing in the state would be vulnerable to bankruptcy.**

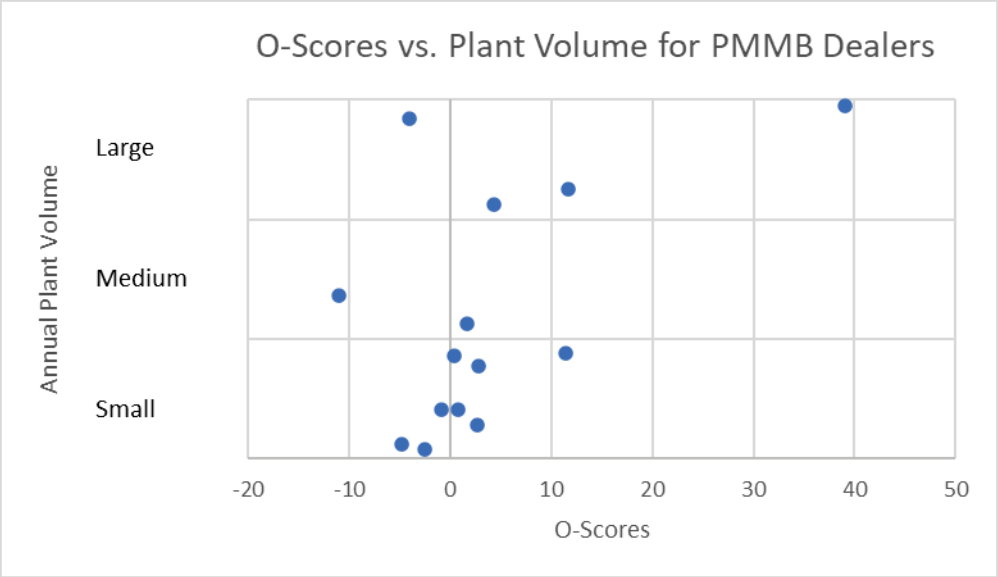

Figure 6.2 Ohlson O-Scores vs. Plant Volume for Pennsylvania Milk Dealers

Note: annual plant volumes range from a low of 11 mil to a high of 442 mil pounds.

Dealers at risk for bankruptcy would range from 42 mil lbs per year to 442 mil lbs per year in terms of annual volume of fluid milk processing.

6.6 Section Summary and Key Findings

This section addressed the following research questions:

- *Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?*
- *Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?*
  - *If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?*
- *How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?*

This section built on prior sections and addressed the three research questions above by simulating the impact of eliminating minimum milk pricing in Pennsylvania. To address these questions, a research methodology was developed that starts with a baseline that describes economic conditions "as they are." From there an alternative scenario was simulated for the Pennsylvania dairy industry that assumed elimination of minimum milk pricing. This section estimated the direct economic impacts of such a scenario on Pennsylvania dairy farmers, dealers/processors, and consumers. The indirect economic impacts from such a scenario on the broader Pennsylvania economy will be quantified in the next section.

So, would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated? The answer is yes, there would be a modest increase in fluid milk consumption. An econometric model was estimated in this section and the results indicate that the retail price of milk would decline 8.3% for whole milk and 5.2% for reduced fat milk, and total consumption of fluid milk in Pennsylvania would increase a modest 1.3%, or an average of 23.3 mil lbs per year.

A summary of the impacts of eliminating minimum milk pricing in Pennsylvania is provided in table 6.5. The results are based on a study period of 2017-21 and a milk production base in 2022.

The impact on the farm supply of milk is a loss of 11.9 mil lbs from reduced milk prices due to a loss of over-order premiums in Pennsylvania, and a loss of 950 mil lbs from farmers who would no longer have a home for their milk due to Pennsylvania fluid milk processors going out of business. The total loss of milk production of 962 mil lbs is equivalent to a 9.7% reduction in 2022 Pennsylvania milk production of 9,949 mil lbs. Hauling costs in the state would rise $1.1 mil under this scenario on 317 mil lbs of milk. Also, eliminating minimum milk pricing would remove the regulatory mechanism that effectively enables fluid milk processors to forward their cost of over-order premiums to retailers. In fact, fluid milk processors would face pressures to reduce costs and would in turn pass back any losses from a bidding war to dairy

Table 6.5 Summary of Estimated Impacts of Eliminating Pennsylvania Minimum Milk Pricing

	Milk Vol. (mil. Lbs.)	Value (mil. $)
Farm Impact:		
Reduced supply due to direct price impact	11.9	$2.0
Loss of over-order premiums[1]	1,406	$18.0
Changes in marketing opportunities:		
Higher hauling costs	317	$1.14
Lost markets	950	$161.0
	Vol. (mil. lbs.)[2]	Value (mil. $)[3]
Loss in Regulated Milk Sales:		
Fluid milk	1,062	$541.6
Creams	81	$137.7
Sour creams	27	$37.3
Loss in retail milk sales value	23.3	$63.2

[1] The milk volume is equal to net Pennsylvania milk subject to minimum pricing for 2022. The PMMB over-order premium of $1.28/cwt used in the calculation was averaged over the period 2017-21.

[2] Pennsylvania regulated Class I and II milk sales multiplied by 0.66 to simulate a reduction in fluid milk processing capacity upon elimination of minimum milk pricing.

[3] Used the wholesale announced prices for Area 1 for September 2022.

farmers. Either way, we estimated the total economic loss of over-order premiums for farmers at $18.0 mil. Total direct economic losses to Pennsylvania dairy farmers would be $182 mil.

We estimated that 66% of the volume of fluid milk processing would be eliminated in Pennsylvania if minimum milk pricing were to disappear. This is based on an analysis of Ohlson scores provided by the PMMB and corroborated by a survey of milk dealers conducted in late June 2023. That's because eliminating minimum milk pricing would initiate retail milk price wars (as already occurred in neighboring states),[47] likely resulting in consolidation of fluid milk sales into large, big box stores and lower margins for dealers/fluid milk processors.

Retailers would likely pass along their losses from lower retail milk prices to processors, who would have less funds to pay dairy farmers. A loss of 66% of Pennsylvania fluid milk processing would equate to a loss of 1,062 mil lbs of fluid milk production per year. That would also result in a loss in co-product production for creams and sour cream. The direct economic loss from this in terms of value of minimum wholesale prices would equate to an estimated $717 mil in a given year. That also implies a loss in indirect spending by fluid milk processors on farm milk, plant inputs such as packaging, chemicals, and non-dairy ingredients, plant and trucking labor, etc. Using the estimated econometric consumption model, fluid milk consumption in Pennsylvania under a scenario in which eliminating Pennsylvania minimum milk pricing would lead to lower retail prices, would rise by a modest 1.3% or by 23.3 mil lbs per year due to a negative own-price elasticity. However, lower milk prices would result in an overall loss of retail milk sales value of $63.2 mil per year. Lower retail milk prices would be a direct benefit to consumers, but the results of a retail bidding war would be passed down the value chain from large retailers to Pennsylvania dealers/fluid milk processors, and ultimately to dairy farmers.

6.7 Section References

Ohlson, James. "Financial Ratios and the Probabilistic Prediction of Bankruptcy." *Journal of Accounting Research* 18,1(1980): 109-131.

Nicholson, Chuck, Mark Stephenson, and Andrew Novakovic. "Analysis of Economic Incentives for Additional Dairy Processing Capacity in Pennsylvania." URL: https://dairymarkets.org/.

[47] See section 5 for a historical context.

Section 7 Economic Impacts of Eliminating Minimum Milk Pricing

7.1 Research Questions

This section addresses the following research questions:

- *Would the elimination of Pennsylvania's minimum milk pricing structure have an impact on rural communities and businesses?*
- *How would the overall economy in Pennsylvania be impacted by elimination of its minimum milk pricing structure?*

More specifically, this section estimates the broader economic impact of elimination of minimum milk pricing in the state beyond direct impacts on Pennsylvania dairy farmers, fluid milk processors (dealers), and consumers.

7.2 Section Introduction

In the analysis below, impact multipliers derived from an economic study of the US dairy industry were used to simulate the negative impact of bankruptcy of fluid milk processors due to the elimination of minimum milk pricing in Pennsylvania.

7.3 Direct Effects

In the prior section, the direct impact of elimination of minimum milk pricing in Pennsylvania is a 66% contraction in the volume of fluid milk processing in the state. The simulated impact is for a loss in regulated fluid milk sales totaling $717 mil (fluid milk, cream, and sour cream). That loss is also associated with a total loss of $182 to Pennsylvania dairy producers (reduced milk supply, loss of over-order premiums, and changes in marketing opportunities).

7.4 IMPLAN Model

There have been a number of studies that examined the impact of the dairy industry on the state economies of Wisconsin, Missouri, and California.[48] These studies used the IMPLAN model in order to quantify the impact of milk production and processing in a particular state. That model, called an Input-Output model, looks at the dollar flows between inputs and outputs across industries and sectors in a defined location and time frame. The model quantified economic activity across an economy by recognizing that a dollar injected into one sector is spent and re-spent in other sectors of the economy, generating waves and waves of economic activity. This is called the "economic multiplier effect."

More recently, the International Dairy Foods Association (IDFA) developed a study called "Dairy Delivers®" and used the IMPLAN model to analyze the economic contributions of the U.S. dairy industry for individual states and the U.S.[49] For this report, impact multipliers were derived

[48] See Deller, Horner et al., and Matthews et al.
[49] See John Dunham and Associates, "2023 Economic Impact Study."

from the Pennsylvania analysis "The Economic Impact of Dairy Products in Pennsylvania," part of the IDFA study.

The IDFA study starts with the value of dairy product production to model the "Direct Impacts" in terms of economic impacts, value of wages, and number of jobs. Dairy processing in an individual state or for the entire U.S. economy has a baseline value for a given year and may expand or contract from that baseline. The baseline reflects the value of dairy processing at the wholesale level and includes estimates for the wages associated with dairy processing and the number of jobs. Also associated with the direct impact level are the dollars spent on wholesaling and retailing activities. Processed dairy products must be transported and warehoused by wholesalers who sell and deliver dairy products to food service companies and retailers that in turn sell these products to customers.

The next level of analysis from the IDFA study is the "Indirect Impacts," or "Supplier Impacts." This level looks at all inputs that are required to produce dairy products. One item at this level is "agriculture" which includes milk production. Matthews and Sumner, in their Input-Output study of the California dairy industry, properly assumed that milk production was an indirect input into dairy processing.[50] Other inputs at the indirect level are transportation, communication, fuel, packaging, etc. There are also wholesale and retail inputs that are accounted for (i.e., supplies and equipment for wholesalers, and displays for retailers). Again, for the Indirect or Supplier Impacts, the IMPLAN model computes economic impacts, wages, and number of jobs.

The final level is the "Induced Impact." This level reflects all spending by employees of dairy processors, wholesale and retailers, and supplier firms directly tied to the dairy industry. This reflects household spending on food, housing, education services, medical services, etc. This level of consumer spending also creates jobs and wages. All three levels of impacts (Direct, Indirect, and Induced) together define the total economic impact.

The IMPLAN model creates an accounting framework that mimics how dollars are spent and re-spent across an economy over a defined period of time. Dairy farmers spend dollars on inputs and sell their milk to processors, who purchase the milk and other supplies in order to create processed dairy products. From there they sell to wholesalers and retailers. All along the way, people are employed from dollars generated by the economic activity associated with dairy farming and processing. The household spending associated with those jobs also creates economic activity.

[50] See pps. 45-46 of "Contributions of the California Dairy Industry." They write, " . . . when considering the economic effects of the dairy processing sector, it is important to remember that the value of output for each sector includes the vale of milk purchased from California dairy farms. As such, the contributions of California dairy farms are included in the measure of indirect and induced effects of the dairy processing sectors."

7.5 Impact Multipliers

The analysis in this report was conducted by starting with the change in the value of dairy processing in Pennsylvania due to eliminating minimum milk pricing, and then calculated the economic impact of this change using the IDFA study. This is done by applying "impact multipliers" to this change in order to estimate the Direct, Indirect, and Induced impacts. This provided a complete analysis of the impact of eliminating minimum milk pricing at both the local level and state level. In addition, we estimated what impact this would have on taxes.

Impact multipliers are fixed coefficients that estimate the relationship between different levels of the economy. Impact multipliers were derived in this study based on data from IDFA's Input-Output analysis for Pennsylvania, "The Economic Impact of Dairy Products in Pennsylvania." That study provided an excellent baseline for all economic activity related to the Pennsylvania dairy industry for a given year. The study has Direct, Supplier, and Induced Impacts reported by economic impact, wages, and jobs. Various impact multipliers were then derived from this study by calculating various relationships.

For fluid milk processing, we divided total economic impact from the IDFA study by wages to derive a multiplier of 9.66. Thus, when computing the change in the economic value of fluid milk processing in the state for this study, we divide by 9.66 to estimate the value of wages that would be lost. Likewise, to go from Direct Impacts to Indirect Impacts, we computed a multiplier for agriculture by dividing the total indirect supplier economic impact for agriculture estimated by IDFA by the total direct economic impact of dairy processing to arrive at a multiplier of 0.508. Thus, when computing the direct economic impact of reduced fluid milk processing for this study, one can multiply the result by 0.508 to estimate the indirect or supplier impact from agriculture.

Table 7.1 details the impact multipliers estimated from the IDFA results for Pennsylvania. These impact multipliers were used to simulate the impact of reduced fluid milk processing in Pennsylvania from an elimination of minimum milk pricing.

7.6 Impact Results

The total statewide impact of eliminating minimum milk pricing in Pennsylvania at the Direct, Indirect, and Induced levels is presented in Table 7.2. We begin with the direct economic impact of a 66% reduction in the volume of fluid milk processed in Pennsylvania that was estimated at $717 mil in the prior section. That would begin a chain of economic activities that would potentially impact wholesaling and retailing activities in the state, supplier impacts on dairy and other agriculture, as well as wholesale and retail supplies, transportation, services, etc. From all of that would come the economic impact of reduced household spending by those employed by companies that directly or indirectly service the Pennsylvania dairy industry.

We begin with the direct economic impact of fluid milk processors at the top of Table 7.2 as reflected by the row heading "loss in regulated milk sales" and under the column heading

"Economic Impact." The wages and employment estimates for fluid milk processing were derived via the direct economic multipliers from Table 7.1. The direct estimates for wholesaling and retail activities are conducted in a similar fashion.

The indirect or supplier estimates were calculated by starting with the jobs, wages and economic impact from the loss in regulated milk sales and applying the relevant estimated impact. For example, the loss in indirect wages for transportation and communication is estimated by multiplying direct fluid milk wages of $74.2 mil in table 7.2 (due to the loss in regulated milk sales) by the impact multiplier 1.063 to arrive at $78.8 mil. The Induced Impacts

Table 7.1 Estimated Impact Multipliers Derived from the IDFA Study for Pennsylvania "Dairy Delivers®"

Direct Multipliers:			
	Economic Impact Divided by:		
	Job nos.	Wage dollars	
Dairy	$794,296	$10.18	
Fluid Milk	$726,393	$9.99	
	Jobs numbers	Wages dollars	Econ Impact dollars
wholesaling/dairy	0.254	0.255	0.078
retailing/dairy	4.169	1.783	0.446
total direct/dairy	5.423	3.038	1.524
Indirect Multipliers:			
Ag/direct dairy	1.266	0.738	0.508
Transp-comm/direct dairy	0.916	1.063	0.306
Wholesale/direct dairy	0.720	0.866	0.265
Retail/direct dairy	0.103	0.061	0.017
Other/direct dairy	2.795	2.808	0.997
Induced Multipliers:			
Ag/direct dairy	0.053	0.024	0.008
Transp-comm/direct dairy	0.349	0.442	0.150
Wholesale/direct dairy	0.135	0.180	0.065
Retail/direct dairy	0.633	0.341	0.090
Other/direct dairy	3.804	3.131	0.897
	Fed Taxes	State Taxes	
Business taxes [1]	0.05298953	0.041626066	

[1] Business taxes divided by total economic impact.

Table 7.2 Analysis of the Impact of Eliminating Pennsylvania Minimum Milk Pricing

	Jobs	Wages	Economic Impact
Direct Impacts:			
Loss in regulated milk sales (fluid, cream, sour cream)	987	$74,191,270	$716,600,000
Wholesaling	250	$18,928,914	$55,918,344
Retailing	4,112	$132,290,103	$319,568,761
Total direct impacts	**5,349**	**$225,410,286**	**$1,092,087,105**
Indirect or Supplier Impacts:			
Agriculture	1,249	$54,789,587	$363,906,236
Transportation and Communication	904	$78,829,618	$219,587,072
Wholesale	710	$64,216,872	$189,875,164
Retail	102	$4,509,814	$12,265,292
Other[1]	2,758	$208,345,028	$714,400,263
Total indirect impacts	**5,723**	**$410,690,919**	**$1,500,034,028**
multiplier (supplier to direct)	1.1	1.8	1.4
Induced Impacts:			
Agriculture	52	$1,781,921	$5,890,989
Transportation and Communication	344	$32,772,632	$107,180,553
Wholesale	134	$13,341,470	$46,653,507
Retail	625	$25,290,509	$64,456,764
Other[1]	3,753	$232,261,353	$642,735,885
Total indirect impacts	**4,908**	**$305,447,885**	**$866,917,698**
multiplier (induced to direct)	0.9	1.4	0.8
Total Economic Impact	**15,981**	**$941,549,091**	**$3,459,038,830**
Total Economic Impact Less Wholesaling/Retailing	**10,047**	**$682,971,409**	**$2,770,300,998**

	Federal	State
Business Taxes	$183,292,825	$143,986,180
Business Taxes Less Impact of Wholesaling/Retailing	$146,796,935	$115,316,733.12

[1]Other includes mining, construction, manufacturing, finance, insurance, real estate, travel & entertainment, business & personal services, and government.

are computed in a simar fashion. For example, the Induced Impacts of agriculture were estimated by starting with the economic impact of $717milk from the loss in regulated milk sales and multiplying by the impact multiplier of 0.008 to arrive at $5.9 mil.

The results of this analysis indicate that a loss of $717 mil from the elimination of regulated milk sales will result in a total Pennsylvania negative impact of $3.5 bil in total economic activity, $942mil in lost wages, and 15,981 in lost jobs. But before we reach this conclusion, however, further discussion is required.

First, the results in Table 7.2 indicate that the loss in fluid milk processing in Pennsylvania would also result in an indirect or supplier loss to agriculture of $364mil. In the prior section we estimated that the loss in minimum milk pricing in Pennsylvania would result in a total loss of $182 mil to Pennsylvania dairy farmers from milk production. The IMPLAN model estimates the input-output relationship between indirect agricultural suppliers and direct dairy processing. Our assumption is that the category "agriculture" used in the IMPLAN model is much broader than just milk production and may also include dairy cattle, feed, etc.

Second, it is likely that under this scenario, even though fluid milk processing in Pennsylvania may decline due to elimination of minimum milk pricing, wholesaling and retailing activities in the commonwealth may not. That's because fluid milk processors in surrounding states would likely step in and export any shortfall in packaged fluid milk products into the state for retail sale. Therefore, the negative impacts from wholesaling and retailing activities in table 7.2 should not be included in the calculation of total economic impact.

The results in Table 7.2 clearly detail changes in the economic activities of the fluid milk processing sector at three levels (Direct, Indirect, and Induced). The change in the value of milk purchased from Pennsylvania dairy farms is included in the Direct Impact of fluid milk processing. It is further reflected in the Indirect effects of the dairy processing sector. The Input-Output model therefore identifies transactions between different sectors and traces how a dollar is multiplied throughout the economy. Of interest for this study is the change in total economic activity.

To put things in context (the results in table 7.2), consider what happens when a dairy farmer in Pennsylvania sells $1.00 worth of milk. The farmer must first spend roughly 60 cents on feed and up to 40 cents on other supplies such as veterinary and feed consulting services, diesel fuel, bedding, equipment, building supplies, etc.

A cheese processor then buys the milk from the farmer for $1.00, but also buys sanitizers packaging materials, hires labor, and then processes the milk into cheese. The processor then sells the cheese for say $2.00 to a wholesaler or converter who transports and stores the cheese. It is then sold to either a foodservice company that sells it to a restaurant, or to a retailer who merchandizes the cheese and sells directly to a retail customer. All along the way supplies are purchased and salaries are generated from individuals who participate in the dairy

industry at the supplier, producer, wholesale or retail level. **The point is, one dollar in milk sales is turned over many times throughout the economy. Thus, our objective to account for all of the economic activity that was generated.**

7.7 Section Conclusions

This section of the report focuses on the change in economic spending and activities due to the elimination of minimum milk pricing in Pennsylvania. In the prior section we estimated that such a policy change would result in a reduction of 66% of the volume of fluid milk processed in the commonwealth due to bankruptcy. That would result in a decline in direct economic activity of $717 mil. We assumed in this study that wholesaling and retailing activities tied to packaged fluid milk sales would remain unchanged despite a loss in Pennsylvania fluid milk processing as out of state processors would step in and export the difference in order to meet Pennsylvania consumer demand.

Therefore, this study finds that the total statewide impact of eliminating minimum milk pricing in Pennsylvania would be total economic loss of $2.8 bil, lost wages of $683 mil, and lost jobs of 10,047 (see table 7.2). In addition, business taxes totaling $147 mil for federal and $115 mil for the state would be lost.

7.8 Section References

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Section 8 Summary and Conclusions

8.1 Project Objectives

The objective of this study was to study the economic impact of eliminating the commonwealth's minimum milk pricing structure (see section 1). More specifically, it explored what would happen if the PMMB no longer set minimum milk prices, an over-order premium on Class I milk produced, processed and sold in the state, and minimum wholesale and retail milk prices. This study also addressed the following research questions,

1. *Would Pennsylvania consumers buy more milk if the state's minimum milk pricing structure was eliminated?*
2. *Would Pennsylvania retail outlets engage in bidding wars with milk processors/dealers?*
    a. *If so, would Pennsylvania milk processors go out of business as a result of these bidding wars?*
3. *Would the elimination of Pennsylvania's minimum milk pricing structure have an impact on rural communities and businesses?*
4. *How would Pennsylvania's dairy industry, as a whole, be impacted by elimination of the state's minimum milk pricing structure?*
5. *How would the overall economy in Pennsylvania be impacted by elimination of its minimum milk pricing structure?*

8.2 The Pennsylvania Dairy Industry is Unique

Pennsylvania milk law has its origins in the 1930s. The goal back then was to support dairy farmers, cooperatives, and consumers. It was generally recognized in those days that competition without any regulatory bumper guards could become so destructive that it could permanently damage the economy. From this early legislation the Pennsylvania Milk Marketing Board (PMMB) was created, along with authority to set Class I over-order premiums (OOP) and minimum milk prices for Pennsylvania dairy farmers, processors (dealers), and retailers (see section 2).

Pennsylvania is a top 10 dairy state by volume in terms of milk production and processing. What is unique about the state is the large concentration of small dairy farmers and large number of milk processors (see section 3). For example, Pennsylvania is ranked number 2 in the nation in terms of numbers of licensed dairy farmers with an average herd size less than 100. Also, with a state population of 13 mil, the state had over 40 licensed fluid milk processors in 2023.

Strong macro trends have impacted the U.S. dairy industry over time (see section 5). There has been a steady negative trend in per capita fluid milk consumption in the U.S. that accelerated after 2009. That trend has also been experienced in Pennsylvania. Another trend impacting the

U.S. has been industry consolidation for fluid milk processors from the 1960s through to the early 2000s during which time the number of fluid milk plants declined. The remaining plants, however, got bigger. Since early 2000 there was a consolidation in ownership of plants with Dean Foods and Suiza Foods competing for supremacy. In the end, Suiza acquired Dean Foods and kept the company name. Later, Dean Foods filed for bankruptcy.

Two factors here are relevant for Pennsylvania. First, the state has a large number of fluid milk processors when compared to other states of similar size. Second, if minimum milk pricing in Pennsylvania were eliminated, it is the opinion of this author that retailers would engage in bidding wars and fluid milk processing in the state would further consolidate.

8.3 Elimination of Minimum Milk Pricing in Pennsylvania

A number of research questions were posed in section 1 of this report. This study collected data, estimated models, and created scenarios to address these research questions. In particular, this study examined the impact of eliminating minimum milk pricing in Pennsylvania. Such a policy change would also eliminate the state regulatory ability for processor/dealers to pass along any agreed upon over-order premiums for fluid milk to retailers.

8.3.1 Impacts on Consumers

This study estimated a per capita fluid milk consumption model for Pennsylvania and simulated the impact of eliminating minimum milk pricing in the state (see section 6.3). The scenario results show that if PMMB minimum pricing were eliminated, the retail price of milk over the study period 2017-21 would decline 8.3% for whole milk and 5.2% for reduced fat milk, and total fluid milk consumption in Pennsylvania would increase by a modest 1.3% or an average of 23.3 mil lbs per year. These results make sense given the inelastic parameter estimates from the model. ***So, would Pennsylvania consumers buy more milk if minimum milk pricing was eliminated? The answer is yes, there would be a very modest increase in consumption.***

8.3.2 Impacts on Farmers

A supply response model was estimated for this study (see section 6.4). The baseline included the Pennsylvania mailbox price and the PMMB over-order premium (OOP). Under simulation the average OOP for the study period was eliminated. This would have mixed effects on individual dairy farmers in Pennsylvania due to the fact that the OOP in an individual farm milk check is highly dependent on how much of the milk is eligible for the premium. Most independent dairy farmers shipping milk to fluid milk plants have a high fluid milk utilization rate, whereas other farmers that are cooperative members may have a lower rate (more manufacturing, less fluid milk processing). **The loss in OOP would total $18 mil under the study period.** The study estimated an average 1.1% reduction in the milk price over the period 2017-21. This was used in the model to simulate Pennsylvania milk production under the alternative mailbox price. The result was a 0.1% reduction in the milk supply. This change is consistent with the estimated own price elasticity of supply of 0.054. **The results simulate an average loss in the milk supply over the period 2017-21 of 11.9 mil. lbs. valued at $2 mil.**

But there were other farm responses to eliminating minimum milk pricing. Restructuring of the fluid milk industry in Pennsylvania due to an elimination of minimum milk pricing would result in changes in marketing opportunities for Pennsylvania dairy farmers. Hauling costs would increase for some dairy farmers who would no longer be able to ship their milk to a local fluid milk plant. In other cases, dairy farmers would simply lose a market for their milk and would no longer be in business. **We estimated the increase in hauling costs at $1.1 mil and that the value of lost markets for Pennsylvania dairy farms would total $161 mil.**

Altogether, the impact to Pennsylvania dairy farmers from the elimination of minimum milk pricing (reduced milk supply, loss of OOP, higher hauling costs, and reduced marketing opportunities) would be $182 mil (see table 6.1, section 6).

8.3.3 Impacts on Fluid Milk Processors

The impact of elimination of minimum milk pricing in Pennsylvania on fluid milk dealers in Pennsylvania was simulated in this study based on two studies. One was a survey of dealers who were asked what impact an elimination of minimum milk pricing would have on their businesses (see the appendix to section 6). The survey results showed that 67% of diversified fluid milk processors, who accounted for 77% of all responses, felt that elimination of minimum milk pricing would make them financially vulnerable.

Next, a more quantitative approach was used. We examined financial data for a select group of processors supplied by the PMMB. The PMMB used this data to compute their Ohlson O-score, which is used to measure financial distress. The results of this analysis indicate that if minimum milk pricing regulations in Pennsylvania were eliminated, and if a retail bidding war erupted which caused reduced margins for all Pennsylvania dealers, roughly 57% of dealers and 66% of the volume of fluid milk processing in the state would be vulnerable to bankruptcy. **Applying this to the volume of regulated milk sales in Pennsylvania (fluid milk, creams, and sour cream) for the study period, we estimated that elimination of minimum milk pricing in Pennsylvania would generate a total loss of up to $717 mil for fluid milk dealers (see table 6.1, section 6).**

8.3.4 Impact on Local Economies

The impact of elimination of minimum milk pricing in Pennsylvania on dairy farmers, fluid milk processors, and consumers, which was discussed above, only tells part of the story. There would be further impacts on the state economy. Those would include impacts to rural businesses that supply dairy farmers such as feed dealers, consulting services from veterinarians and nutritionists, equipment dealers, etc. It would also include impacts from companies closer to urban markets that supply the fluid milk dealers including sanitizing chemical companies, plant equipment and packaging companies, etc. An Input-Output model such as the IMPLAN model is required to estimate those impacts.

This study derived impact multipliers from an IDFA study of the impact of the dairy industry on Pennsylvania. That study estimated both direct and indirect impacts. This study simulated the impact of a $717 mil loss in Pennsylvania fluid milk processing using the impact multipliers

derived from the IFDA study. The results showed a $364mil loss in agriculture, which included dairy farming, a loss of $220 mil in transportation and communications, and a loss of $714in other indirect costs (i.e., mining, construction, manufacturing, finance, insurance & real estate, travel & entertainment, business & professional services, and government). **Many of these losses in economic activity would occur in rural communities.**

8.3.5 Impact on the General Economy

There are other economic impacts that were generated by the IMPLAN model. This study estimated "induced effects" that reflect household spending by employes directly and indirectly tied to the dairy industry. It includes spending on food, housing, education services, medical services, etc. **The estimated induced impacts totaled $756mil.**[51]

The total impact of eliminating minimum milk pricing in Pennsylvania would include the sum of the changes in direct, indirect, and induced effects. This would capture all of the ripple effects of reduced economic spending across the entire Pennsylvania economy. We netted out the impact of changes in wholesale and retail activities due to reduced Pennsylvania fluid milk processing as we assumed any shortfalls in fluid milk consumption would be maintained from imported packaged fluid milk (see section 7.6). **This study therefore estimates that a decline in direct economic activity of $717 mil from fluid milk processors would result in a reduction in total statewide economic activity of $2.8 bil, lost wages of $683 mil, and lost jobs of 10,047. In addition, business taxes totaling $147mil for federal and $115mil for the state would be lost.**

8.4 Study Conclusions

It is understandable that the average person today would question the need for laws that were initially created during the depth of the Great Depression in the 1930s. The global economy today is very different than it was back then. Digitalization of data, smart phones, the internet, and computers have changed how we interact with each other and has greatly improved the efficiency of businesses. But basic human behavior in a business environment has not changed that much.

Milk laws, both federal and state, were created in the 1930s to bring greater transparency to milk pricing, to account for the perishability of milk, and to better manage the balance of economic activity between farmers, processors, and consumers. The laws in Pennsylvania were later updated to include state regulation of milk weights (bulk calibration program) to ensure dairy farmers get paid for what they deliver, the creation of the Milk Producers' Security Act which requires bonds from dealers to ensure dairy farmers are paid in the event a dealer went bankrupt, and the creation of over-order premiums to update the cost of production above minimum federal order formulas (which have not changed since 2000), and state auditing to

[51] See table 7.2. We deducted wholesale and retail activities from the total induced impacts of $866.9 mil as we assumed these activities would be maintained (see section 7.6).

enforce these regulations. The fact is, these protections are just as important today as they were back in the 1930s. One example cited in section 2 was when Dean Foods went backrupt and not all Pennsylvania dairy farmers were paid in a timely manner. The PMMB board acted to ensure all independent dairy farmers and members of cooperatives were paid in full.

Others think that milk price regulation is already too complex, and that less regulation is better than more regulation. "Free competition" in a free and open market is often cited as superior to direct regulation. Some in the state voiced concerns that Pennsylvania milk regulation in the form of minimum milk pricing acted to reduce fluid milk consumption in the state, thereby reducing the value of the milk pool and hence dairy farm milk prices. But regulation in the face of a highly competitive market is often used to prevent bad outcomes such as destructive competition. There have been many studies that cited the behavior of actors in the real estate boom and bust that led to the "Great Recession" of 2007-2009. Loose regulation created a housing bubble, which led to the collapse of the subprime mortgage market, which then contributed to the collapse in the real estate market in 2008.[52] Some traders were financially incentivized to "short" the real estate market even if it ultimately contributed to greater financial instability.

Another example of regulation in the face of strong competition is the insurance market for life and homes. One could easily imagine that in a highly competitive market with much less regulation, insurance companies would be incentivized to charge more for their insurance policies and pay less out in claims, realizing greater profits. Some changes would take place even if it led to the ultimate destruction of the industry. For that very reason, the insurance industry today, while operating in a very competitive market, is also highly regulated.

This study concludes that

1. The purposes of state regulation of the Pennsylvania dairy industry are just as valid today as they were when first implemented.
2. If minimum milk pricing in Pennsylvania were eliminated, there would be tremendous incentives for large retailers in the state to engage in bidding wars with milk processors/dealers. In fact, that has already occurred in other states. Retailers would be incentivized to offer milk below cost to their customers to use milk as a loss leader. Families that buy milk often spend more than those who don't purchase milk. Thus, if minimum retail milk pricing is eliminated, retailers would be incentivized to push back on the cost of milk to their suppliers during the bidding process. That would destabilize the financial health of many fluid milk processors in Pennsylvania as evidenced by their O-scores. Some would go bankrupt and fluid milk processing would be reduced in the state. The remaining fluid milk processors would need to adjust by paying less to

[52] Becky Sullivan & Ari Shapiro, "10 Years After Housing Crisis: A Realitor, A Renter, Starting Over, Staying Put." NPR, April 28, 2018. URL: npr.org.

farmers that supply them milk and cut back on distribution and other costs. This would result in less economic spending.

The direct economic impact of elimination of minimum milk pricing would be a loss of fluid milk processing in the state valued at $717 mil. This loss in economic spending would cascade down throughout the entire Pennsylvania dairy industry. Pennsylvania dairy farmers would reduce milk production after losing the PMMB over-order premium. In addition, some farmers would need to haul their milk further, raising their overall costs, and others would simply lose a market. And there would be other economic losses throughout the Pennsylvania economy as economic activity declines, and federal and state taxes decline.

However, there would be one beneficiary of such a policy change - consumers. Eliminating minimum milk pricing would create a price war that would likely reduce Pennsylvania milk prices. **This study concluded that retail milk prices in Pennsylvania would decline 8.3% for whole milk and 5.2% for reduced fat milk, and that total fluid milk consumption in Pennsylvania would increase by a modest 1.3%.** That's not much of a change. But clearly, lower income consumers in Pennsylvania would benefit more from the price change than higher income consumers. So, the question would become "is the benefit of the policy change worth the cost? Public policy is debated in such terms. **Such a policy change would come at the cost of total Pennsylvania economic spending declining $2.8 bil and the loss of 10,047 jobs.**

Our conclusion is that eliminating minimum milk pricing in Pennsylvania would reduce the regulatory burden of state regulation on retailers, processors, and cooperatives, and would only marginally expand milk consumption (around 1.3%).

1. This policy choice would come at the expense of reduced economic activity in rural communities and fluid milk plants close to urban centers.
2. This policy choice would result in less economic spending by dairy farmers. Dairy farmers purchase many inputs in their local communities. Also, fluid milk plants have significant payrolls and also purchase many inputs in order to process fluid milk.
3. Reduced direct and indirect economic activities would also have a negative multiplier effect on household spending in the state.
4. The policy choice to eliminate minimum milk pricing in Pennsylvania would create some very modest benefits for fluid milk consumers, would not increase dairy farm income, and would come with a heavy price tag of $2.8 bil in reduced state-wide economic activity along with a loss of $683 mil in wages and 10,047 jobs.

Appendix – Survey of Regulated Dealers in Pennsylvania

An important question to be addressed in this study is what impact would elimination of minimum milk pricing in Pennsylvania have on the fluid milk industry. More importantly, what impact would it have on the structure of fluid milk processors and the volume of milk processed as fluid milk in the state.

One way of addressing this question was to conduct a survey of Pennsylvania fluid milk dealers. A survey was sent by the Pennsylvania Milk Marketing Board to 37 regulated dealers in Pennsylvania on June 26, 2023. As of July 13, a total of 32 dealers completed the survey, indicating a response rate of 81%.

Questions

The questions asked were as follows:

1. Which of the following do you process and/or manufacture?

    a. I process only fluid milk and/or cream products (Class I and Class II regulated).

    b. I process fluid milk and/or cream products AND other non-regulated products such as ice cream, tea, etc.

A response of "a" to question 1 will be directed to:

2. If PA minimum milk pricing is eliminated, how vulnerable would your business be –vulnerable being chance of going out of business?

    a. Extremely vulnerable.

    b. Somewhat vulnerable.

    c. Not too vulnerable.

    d. Not vulnerable.

3. Please provide the reason for your response to Q2.

A response of "b" to question 1 will be directed to:

4. If PA minimum milk pricing is eliminated, how vulnerable would the fluid milk portion of your business be-vulnerable being chance of going out of business?

    a. Extremely vulnerable.

    b. Somewhat vulnerable.

c. Not too vulnerable.

d. Not vulnerable.

5. Please provide the reason for your response to question 4.

6. How will your non-regulated business be impacted?

Responses

Question 1

Seven of 31 answered respondents or 23% identified themselves as processing only fluid milk and cream products; 24 respondents or 77% identified themselves as also processing non-regulated products such as ice tea, ice cream, etc.

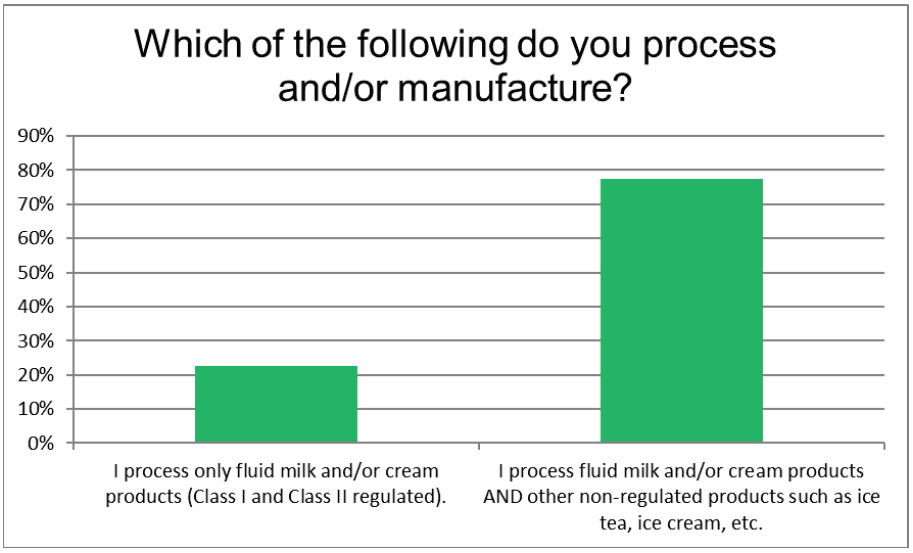

Figure 0.1 Survey Question 1

Question 2 - response for fluid milk and cream processors only

Of the 7 respondents, about 43% were either extremely or somewhat vulnerable to elimination of Pennsylvania minimum milk pricing. About 57% were either not too vulnerable or not vulnerable.

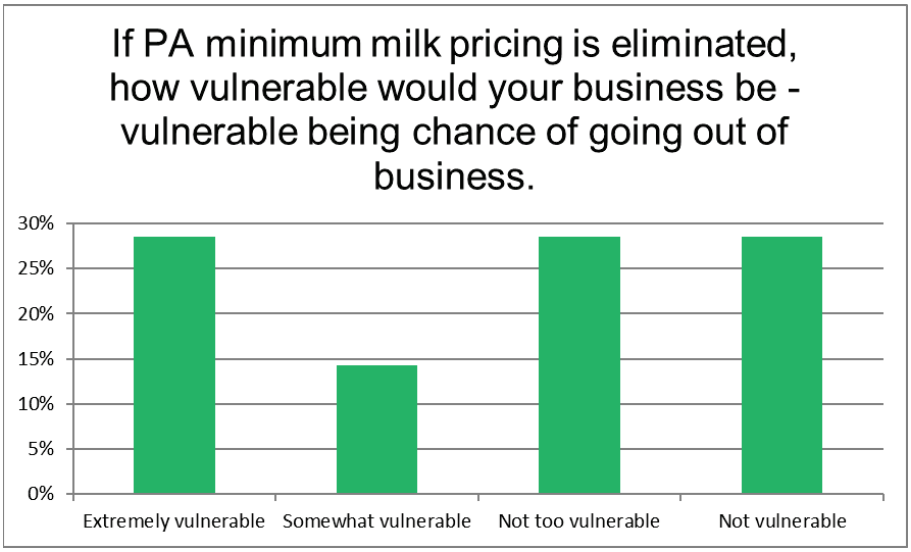

Figure 0.2 Survey Question 2

Question 3 – responses for question 2 by fluid only/non-diversified plants

- Large stores would sell milk at a loss and bring customers to their store; they would only deal with large processors.
- We have a strong connection to our customer base.
- We only sell raw milk.
- This would not affect us at all.

Question 4 – responses from diversified fluid milk processors

There were 24 responses from diversified fluid milk plants. About 67% responded extremely or somewhat vulnerable if minimum milk pricing were eliminated. That response is much higher than plants that were fluid only. It also corroborates the results of the O-score study reported above.

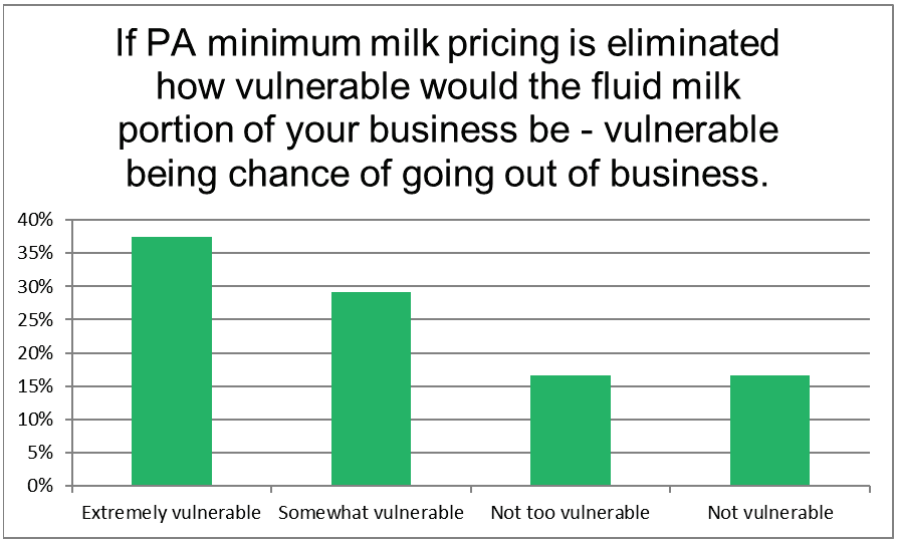

Figure 0.3 Survey Question 4

Question 5 – reasons for responses from diversified fluid milk processors

- Many wholesale customers are extremely price sensitive when it comes to fluid milk and the largest processors would be able to undercut us. Retailers would also start price wars with milk putting more pressure on processors, like we have seen in neighboring states.
- It would be devastating to my company if PA minimum milk pricing is eliminated. While we do produce ice cream and iced teas, the overwhelming majority of our income comes from processing fluid milk. If the minimum pricing is eliminated, it would cripple our ability to compete in the market. We would be undercut by larger dairies bidding on schools and stores, and other customers. We would have to inform our farmers that we would not be able to continue paying them the same prices that they are used to seeing us pay, because we would need to procure our milk cheaper to stay in business. We would not be able to pay premiums for better quality milk, because we would need to do everything possible to compete. Our drivers get paid on commission, so lower prices mean lower wages for them. We would be forced to consolidate routes to try to keep their routes profitable. It would be a huge ripple effect that would ultimately affect the farmers and the agriculture business in the state in a detrimental way. If the farmers are not getting enough money for their milk, they will be forced to sell off cows. They would no longer need companies to process feed for their milking cows, and that will hurt that industry as well. I can continue on, but eliminating the state minimum pricing would be a dagger in the heart of all of the smaller dairies in the state. It would be awful.

- Retailers would engage in price cutting on milk as a loss leader to drive traffic through their stores. This would make them even more motivated to buy milk as cheap as possible.
- Minimum retails are essential to orderly marketing. Without minimum retails the supermarket chain buyers will immediately use milk as a loss leader in the stores. Then they will look to replace those lost margin dollars through bidding and RFP process to the manufacturers and processors. The downward pressure on the companies will eventually lead to attrition.
- We are a medium sized processor of primarily fluid milk. Without a minimum milk pricing structure, our larger competition would sell milk at below-cost prices, essentially eliminating our ability to compete in the marketplace. Lower market prices of milk would result in lower prices paid to all PA dairy farmers. The presence of choice - in the form of small to mid-sized dairy processors who are willing and able to market farmers' milk makes the PA milk market unique. In other states, there simply isn't the variety of local fluid milk processors that we're blessed to have in PA.
- Purchasing quality milk is made possible because of the OOP and we recover those premiums in the price to retailers. If we did not recover the premium in the minimum price, we could not afford to pay any premium.
- Our drink customers expect a full line of milk products at a competitive price and we couldn't be competitive without PMMB.
- Competitive markets may use fluid milk as a loss leader.
- People still need milk. As long as demand is there, we should be fine.
- Most of our sales are in the non-regulated segment of the milk sales.

Question 6 – how will your non-regulated business by affected (for diversified fluid plants)

- Much of our non-dairy products are reliant on fluid milk volume for distribution and processing scale/efficiency. The loss of milk volume we result in fewer distribution outlets and substantially higher costs per unit.
- With the loss of non-regulated or regulated (sales volume) a milk processing plant would be extremely vulnerable.
- It would obviously get affected because if we lose bids because we are not being competitive in the marketplace with milk, we would lose business in the non-regulated processing as well.
- Honestly, if PA minimum pricing is eliminated we could never survive.
- We most likely would not be able to survive without delivering both types of products.
- Our iced tea and juice business is dependent on our milk business. The processing, packaging and delivery equipment required to process and deliver non-regulated products is here because of our milk business and could not be sustained on tea and juice alone.

- Non-regulated products do not have enough sales to offset the lower margin dollars that the loss of minimum retails would cause
- The prices for non-regulated raw milk may become become high and cause us to increase ice cream prices outside the expected limit.
- No impact...except that we'd have to likely increase pricing in order to find revenue and stay solvent if there is no minimum pricing on regulated products.
- It would not be impacted unless there would be a significant increase in the demand for milk. Even then, it becomes a scheduling issue.
- Not at all.
- Minimally.
- I don't expect any change.