



*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

## **Stability in Organic Milk Farm Prices: A Comparative Study**

Ye Su

Department of Agricultural and Applied Economics

University of Missouri

Email: [ys4d8@mail.missouri.edu](mailto:ys4d8@mail.missouri.edu)

Scott Brown

Department of Agricultural and Applied Economics

University of Missouri

Email: [BrownSc@missouri.edu](mailto:BrownSc@missouri.edu)

Michael Cook

Department of Agricultural and Applied Economics

University of Missouri

Email: [cookml@missouri.edu](mailto:cookml@missouri.edu)

*Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013.*

*Copyright 2013 by Ye Su, Michael Cook and Scott Brown. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

## **Stability in Organic Milk Farm Prices: A Comparative Study**

### **Abstract**

The organic milk pay price is more stable year round and increases every year. However, the conventional milk price varies within the year and from year to year. As an emerging segment of the milk industry, consumer demand for organic milk is increasing rapidly. The growth in demand relative to supply provides organic milk producers and processors large premiums over the conventional milk price. Many conventional dairy farms have converted to organic operations for the more stable price.

The objective of this study is to understand the stability of organic milk price relative to conventional milk price, differences in pricing mechanisms between organic milk and conventional milk, and shed light on the policy implications for organic milk and conventional milk markets.

Farm price and retail price of organic milk and conventional milk are compared and analyzed. The comparative stability and volatility of the farm and retail price of organic milk and conventional milk are investigated. Seasonality and volatility of milk price are examined. The supply and demand patterns and profit margins are compared between conventional and organic milk. Additionally, we explore the market structures of the organic milk industry. Our analysis develops hypothesis for future work on the organic milk pay price phenomenon.

## Table of Contents

1	Introduction.....	4
2	Producers prefer stable pay price .....	4
3	Market structure of the organic milk industry in the U.S.....	6
4	Milk pricing and the policies affecting the price .....	7
4.1	Milk pricing .....	7
4.2	Conventional and organic milk farm price overview.....	9
4.2.1	Seasonality of the milk price .....	11
4.2.2	Volatility of the farm prices .....	13
4.3	Conventional milk and organic milk retail price .....	15
5	Factors affect the volatility of milk price .....	18
6	Competitive yardstick effect of Organic Valley Cooperative in the organic farm milk price .....	21
6.1	Duopsony market structure (imperfect competition) .....	21
6.2	Competitive yardstick effect of the CROPP cooperative .....	23
7	Policy implications .....	24
8	Reference .....	25

# **Stability in Organic Milk Farm Prices: A Comparative Study**

## **1 Introduction**

Milk is one of the most regulated commodities in the United States. The dual objectives of dairy policies are to reduce the variability of conventional milk prices and stabilize dairy producers' incomes. The organic milk farm price has little or no government policy and is driven over time by market supply and demand factors. However, empirical evidence suggests the organic milk farm price is much higher and more stable than the conventional milk price. Farmers, policy makers, and researchers are interested in the differences that drive the more stable pay price in the organic milk market relative to the conventional milk market. Unraveling the price stability mechanism of the organic milk will provide farmers the knowledge to make more informed decisions about whether they should convert from a conventional dairy farm to an organic dairy farm, and provide processors more information to make decisions about their portfolio mix in dairy production and processing.

To date, we have not found seminal work addressing the price determination of organic milk farm price. The objective of this study is to understand the stability of organic milk price relative to conventional milk price, differences in pricing mechanisms between organic milk and conventional milk, and shed light on the policy implications for organic milk and conventional milk markets.

The paper is organized as the following. Section 2 reviews the producers' welfare of price stability. Section 3 illustrates the organic milk pricing method in the USA. Section 3 exams the organic milk market structure. Section 4 illustrates the characteristics of the historical milk prices. Section 5 discusses the factors affecting the milk price. Section 6 proposed hypotheses why the organic milk price can be stable year round. Section 7 explains the policy implication and Section 8 concludes.

## **2 Producers prefer stable pay price**

Sustainability is the first priority of the price. The price must cover the costs of production and provide a reasonable return. Then the farmers prefer stable price. Price stability means the price change is relatively small from one period to next with some predictability. On the contrast, price volatility means frequent directionless changes of the price (Butler 2002; Keating 2002). Volatility leads to less prediction (Romain, Frigon et al. 2002). Though volatility is a natural feature of agricultural commodities due to the seasonality, inelastic demand and supply, and certain degree volatility is desirable, high volatility of the price contributes to higher risk and higher costs to manage the risk related to volatility. This is especially hard for small farmers to manage their production. In response to price variation, many farmers try to grow to explore the economy of scale so that they can stay in the business. One of main reasons that many farmers converted from the conventional dairy to the organic dairy business is to get a higher and stable

pay price. A study with Wisconsin organic dairy farmers showed that farmers in organic dairy had better return than their counterpart in the conventional dairy (Barham, Brock et al. 2006; Krieg 2007). McCrory et al (McCrory and Parsons 2013; McCrory and Parsons 2013; McCrory, Parsons et al. 2013) did case studies with Vermont dairy farmers transitioned from conventional dairy to organic dairy. They found that the farmers are better off economically after transition.

Hiebert (Hiebert 1984) used a two-input model with one input chosen before the price was revealed and found that the risk-neutral producers preferred stable price. We personally interviewed organic dairy farmers converted in the early 2000s and the farmers stated that the financial reason was a very important one for them to convert from conventional to organic operation. They personally also preferred the stable prices because it is very hard to manage their farm with volatile prices. Small farmers particularly are more difficult to survive through the economic trough.

Milk is one of the most regulated commodities in the United States, European Union and Canada. All regulations are in place to ensure the producers' price and income stability and reduce risk and uncertainty. In fact, the conventional milk price was stable until the late 1980s<sup>1</sup>. After that, big swings of milk price occurred due to the lower government support price. In the recent years, these policies are under challenge due to the high volatility of milk price and instability of the farm income. CROPP (best known by its brand name, Organic Valley®), the nation's largest organic dairy cooperative, provides year round stable pay price to their farmer members plus seasonal premiums and a market adjustment premium<sup>2</sup>. The management team of Organic Valley ascribes that stable pay price is one of the most important factors for its success. With stable pay price, the cooperative can attract members and grow from seven members to 1834 at the end of 2012 (1507 dairy farmers)<sup>3</sup>. The nation's number one organic milk brand, Horizon Organic®, owned by WhiteWave, a public firm and formerly owned by Dean Foods, also offers similar pricing to its contracted farmers<sup>4</sup>.

Producers want a stable pay price (Vanbaale 2004; Novakovic, Nicholson et al. 2011). Kooten extended the Waugh-Oi-Massel model of welfare effect of price stabilization with rational expectation for price and found that the price stabilization is a Pareto optimal when the price is endogenous (Kooten and Schmitz 1985). Due to the unique characteristics of milk -- perishable, not storable, produced every day, seasonality of production, and imbalance of supply and demand in some seasons, the conventional milk price fluctuates from month to month. Government regulations and programs are provided to stabilize the commodity price, reduce the uncertainty and risk for the producers. Cook and Marion (Cook and Marion 1981) argued that the more price stability, the more the small farmers in the business. The unstable price drives larger farmers to invest and filter out the small farmers.

---

<sup>1</sup> Data from NASS. All milk monthly price shown in Figure 4.

<sup>2</sup> <http://www.farmers.coop/producer-pools/dairy-pool/pay-price/northeast/>

<sup>3</sup> <http://www.farmers.coop/producer-pools/cropp-producer-map/>

<sup>4</sup> [http://www.nodpa.com/payprice\\_update\\_02062013.shtml](http://www.nodpa.com/payprice_update_02062013.shtml)

### **3 Market structure of the organic milk industry in the U.S.**

The USDA enforced the national standard, National Organic Program, in 2002. The U.S. organic industry is still relatively new and only a small portion of the entire food industry. The Organic Trade Association 2012 survey reported the organic food market exceeded \$29 billion, expanding at more than 9% in 2011 (Organic Trade Association 2012). Organic dairy value is the second largest in the organic food grouping, totaling 6% of the US dairy production. Sales of organic dairy products reached \$3.9 billion in 2011, approximately 15% of the value of the entire organic food market. The average annual growth rate of organic milk consumption has exceeded 20% since 2006; while growth rates of conventional milk sales have been zero or negative percent during the same time period. Organic milk is consumed mostly in the form of fluid milk. At the end of 2012, the total organic fluid milk consumption was 4.08% of the entire fluid milk consumption<sup>5</sup>. The total organic milk fluid consumption increased by 2.9% in 2012, while the consumption of the total fluid milk decreased by 1.5%. Total organic milk sales were 1.3 billion in 2012 in the U.S.<sup>6</sup>.

Milk is considered as homogenous commodity. The only difference is brand, which creates consumer confidence, reputation and consumer loyalty. There are about 50 organic milk processing groups today, only two national brands among them. HP Hood, licensed Stonyfield brand, exited the market in 2010 during the economy recession and transferred its over 200 members to Organic Valley<sup>7</sup>. We saw a trend of market concentration. Another local cooperative, Lancaster Organic Farmers Cooperative (LOFCO) merged its 53 members with Organic Valley as well in 2011<sup>8</sup>. Others are regional and local brands (many of them family owned or co-operated) and produce for store brands (Dimitri and Venezia 2007; NODPA 2011), such as Natural By Nature in Pennsylvania and the MOO in Maine. Dairy Market Service, a joint venture of Dairy Farmers of America and DairyLea Cooperative handles organic milk for more than 300 farms in the northeast and is the largest organic milk supplier in that region. The company sells its milk mainly to Horizon Organic and CROPP<sup>9</sup>.

Larger processors have obvious advantages over small ones with lower costs and better capacity to handle oversupply because of economy of scale and market access. Some family farms process their milk on site and sell to customers, distributors and retailers through private label. Some cooperatives process both organic and conventional milk and distribute their products through distributors and retailers. In the past few years, excluding 2009, organic milk industry underwent short supply due to increasing demand.

The largest national organic milk processor is Horizon Organic, LLC, owned by WhiteWave, a public firm, and the other is CROPP (Cooperative of Regional Organic Producer Pools), an organic producer-owned firm. Horizon Organic® is the largest seller and the number one brand

---

<sup>5</sup> Calculated based on data from USDA AMS

<http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5102996&acct=dmktord>.

<sup>6</sup> Data from 10-K of WhiteWave 2012, [http://www.whitewave.com/investor\\_relations/](http://www.whitewave.com/investor_relations/).

<sup>7</sup> CROPP 2009 annual report.

<sup>8</sup> CROPP 2010 annual report.

<sup>9</sup> <http://www.dairymarketingservices.com/organicmilk.html>

in the country. The second organic dairy brand is Stonyfield®, a yogurt processor, and the Organic Valley® is the third brand owned by CROPP<sup>10</sup>. CROPP licenses the Stonyfield® fluid milk and a major organic ingredient provider for the Stonyfield® yogurt<sup>11</sup>. About 70% organic milk is consumed as fluid milk. Horizon Organic® has 43% of the fluid milk market share<sup>12</sup>. Horizon Organic has the largest market share of organic dairy, followed by the private label, and Organic Valley is third<sup>13</sup>.

There is another large organic milk processor Aurora Organic Dairy<sup>14</sup>, which only provides private labeled organic milk, butter and organic ingredients to retailers such as Wal-Mart, Target, Costco, and Safeway<sup>15</sup>. Private labeling store brands are increasing in the recent years. The market share for store brand products, local and regional brands increased from 10% to 27%, and 10% to 21% respectively from 2004 to 2007. The two national brands market share decreased from 78% in 2004 to 52% in 2007 (Dimitri and Venezia 2007). Aurora Organic Dairy and Organic Valley are the largest two private label providers<sup>16</sup>.

## **4 Milk pricing and the policies affecting the price**

### **4.1 Milk pricing**

Different from conventional milk price determined monthly by the Federal Milk Market Order, organic milk price is set at least one year ahead. Horizon Organic has two organic farms, which only provide 7% of its supply. Horizon Organic contracts with more than 600 certified organic farmers from one to three years in over 20 states<sup>17</sup>. CROPP determines pay price for the next year by farmer owners at the end of year. Each of them provides a base price, plus seasonal premium or deduction, and market adjusted premium<sup>18</sup> (Table 1). Horizon changes the market adjustment premium to reflect the market condition and costs of production<sup>19</sup>. CROPP does not provide a contract to its members. The members set up the price and finalized by its board of directors at the end of the year for next year based on their costs of production and a fair return. If the market condition changes within a year, the board of directors can adjust the pay price based on the market and the cooperative performance. The CROPP has more flexibility than Horizon Organic in the pay price. Horizon Organic set up new terms with their contracted farmers and said it has sole right to reduce the pay price based on the market condition with 30 days written notice to its members if the price change is less than 25%<sup>20</sup>. Some farmers did not

---

<sup>10</sup> <http://www.farmers.coop/producer-pools/dairy-pool/>

<sup>11</sup> CROPP annual report 2011.

<sup>12</sup> Data from 10-K of WhiteWave, [http://www.whitewave.com/investor\\_relations/](http://www.whitewave.com/investor_relations/)

<sup>13</sup> [http://www.nodpa.com/payprice\\_update\\_02062013.shtml](http://www.nodpa.com/payprice_update_02062013.shtml)

<sup>14</sup> <http://www.auroraorganic.com/products.html>

<sup>15</sup> <http://www.cornucopia.org/aurora-organic-factory-dairy/>

<sup>16</sup> [http://www.nodpa.com/payprice\\_update\\_02062013.shtml](http://www.nodpa.com/payprice_update_02062013.shtml)

<sup>17</sup> [http://www.whitewave.com/our\\_foods/#horizon](http://www.whitewave.com/our_foods/#horizon)

<sup>18</sup> [http://www.nodpa.com/payprice\\_update\\_02062013.shtml](http://www.nodpa.com/payprice_update_02062013.shtml), <http://www.farmers.coop/producer-pools/dairy-pool/pay-price/>

<sup>19</sup> [http://www.nodpa.com/PayPrice/Horizon\\_2008\\_pay\\_price.pdf](http://www.nodpa.com/PayPrice/Horizon_2008_pay_price.pdf)

<sup>20</sup> [http://www.nodpa.com/payprice\\_only\\_update\\_120611.shtml](http://www.nodpa.com/payprice_only_update_120611.shtml)



like this contract and switched to CROPP for a right to have a say in the pay price<sup>21</sup>. With the stable price, farmers can know their income ahead of time and it is easy for them to manage their farms and arrange their debts payment.

Table 1 Organic Milk Pay Price Summary<sup>22</sup>

	Horizon Organic								Organic Valley							
Year	2006	2007	2008	2009	2010	2011	2012	2013	2006	2007	2008	2009	2010	2011	2012	2013
Base price	24	24	25	25	25	25	25	25	22	22.5	24.75	23.75	23.57	24.55	26.55	25.55
MAP*	2	2	2.5	2	1	2.5	3.5	3.5						1	1	1
Seasonal MAP	1.5	1.5	3	4	3	3	3	3	1			2	2	3	3	3
Summer deduct										-1	-1	-1	-1	-1	-1	-1

Notes: unit is dollar. Organic Valley also has regional premiums based on the costs of production in different regions. In the northeast region, the premium is \$3.25. It has 11 regional premiums. Both of them have component prices and quality premiums.

MAP: market adjustment premium

In contrast, there are federal, state, and interstate regulations for the conventional milk price. Federal Milk Market Order (FMMO), started in the 1930s, set up minimum conventional milk farm prices that the manufacturers need to pay to their milk producers (Farmers Weekly 2006). The purpose of the FMMO is to ensure the reasonable return for the producers and a stable supply for the consumers and keep the stability of the market<sup>23</sup>. Milk is divided into four different classes according to usage, class I fluid, class II soft product like cottage cheese and ice cream, class III cheese and whey, and class IV butter and non-fat dry milk. Conventional milk also received a component price, and some cooperatives have an over the order premium. Since 2000, new orders took effect and the new price formula was adopted. Now the FMMO price is determined by the wholesale commodity price of cheese, butter, nonfat dry milk and dry whey (Ashbridge 2006).

The Dairy Price Support Program (DPSP) sets up the minimum support price for the dairy products. Once the market price is lower than the support price, the Commodity Credit Corporation (CCC) is ready to buy any amount of the supported products available in the market (Ashbridge 2006). When the market price increases higher than the CCC reserved price, CCC sells the products to the market. The program was active before the end of the 1980s and played an important role in stabilizing the conventional milk commodity price. This program ensured the conventional milk price stability from the 1960s to the 1990s<sup>24</sup> by serving as an inventory

<sup>21</sup> Personal interview with dairy farmers

<sup>22</sup> [http://www.nodpa.com/payprice\\_update\\_02062013.shtml](http://www.nodpa.com/payprice_update_02062013.shtml), <http://www.farmers.coop/producer-pools/dairy-pool/pay-price/northeast/>

<sup>23</sup> Dairy Federal Milk Marketing Orders – Program Overview, <http://www.ams.usda.gov/AMSV1.0/ams.fetchTemplateData.do?template=TemplateO&navID=IndustryMarketingandPromotion&leftNav=IndustryMarketingandPromotion&page=FMMOProgramObjectives>

<sup>24</sup> See Figure 4.

buffer. Since the early 1990s, the DPSP is inactive due to a support price lower than the market price. The conventional milk price is determined mainly by the market and is much more volatile than the previous period. There are also other dairy programs in existence, such as milk income lost contract. This program is effective for both conventional and organic dairy farmers.

## 4.2 Conventional and organic milk farm price overview

As shown in Figure 1, the organic milk farm pay price is relatively stable each year from 2004-2012. There is a clear linear trend in the price of organic milk (Figure 2). Though the conventional milk price also displays an upward trend, the conventional milk farm price varies from month to month. This can be further verified from Figure 3, which shows the annual price change percentage from the previous year from 1990 to 2012. Often, organic milk base pay price increased less than 10% every year, but the conventional milk prices fluctuated without any clear pattern. The range for the conventional milk annual price change is from -23% to 52%, and the range for the organic milk is from -4% to 10%. From 2006 to 2007, the conventional milk farm price increased about 50%, while a year later from 2008 to 2009, the farm price decreased more than 20%. Conventional milk prices from 1960 to 1995 were much more stable than years after 1995 (Figure 4). The prices have clear cycles after 1995. The cycles are from two to four years from peak to trough. Clearly, in the recent years, some forces determining the conventional milk price has changed. This is partly because the government support price reduced and was lower than the market clearing price. Organic milk has a premium price over the conventional milk price most of the time. This is partly due to the higher costs of production and the increasing demand of organic milk and the organic milk consumers are willing to pay higher price (Bailey 2005).

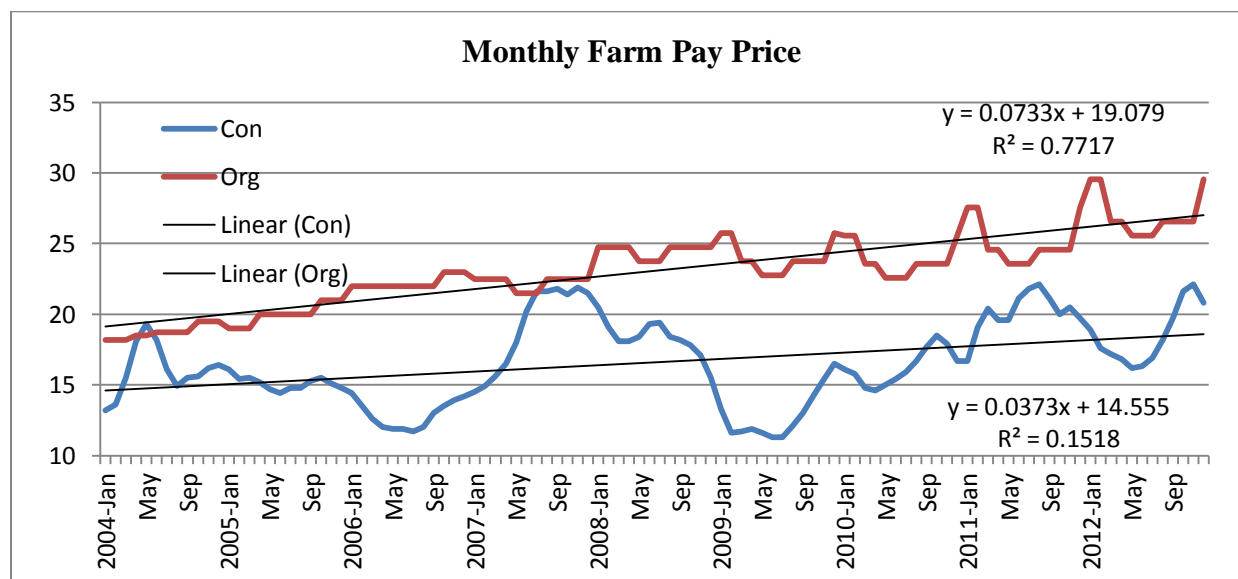


Figure 1. Organic and Conventional Milk Monthly Farm Price (data from ERS and CROPP Midwest base price)

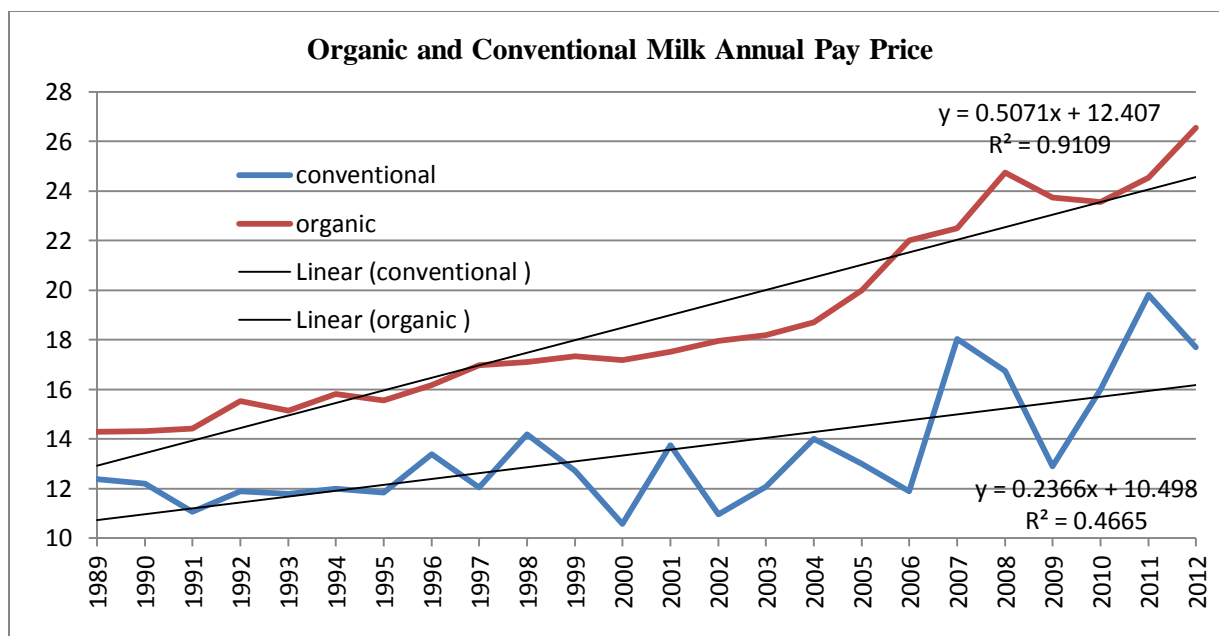


Figure 2. Organic and Conventional Milk Annual Farm Price (Data from ERS and CROPP)

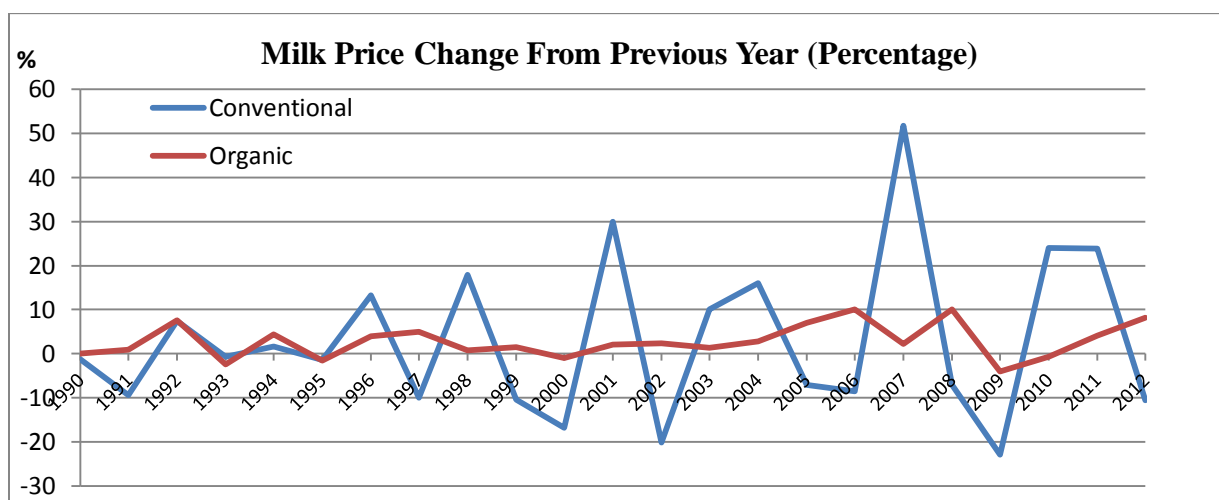


Figure 3. Milk Price Percentage Change from Previous Year  
(data from ERS and CROPP Midwest base price)

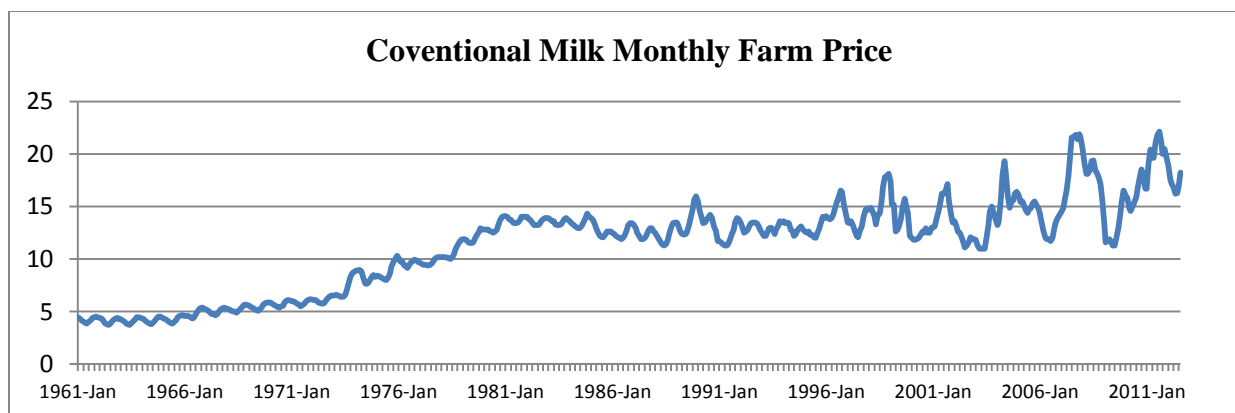


Figure 4. Conventional milk farm monthly price from 1961-2012 (data from ERS)

#### 4.2.1 Seasonality of the milk price

There is a clear seasonal pattern of the milk price in both conventional milk and organic milk farm price. The milk prices decrease from the beginning of the year, then increasing from June or July (Figure 5, Figure 6). This is because the biological cycle of the cows, calving in the spring leading to the spring flush. The milk production increases in the late spring, decreases afterwards (Figure 7). Organic milk cows have similar production cycle except the production per cow is less because of no hormones and less grain feed. There are some exceptions in the years 2004, 2007, 2008, and 2011 for the conventional milk price, which increased the volatility of the milk price. This is consistent with Novakovic and colleagues' study (Novakovic, Nicholson et al. 2011) that the milk price is more random after 2000 and the prices are more spread. The two national organic milk processors both set up base price plus the seasonal bonus. Organic Valley deducts one dollars/cwt in May, June and July to compensate the costs for the spring flush. Both of them have incentive payments for December, January and February to increase the production (Table 1).

Compared to conventional milk, organic milk production and demand presents similar seasonality due to the calving pattern. Other factors like weather affecting the production also apply to the organic milk production (Figure 17). The total organic dairy is only about 6% of the entire dairy consumption. There are only small amounts of the food service facilities serving organic products.

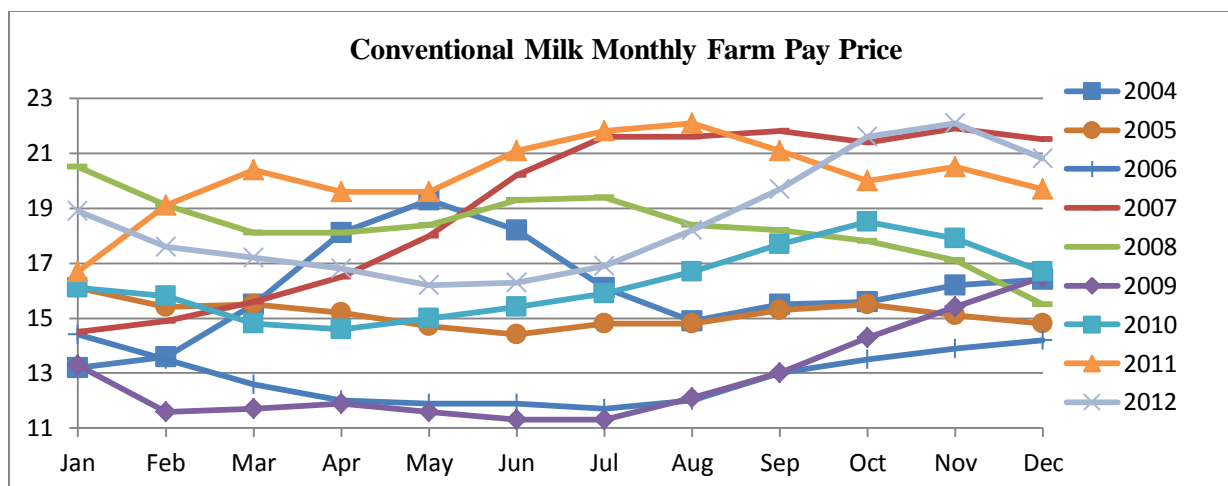


Figure 5. Convectional Milk Monthly Farm All Milk Price (data from ERS)

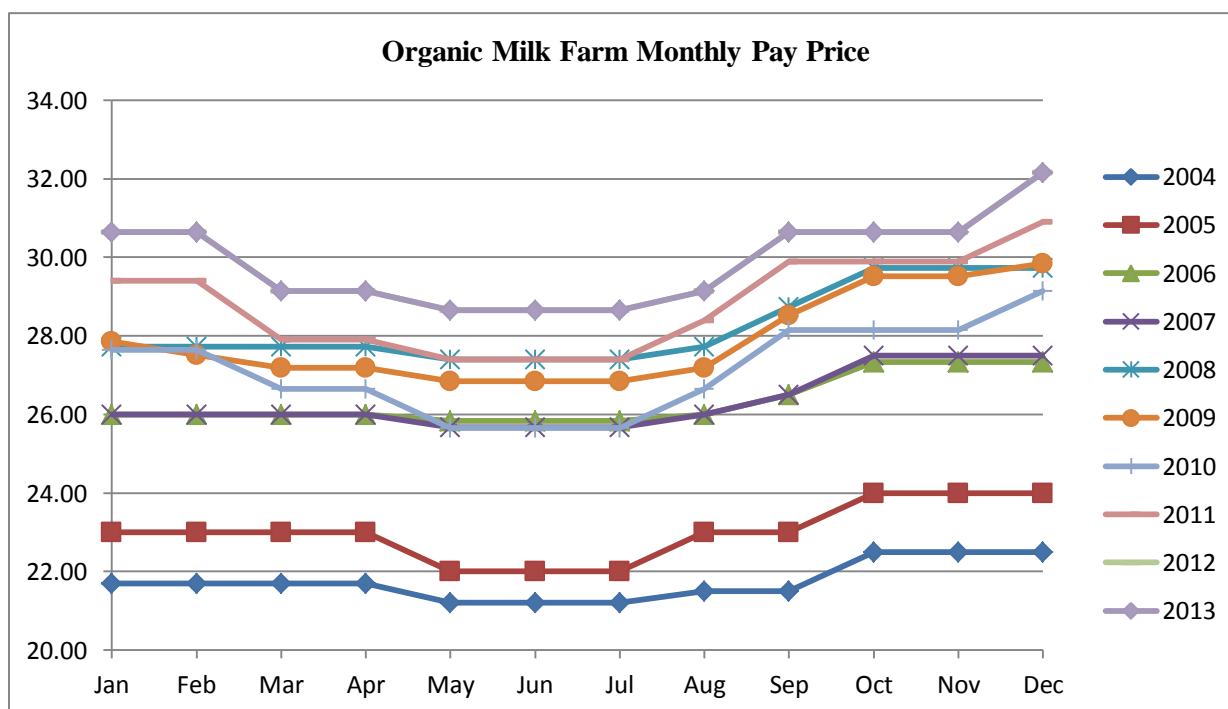


Figure 6. Organic Milk Monthly Farm price (Data from CROPP Midwest pay price)

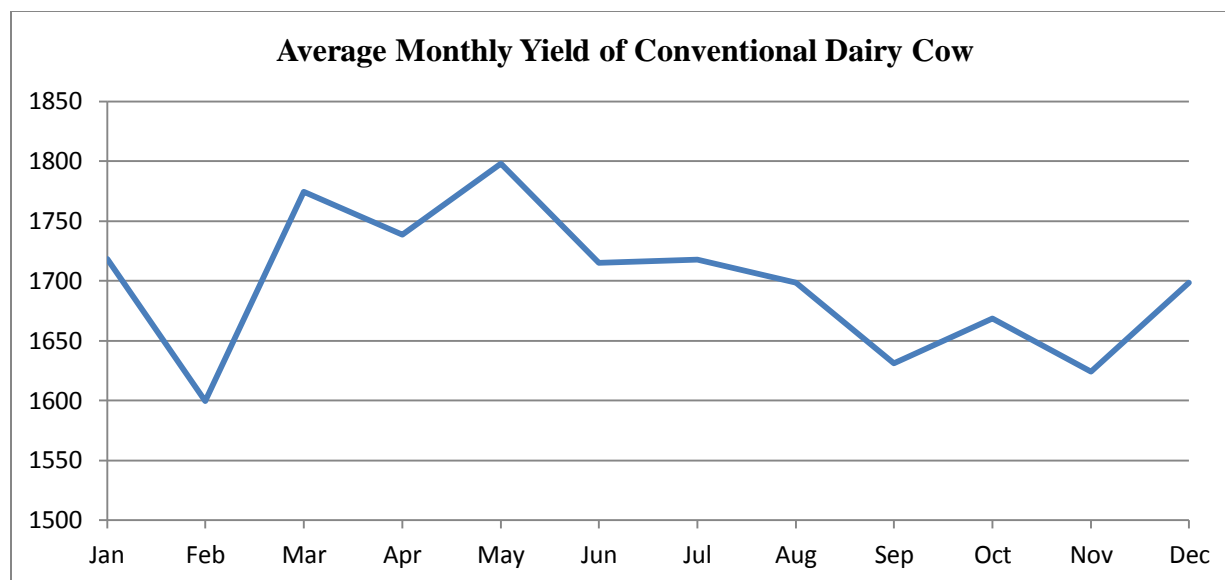


Figure 7. Monthly Average Yield of Conventional Dairy Cow from 2004-2012  
(Data from ERS)

#### 4.2.2 Volatility of the farm prices

The overall trend for the organic milk price is increasing. However, the price for conventional milk is up and down. The price rose to \$19.3/cwt in May 2004, and then fell to the lowest price of \$11.30 in June 2009. High milk prices were in 2004, 2007 and 2011, and low in 2006 and 2009, very erratic changes in a short period time without predictability (Figure 1). Irregular, directionless changes of the price is defined as volatility (Gilbert and Morgan 2011).

Variation of the milk price affects all the participants in the supply chain, from farm, processors, to the end consumers. One of the measurements of the volatility is the coefficients of variation (CV) (Gilbert and Morgan 2011; Tothova 2011). As shown in Figure 8, the annual CV of the organic milk is from 2-6%, and the CV of conventional all milk price is from 3-16%. The overall CV from 2004-2012 for the organic milk price is 11% and 18% for the conventional milk price. The variation of the conventional milk price is higher than the organic consistently. The variation of the conventional milk price is up and down, but the variation of the organic milk price is increasing slowly.

The Figure 9 shows the monthly price change percentage of the organic and conventional prices from 2004 to 2012. The organic milk price change ranges from -10 to 12%. Among them, nine of 106 months are over 5%, and 73 over 106 months have no change. For the months with price change, the changes were predictable, because the prices were predetermined either by contract or by farmer members and because of the seasonal change. The conventional milk price change is from -14 to 16%. Among them, 32 of 106 months are more than 5%. Figure 10 shows the three month price change from 2004 to 2012. It displays a similar pattern as the monthly price change. Figure 11 illustrates the annual price change percentage from the lowest to the

highest in this period. The conventional milk price change was from -20% to 51%, while the organic milk price change was less than 10% all the time.

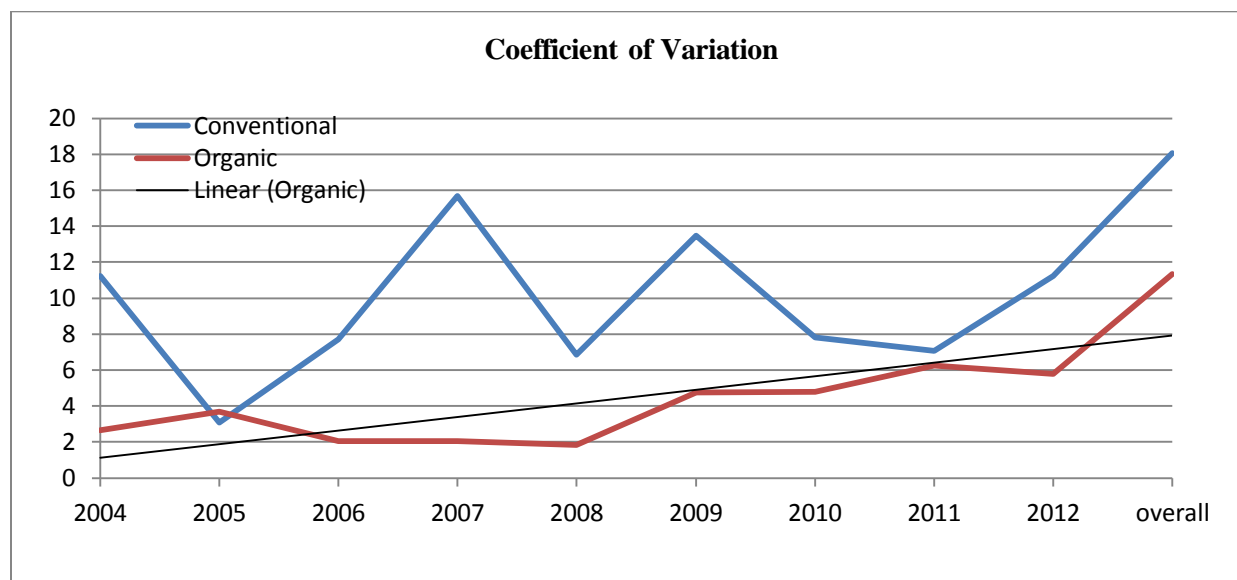


Figure 8. Coefficient of Variation of the Annual Prices (data from ERS and CROPP)

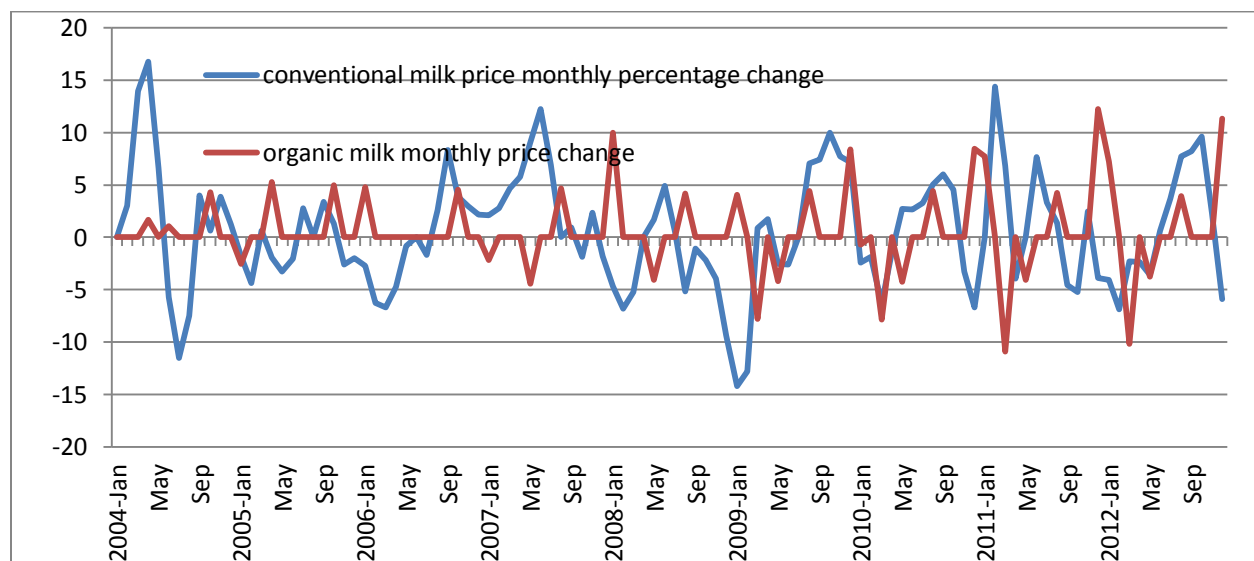


Figure 9. Organic and Conventional milk price monthly change percentage  
(Data from CROPP and ERS)

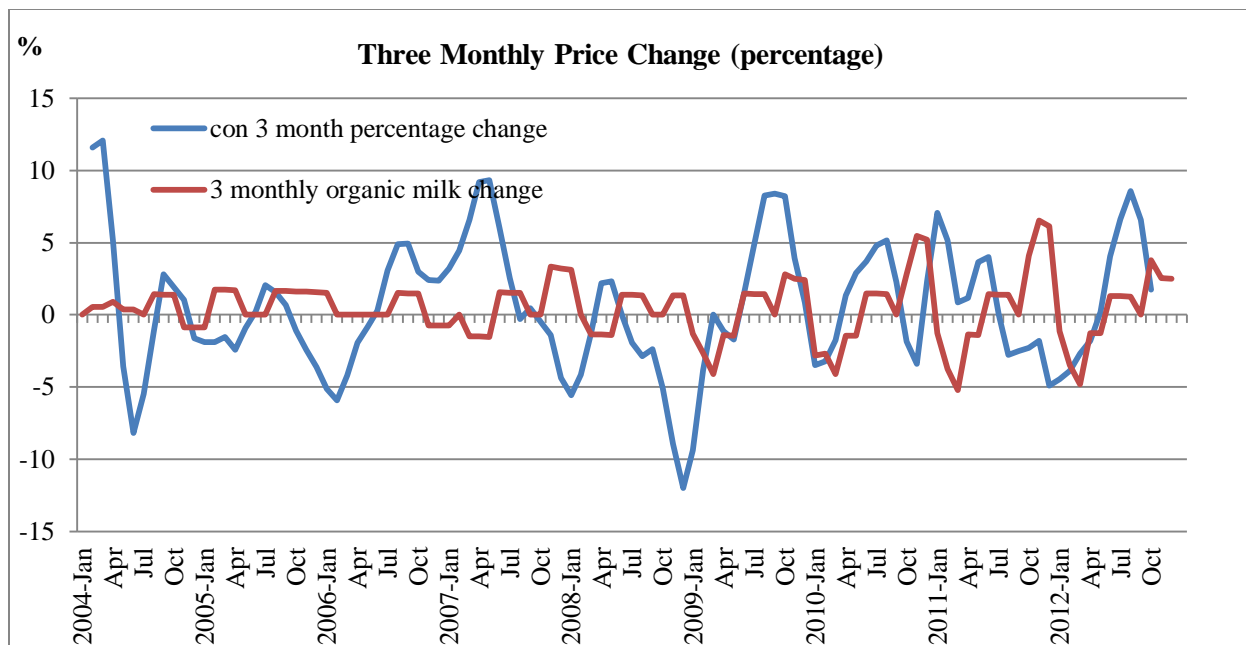


Figure 10. Organic and Conventional Milk Price Three Monthly Change Percentage (data from CROPP and ERS)

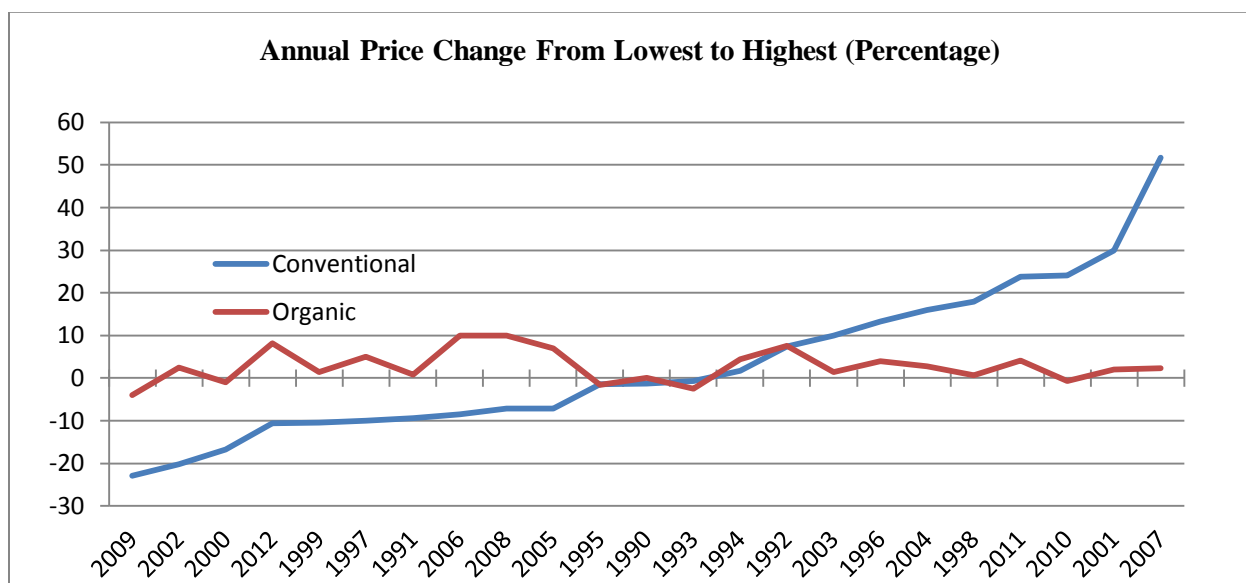


Figure 11. Organic and Conventional Milk Price Annual Change Percentage from Lowest to Highest (Data from CROPP and ERS)

#### 4.3 Conventional milk and organic milk retail price

Different from conventional milk farm price control, there is no federal level retail price control and only some states have retail price control, such as New York and Pennsylvania (Bolotova and Novakovic 2012). The retail price is almost totally determined by the market.



Retail price is based on wholesale price from the milk processors, who set their wholesale prices based on the farm price. Under perfect price transmission from farm to retail, the retail price change reflects the farm price and wholesale price change.

Similar to the farm price, the conventional fluid milk retail price varies more than the organic fluid milk retail price (Figure 13, Figure 14). The conventional fluid milk retail price is more closely related to the farm price. The conventional milk farm price and fluid milk price display similar variation from month to month (Figure 12). Organic fluid milk retail price is more stable than the conventional milk, but less correlated to the farm price. One reason of low correlation between the organic farm price and the retail price may be due to the low variation in the farm price. Both conventional and organic milk retail prices increased significantly from 2005, then the organic milk retail price decreased in 2008 and reached the price of approximately 50 cents higher than the price before the increase, but the conventional milk retail price came back close to the original price before the increase a year later. The organic fluid milk retail prices between 2005 and 2007 were higher than prices in other years. The difference between the organic milk farm price and retail price is higher than the difference of conventional milk. Smith et al (O'Conner, Keane et al.) found that the organic fluid milk premium over conventional is from 1.23 to 1.86 dollars per half gallon from private labeled whole milk to branded low fat and skimmed milk. What we found is 1.03-2.68 dollars per half gallon from 2004-2012. The difference may be because of the different data we used.

Retail price variation is smaller than the farm price variation for both conventional and organic milk fluid. Farm price is asymmetrically transmitted to retail price (Stewart and Blayney 2011; Bolotova and Novakovic 2012). Retailer response to the farm price increase faster than the response to the farm price decrease. In addition, there is a delay of price transmission from farm to retail and a cost to change the retail price frequently.

Organic fluid milk retail price displays a similar pattern with the conventional fluid milk retail price. This is because conventional milk is the closest substitute for organic milk. The retail price change of one product affects the demand of their substitutes. Alviola and Capps (Alviola and Capps 2010) found with the Nielson data of 2004 that the cross price elasticity of conventional milk and organic milk is 0.70 (1% increase of price of conventional milk, the demand of organic milk increases by 0.70%), and own price elasticity is -2.00 for organic milk. The cross price elasticity for conventional milk is 0.18. The cross price effects between conventional milk and organic milk are uneven. The price increase of conventional milk leads to more consumption of organic milk, while the increase of organic milk price leads less increase of conventional milk (Alviola and Capps 2010). The demand for organic milk is elastic, but is inelastic for conventional milk.

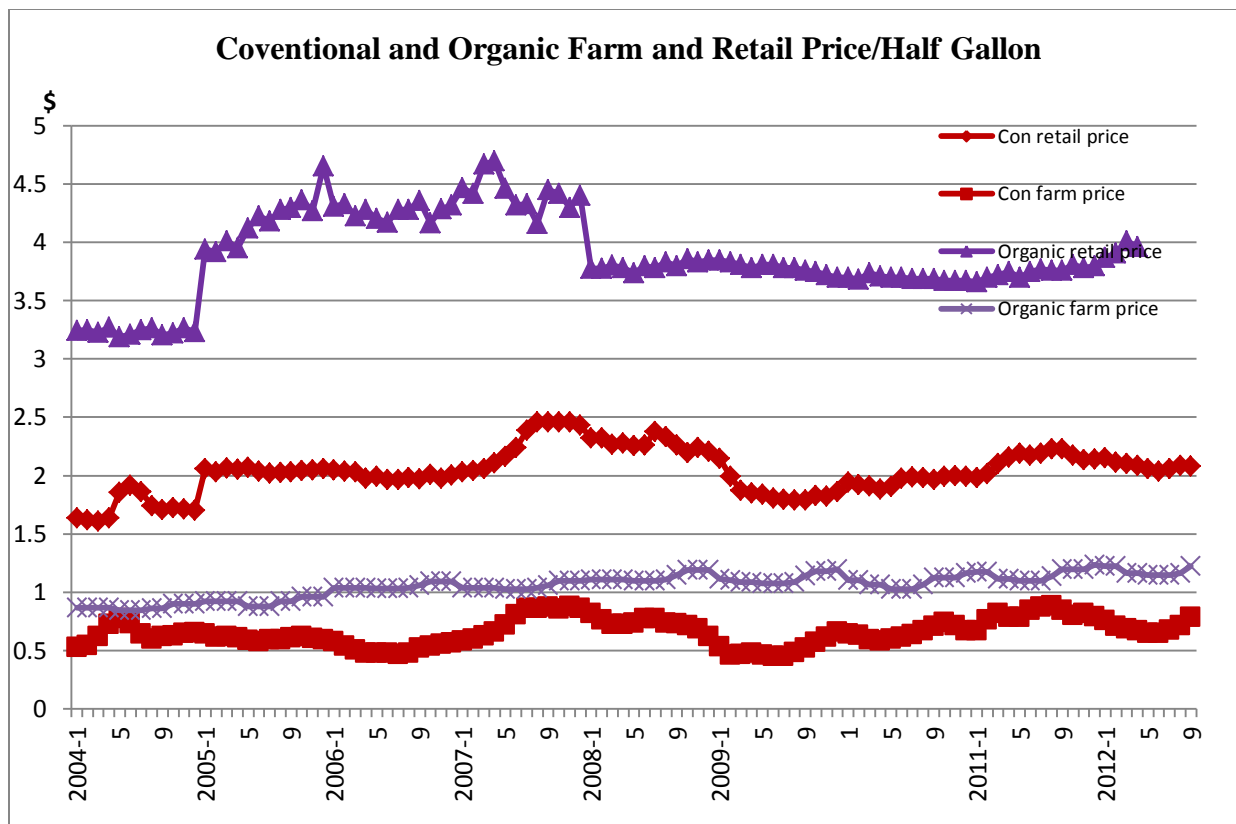


Figure 12. Conventional and Organic Milk Farm and Retail Price/half gallon from 2004 to 2012 (data from AMS and CROPP)

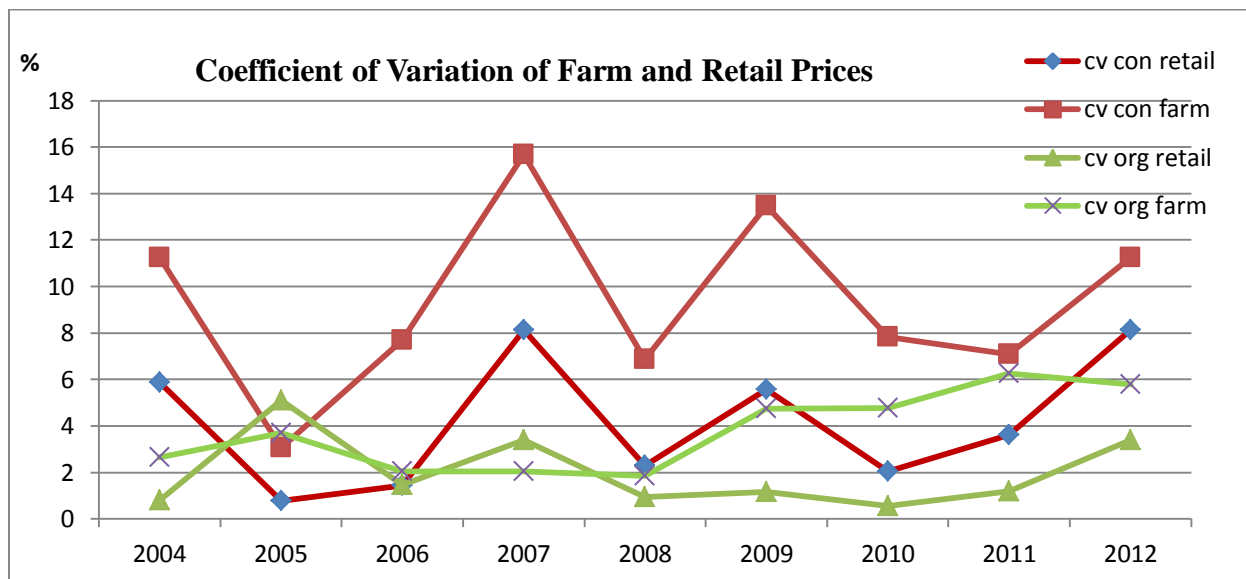


Figure 13. Coefficient of Variation of Farm and Retail Prices (Data from AMS and CROPP)

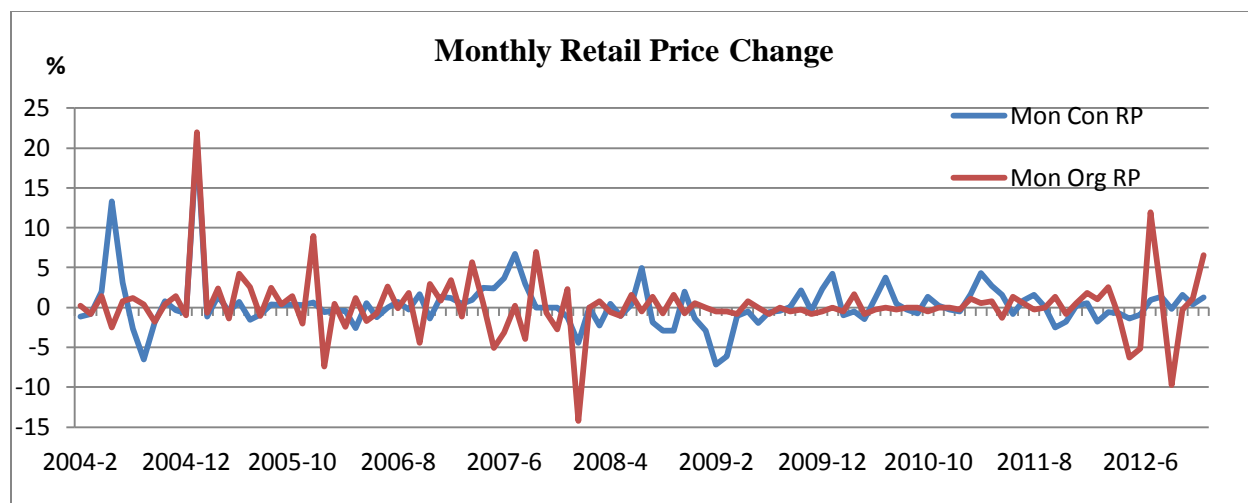


Figure 14. Monthly Price Change Parentage of Retail Price (Data from AMS)

## 5 Factors affect the volatility of milk price

Factors causing the price volatility have been widely studied. Many factors cause the volatility of milk price. The most important ones are the fundamental inelasticity of supply and demand, seasonality of the production and production cycle. Other factors affecting the supply and demand influence the milk price indirectly. These factors can be macroeconomic variables, such as dollar value, speculation, market-specific factors, input price, world price, export and weather. Except the world price and export, all other factors affect the organic milk demand and supply equally.

Why was the farm price of the conventional milk stable between the 1960s and the 1990s and volatile recently? This is due to the unique characteristic of the raw milk and the government policy change. Conventional milk price was stable before 1990 due to the government support price higher than the market price. The government bought the extra products and the government stock acted as a buffer for the milk and other dairy products. After 1990, the government support price was lower than the market price. The milk price was determined more or less by the market. Milk is a flow commodity, produced every day, not storable, relative inelastic production in the short run. At the same time, the demand of conventional milk is also inelastic in the short run. Therefore, either changes in the supply or demand will lead the price changes. Both supply and demand display some seasonality. The production is high from March to May due to calving, and low in the fall (Figure 7). However, the demand is low in the spring and relatively high in September due to the beginning of school. Demand is also high for dairy products during the Thanksgiving and Christmas holidays (Stephenson 2010). The fluid milk monthly sales are shown in Figure 15. The demand increases after July, but the supply decreases in May (Figure 7). Opposition seasonality of the production and consumption leads to the conventional milk surplus in the spring and shortage in the fall. In response to the supply and demand change, price fluctuations month to month, relatively high in the fall and low in the

spring. Organic milk production and demand have the same seasonality as the conventional milk, but the organic milk processors have another outlet, conventional market. Relative to conventional milk, the demand of organic milk is more price elastic.

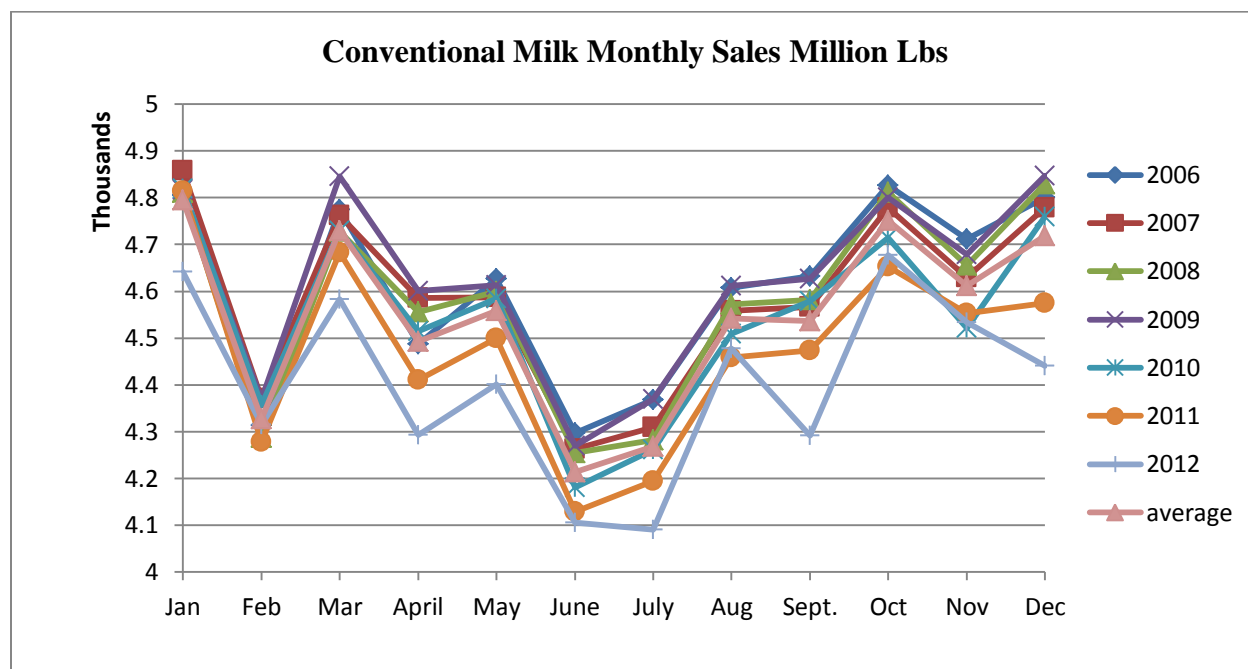


Figure 15. Conventional Milk Monthly Sales from 2006 to 2011

Studies show that consumers are willing to pay an extra premium for the organic milk due to health concern, environment concern and other reasons. Therefore, the demand of the organic milk increases annually. Monthly sales of organic milk increased in most time from 2007 to 2012, except 9 months in 2009-2010, and 4 months in 2012 as shown in Figure 16 and Figure 17. However, the conventional milk sales only increased in early 2007, late 2008 and 2009, 22 of 72 months, but decreased at other times, especially in the year 2011.

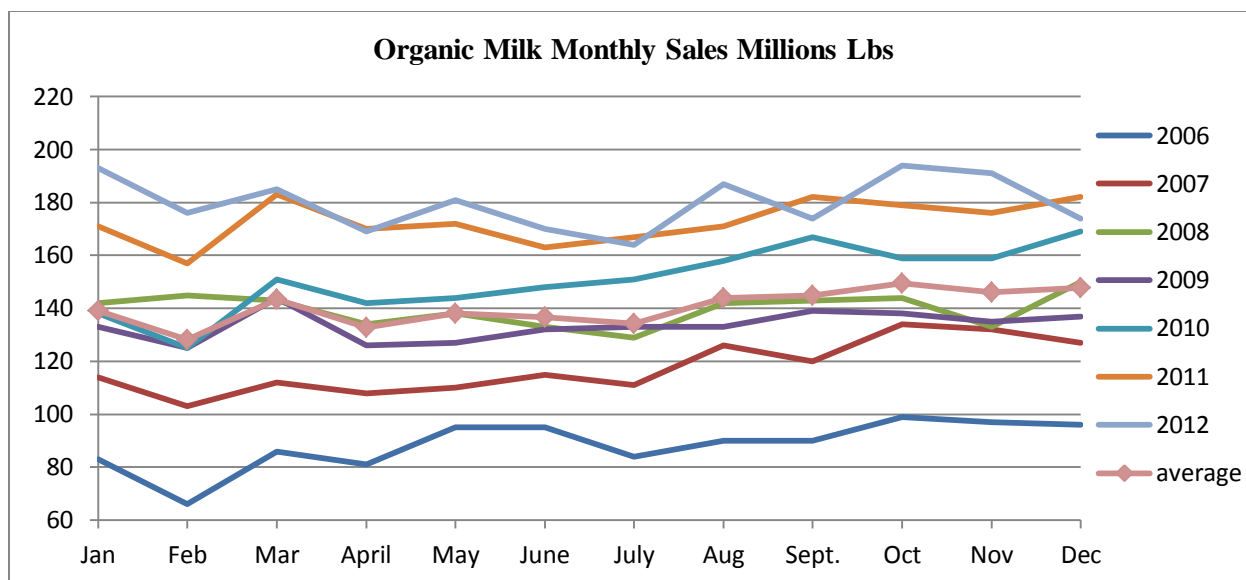


Figure 16. Organic milk monthly sales from 2006 to 2011 (data from AMS)

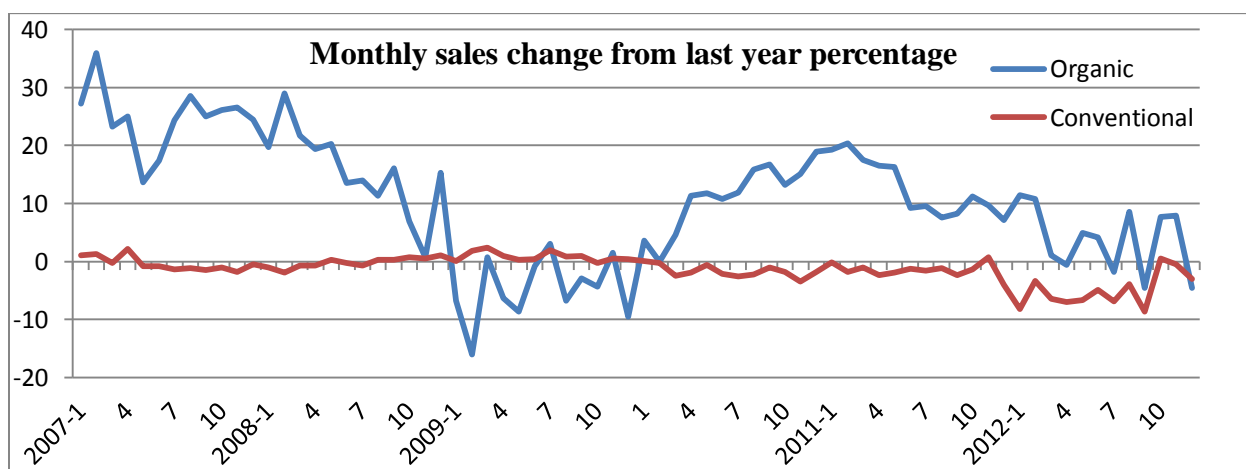


Figure 17. Organic and conventional milk monthly sales change from previous year from 2007 to 2012 (data from ERS)

The National Organic Program was enforced in October 2002. The program requires a three-year transition period from conventional dairy to the organic operation. This new requirement affects the number of certified organic dairy cows. The increased rate of the total certified organic milk cows decreased from 2002 to 2005 after the program was enforced (Figure 18). Since 2005, the certified number increased dramatically and the number flattened from 2008 to 2011. There is no data for 2009-2010. Since hormone cannot be used for the organic milk cow, the yield of the organic milk cow is about 70% of the conventional milk cow (Krieg 2007). Due to the high price of feed costs from late 2011, organic dairy farmers feed less grain to their cows.

Total production of organic milk is under shortage, which leads the retail price of organic fluid milk increases. Theoretically, since the farm price of organic milk is stable, the total milk supply should be less responsible than the supply of the conventional milk. The National Organic Program keeps adding new regulations to the program, such as the pasture rules in 2010. All these new regulation can affect the supply of the milk.

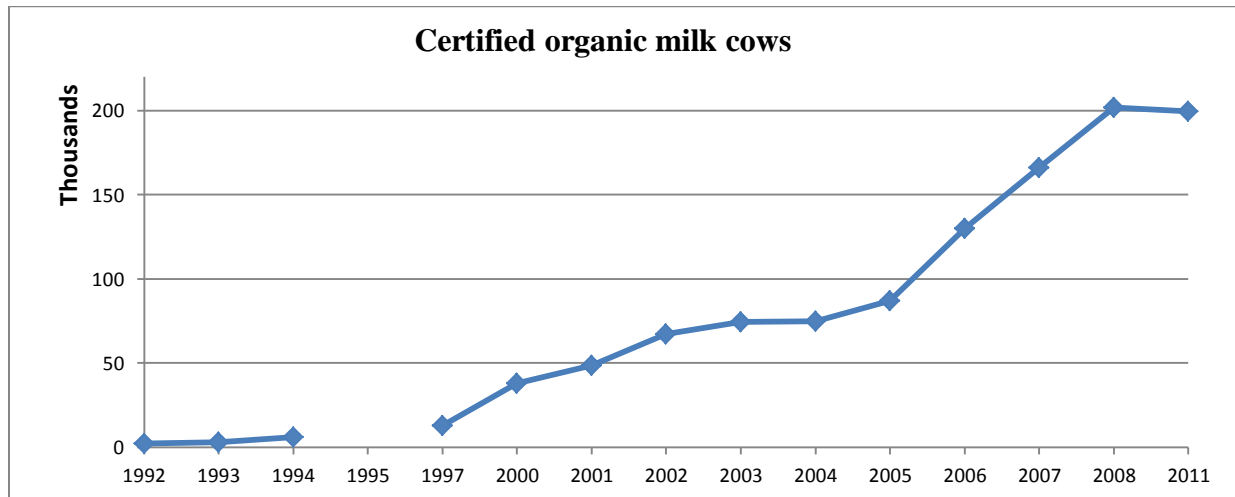


Figure 18. Number of Certified Organic Milk Cow (data from NASS), no data for 1995, 2009 and 2010

## 6 Competitive yardstick effect of Organic Valley Cooperative in the organic farm milk price

### 6.1 Duopsony market structure (imperfect competition)

One of the key characteristics of the competitive markets is many sellers and many buyers (Sexton and Iskow 1988; Sexton 2012). There are only two national organic milk buyers, one large private label processor, and about 50 small regional and local processors in the country. In some areas, there is only a single buyer, so the farmers have no choice to choose the buyer. Producers of commodities such as milk and vegetables are considered as price takers (Sexton 1990). In these areas, the buyer has the monopsonistic or oligopsonistic power.

The two national buyers are Organic Valley and Horizon Organic. Organic Valley is a cooperative owned by farmer members, and Horizon Organic is owned by WhiteWave. The two major players, they are a duopsony and price setters in both the raw milk and retail fluid milk markets. Organic Valley and Horizon Organic together control about 84% of the organic milk supply<sup>25</sup>. Bolotova and Novakovi (Bolotova and Novakovic 2012) found that the profit margin in

<sup>25</sup> We calculated based on the data from two processors and NASS data.

more concentrated market is higher. This is true for the organic milk industry. The average retail price of national brands was 46 cents higher than the average of private brands in 2012<sup>26</sup>.

Price-cost margin is one of the measurements for market power (Rogers and Petraglia 1994). Here we use the retail to farm price spread as a proxy for the margin. Table 2 and Table 3 show that the profit margin (difference between the retail price and farm price) and the ratio of farm price to retail price of organic and conventional fluid milk. The margin for the conventional milk is 1-1.5 dollars 2004-2012, while the margin for the organic milk is 2.5-3.5 dollars, which is much higher than the conventional milk margin. Smith and Huang et al (Smith, Huang et al. 2009) found that the organic milk retail price premium was about 60-109% over conventional milk with 2006 Nielsen Homescan panel data. We find the premium of retail price of organic fluid milk is 46-136% in 2004-2012 with USDA Agricultural Market Service (AMS) data. Overall, both the organic milk and conventional milk retail margin are relatively stable. The conventional dairy farmers get about 30-40% consumer dollars, and the organic dairy farmers get 20-30% of the consumer dollars (Table 3).

Table 2. Average Annual Profit Margin of Organic and Conventional Fluid Milk

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Conventional</b>	1.28	1.34	1.36	1.33	1.47	1.34	1.24	1.27	1.30
<b>SD of Con</b>	0.13	0.01	0.04	0.05	0.04	0.16	0.04	0.06	0.07
<b>Organic</b>	2.43	3.32	3.31	3.47	2.75	2.75	2.67	2.67	2.64
<b>SD of Org</b>	0.03	0.19	0.07	0.15	0.03	0.07	0.06	0.09	0.17

SD: standard deviation; Con: conventional milk; Org: Organic milk

Table 3. Farm Price to Retail Price Ratio of Organic and Conventional Milk (%)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
<b>Conventional</b>	35.21	32.73	28.94	38.03	34.87	29.36	36.07	40.49	38.07
<b>SD Of Con</b>	3.75	0.81	2.05	3.55	2.08	4.70	2.52	1.99	3.85
<b>Organic</b>	24.97	20.62	22.48	21.69	27.73	27.36	27.81	28.83	30.68
<b>SD Of Org</b>	0.69	0.60	0.59	0.77	0.40	1.33	1.38	1.94	1.83

SD: standard deviation; Con: conventional milk; Org: Organic milk

Sexton and Iskow (Sexton and Iskow 1988) argue that only cooperatives who control significant market share can control the retail price to get extra margin. Organic Valley manages their supply according to market demand. The cooperative only signs up members when there is an increase of demand. It also keeps a reserve pool of nonmembers in the case of inadequate member supply. It also buys from Dairy Market Service in the Northeast<sup>27</sup>. In 2009, when the

<sup>26</sup> Calculation based on data AMS Biweekly National Dairy Retail Report, <http://www.ams.usda.gov/AMSV1.0/ams.fetchTemplateData.do?startIndex=1&template=TemplateW&navID=MarketNewsAndTransportationData&leftNav=MarketNewsAndTransportationData&page=DairyRetailPrintedReports>

<sup>27</sup> Organic milk, <http://www.dairymarketingservices.com/organicmilk.html>

economy was in recession, organic milk demand decreased. Organic Valley reduced each member's supply by 7% to maintain their farm price and wholesale price. The members who did not reduce their production received a lower weighted price because they had to sell their extra milk into the conventional market. At the end of the year, the cooperative made the expected profit and shared the profit with the members<sup>28</sup>. Though the farmers signed contracts with the Horizon Organic, they voluntarily reduced their milk production by 5%. Consequently, Horizon was also able to keep all contractees. Both the milk buyers have the ability to control their milk supply.

## **6.2 Competitive yardstick effect of the CROPP cooperative**

According to Edwin Nourse, cooperatives serve as a competitive yardstick in the performance of the market. The existence of the cooperatives makes the imperfect market competitive and the other players in the market honest. One of the major functions provided by the cooperatives is to pay fair price for farm output. The basic concept of the theory is that the cooperative needs to control a modest share of the market to keep the market competitive (Schomisch 1979).

Azzam and Andersson (Azzam and Andersson 2008) tested the market power and efficiency effects of the market concentration with mixed organization forms, cooperatives and private firms (IOF) in Sweden beef slaughter market. They found that there is a market power effect of both IOFs and the coops. Their results show that 10% increase of the coop concentration contributes to 9.5% increase of the wholesale beef price, and 10% rise of market concentration from IOFs and cooperatives together is only 8.6%. They also found that the IOFs are price-takers in the industry. The cooperative market share is about 79-81% in the Sweden.

Hanisch et al (Hanisch, Rommel et al. 2012) studies the farm milk price in Europe and found that the higher the market share of the cooperatives, the higher the milk farm price. They found that the dairy industry controlled entirely by the cooperatives could pay 3.60 Euros per 100 kg milk more than the market while only 10% of the market was controlled by the cooperatives. They also found that the cooperatives served as price leaders, and the investor owned firm were price followers. The reasons that the farmers prefer cooperatives and maintain loyalty to their cooperatives is that cooperatives provide incentive programs such as service, patronage refunds and industry information. In addition, dairy industries are dominated by the cooperatives in Europe and U.S to avoid the holdup by the opportunistic buyers due to the temporal and site asset specificity of the milk. Under the instability of the market, the farmers feel safer under their cooperatives umbrella. Cooperatives with higher market share can offer fair price to their members.

---

<sup>28</sup> [http://www.organicvalley.coop/fileadmin/pdf/CROPP\\_Annual\\_Report\\_09.pdf](http://www.organicvalley.coop/fileadmin/pdf/CROPP_Annual_Report_09.pdf)



Among organic dairy farmers, about 50% of the entire organic milk producers sell their products to the Organic Valley and about 25% contract with Horizon Organic<sup>29</sup> with one to three years. Though Organic Valley is a closed membership cooperative, the cooperative is looking for new members every year since it was founded to explore the economy of scale and more market share. The members grew from seven to more than 1500 in 25 years. Therefore, farmers can switch from Horizon Organic to Organic Valley easily. Right now, both of these two buyers are looking for producers (Northeast Organic Dairy Producer Alliance 2013). About 83% of conventional milk is handled through cooperatives. Therefore, the farmers have the preference to market their milk through the cooperatives. In addition, organic dairy needs extra paper work, third party certification, specific pasture and animal management, and extra fees to maintain the certification. Physical asset specificity, human capital asset specificity, and the temporal specificity of the milk make dairy farmers vulnerable to opportunistic behavior, especially in monopsonist or oligopsonist market. Consequently, milk producers have an incentive to vertically integrate. They feel an extra protection for them through their cooperatives.

Sexton (Sexton 1990) examined the role of cooperatives in oligopsonistic agricultural market with spatial model. He found that the cooperatives with an open membership policy have positive effects on the private firm behavior, and therefore benefit the farmers. The presence of the cooperatives forces the private firms to pay higher prices than otherwise. In the duopsony market with one cooperative and one investor owned firm (IOF), the IOF has to pay the same price as the cooperative. Otherwise, the farmers will join the cooperative for a better price (Nourse 1992).

Organic Valley has enough farmer members to affect the market and set the farm price. In order to compete for the farmers with the Organic Valley, Horizon Organic has to provide similar or better price. Otherwise, the farmers have the potential to switch to Organic Valley from Horizon. Organic Valley provides stable pay price, and the price is set by the farmers. As Hanisch et al (Hanisch, Rommel et al. 2012) and Azzam et al (Azzam and Andersson 2008) argued, the cooperatives are the price leader and the investor owned firms are price followers. This is the case in the organic milk industry in the U.S. Horizon and Organic Valley almost pays the same price for their farmers in the northeast.

Therefore, we hypothesize that the competitive yardstick effect of the Organic Valley Cooperative is an important factor for the stable pay price to organic milk producers.

## **7 Policy implications**

The recent financial crisis and high feed price because of the increase of corn demand has caused financial problems for many farmers, both organic and conventional farmers. However, farmers who can provide the majority of feed or pasture-based dairy farmers survived. The

---

<sup>29</sup> Our calculation based on data of CROPP and NASS.

National Organic Program requires that at least 30% dry mass is from the grass for the dairy cows, and at least 120 days access to the pasture. Organic dairy farmers have the land for their dairy cows, and have expertise to manage pastures. From the policy side, the government should encourage organic dairy farmers to go further down and provide more dry mass from the pasture. Some of the organic dairy farmers are 100% pasture, and only provide the cows with limited feed under extreme weather. Though these cows produce less milk than the cows with feed, the overall profitability is higher (McCrory, Parsons et al. 2013). Some of the farmers who produce part of the feed also survived through the tough economy. Case studies performed by the scholars of the University of Vermont found that the farmer transmitted from conventional dairy to organic operation financially was better off (Milford 2004; McCrory and Parsons 2013). These farmers were benefited from land management, pasture-feeding system, help from the university extension, and the government (USDA) cost-share program. There is a need for the policy to encourage the farmers to adopt new farming techniques and provide financial and technique supports for the transition and make them self-sufficient.

## 8 Reference

- Alviola, P. A. and O. Capps (2010). "Household demand analysis of organic and conventional fluid milk in the United States based on the 2004 Nielsen Homescan panel." Agribusiness **26**(3): 369-388.
- Ashbridge, I. (2006). "Growth in organic milk demand prompts a need for more herds." Farmers Weekly **144**(4): 24-24.
- Ashbridge, I. (2006). "Increasing demand for organic milk is welcome lift for suppliers." Farmers Weekly **144**(16): 27.
- Azzam, A. and H. Andersson (2008). "Measuring Price Effects of Concentration in Mixed Oligopoly: An Application to the Swedish Beef-slaughter Industry." Journal of Industry, Competition and Trade **8**(1): 21-31.
- Bailey, K. (2005). Factors That Affect U.S. Farm-Gate Milk Prices. The Pennsylvania State University, Information and Communication Technologies in the College of Agricultural Sciences.
- Bolotova, Y. V. and A. M. Novakovic (2012). "The Impact of the New York State Milk Price Gouging Law on the Price Transmission Process and Supermarket Pricing Strategies in the Fluid Whole Milk Market." Agribusiness **28**(4): 377-399.
- Butler, L. J. (2002). "The economics of organic milk production in California: A comparison with conventional costs." American journal of alternative agriculture **17**(2): 83-91.
- Dimitri, C. and K. M. Venezia (2007). Retail and Consumer Aspects of the Organic Milk Market. Farmers Weekly (2006). "Organic demand." Farmers Weekly **144**(10): 51-51.
- Gilbert, C. L. and W. Morgan (2011). Food Price Volatility. Methods to analyse agricultural commodity price volatility. I. Piot-Lepetit and R. M'Barek. New York, Springer: 45-61.
- Hanisch, M., J. Rommel, et al. (2012). Variation in Farm Gate Milk Prices and the Cooperative Yardstick Revisited – Panel Evidence from the European Dairy Sectors. Vortrag anlässlich der 52. Jahrestagung der GEWISOLA, Herausforderungen des globalen Wandels für Agrarentwicklung und Welternährung Hohenheim, 26.09. – 28.09.2012.
- Keating, G. (2002). "WHAT FUTURE FOR ORGANIC MILK?" Organic Farming(75): 35.

- Krieg, T. (2007). Summary of Economic Studies of Organic Dairy Farming in Wisconsin (Seven Years), New England, and Quebec, Center for Dairy Profitability, College of Agricultural and Life Sciences and Cooperative Extension, University of Wisconsin – Madison.
- McCrary, L. and R. Parsons (2013). Transition to Organic Dairy Case Study: Franklin Family Farm (Guilford, Vermont), Extension.org
- McCrary, L. and R. Parsons (2013). Transition to Organic Dairy Case Study: Hall and Breen Farm LLC (OrWell, Vermont), Extension.org
- McCrary, L., R. Parsons, et al. (2013). Transition to Organic Dairy Case Study: Fournier Farm (Swanton, Vermont), Extension.org
- Milford, A. (2004). Coffee, Cooperatives and Competition: The Impact of Fair Trade, Chr. Michelsen Institute.
- NODPA. (2011). "Pay Price & Organic Milk Market in March 2011." Retrieved 11/07, 2011, from [http://www.nodpa.com/payprice\\_update\\_031411.shtml](http://www.nodpa.com/payprice_update_031411.shtml).
- Northeast Organic Dairy Producer Alliance (2013). Organic Milk Sought. NODPA News. [http://www.nodpa.com/january2013\\_final\\_low\\_res2.pdf](http://www.nodpa.com/january2013_final_low_res2.pdf). **January 2013**.
- Nourse, E. G. (1992). "The place of the cooperative in our national economy." American cooperation 7: 104-118.
- Novakovic, A. M., C. Nicholson, et al. (2011). "Price Volatility in US Dairy Markets." from [http://www.fsa.usda.gov/Internet/FSA\\_File/8\\_andy\\_price\\_volat\\_diac\\_jun.pdf](http://www.fsa.usda.gov/Internet/FSA_File/8_andy_price_volat_diac_jun.pdf).
- O'Conner, D., M. Keane, et al. "Measuring Volatility in Dairy Commodity Prices."
- Organic Trade Association. (2012). "Consumer-driven U.S. organic market surpasses \$31 billion in 2011." from [http://www.organicnewsroom.com/2012/04/us\\_consumerdriven\\_organic\\_mark.html](http://www.organicnewsroom.com/2012/04/us_consumerdriven_organic_mark.html).
- Rogers, R. T. and L. M. Petraglia (1994). "Agricultural cooperatives and market performance in food marketing." American cooperation: 261-282.
- Romain, R., M. Frigon, et al. (2002). "Effects of state regulations on marketing margins and price transmission asymmetry: evidence from the New York City and upstate New York fluid milk markets." Agribusiness : an international journal 18(3): 301-315.
- Schomisch, T. P. (1979). Edwin G. Nourse and the competitive yardstick school of thought / by Thomas P. Schomisch. UCC occasional papers ; no. 2, Madison, Wis. : University Center for Cooperatives, University of Wisconsin--Extension, [1979].
- Sexton, R. J. (1990). "Imperfect Competition in Agricultural Markets and the Role of Cooperatives: A Spatial Analysis." American Journal of Agricultural Economics 72(3): 709-720.
- Sexton, R. J. (2012). "Market Power, Misconceptions, and Modern Agricultural Markets." American Journal of Agricultural Economics.
- Sexton, R. J. and J. Iskow (1988). Factors Critical to the Success or Failure of Emerging Agricultural Cooperatives, Giannini Foundation Information Series No. 88-3.
- Smith, T. A., C. L. Huang, et al. (2009). "Estimating organic premiums in the US fluid milk market." Renewable Agriculture & Food Systems 24(3): 197-204.
- Stephenson, M. (2010). Milk price volatility today, NC State University A&T State University Cooperative Extension.
- Stewart, H. and D. P. Blayney (2011). "Retail Dairy Prices Fluctuate with the Farm Value of Milk." Agricultural and Resource Economics Review 40(2): 201-217.

- Tothova, M. (2011). Main Challenges of Price Volatility in Agricultural Commodity Markets. Methods to analyse agricultural commodity price volatility. I. Piot-Lepetit and R. M'Barek. New York, Springer: 45-61.
- Vanbaale, M. J. (2004). An Overview of Factors determining how milk is priced at the farm. The university of arizona cooperative extension