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Fluid Milk Prices and Price Spreads

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Considerable attention has recently been focused on retail fluid milk prices, especially in Northeastern markets. Based on alleged evidence of "unconscionable" farm-to-retail price spreads for fluid milk, some New England states are considering legislation to constrain the resale prices of retail food chains and other milk retailers. The state of New York has had a milk price "gouging" law in place since 1991 that limits retail milk prices to 200 percent of applicable processor costs for at least one brand carried by stores.

Assessing the "fairness" of marketing margins is a difficult task. There are unavoidable costs in selling milk. Some, like processing, delivery, stocking shelves, ordering, pulling out of date milk, and general store overhead are obvious. Others, like advertising, coupon redemption, brand promotion, product development, etc. are not. All of these costs vary among cities and among stores within cities, so there is no reason to expect margins to be the same across outlets even if markets were competitive.

But markets may not be competitive. Market power may be exercised in both milk processing and retailing. Some fluid milk processors are able to extract premiums because their products are perceived as superior. Other processors sell their milk under store labels or position themselves as low-cost distributors. Some retail grocery stores are the only show in town, or may engage in tacit collusion with other larger retailers to maintain large retail margins on their milk sales. In other markets, retailers compete vigorously with each other, keeping retail margins low.

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This paper reviews farm-to-retail price spreads for fluid milk using data that are routinely collected by Federal milk marketing order Market Administrator offices of USDA's Agricultural Marketing Service (AMS) – Dairy Programs. Three aspects of fluid milk price spreads are analyzed: an inter-market comparison of the relationship between retail prices and the cost of milk to fluid processors as measured by announced cooperative Class I prices; a comparison over time and across markets of the sensitivity of retail milk prices to changes in processor milk costs; and an inter-market comparison of the relationship between retail prices for whole milk and reduced-fat (2-percent) milk.

About the Data

Two AMS — Dairy Programs data series are used in this analysis. One is a monthly retail milk price series for selected U.S. cities. The "selected cities" retail price series includes monthly prices for whole milk and 2-percent milk in gallon containers for 32 cities (2001-2003).[2] Prices are collected from three retail outlets on one non-weekend (Friday-Sunday) day between the first and the tenth of the month. The three outlets are the largest retail food chain in the metropolitan area, the second largest food chain, and the largest convenience store chain. The same store within these chains is surveyed each month. The price information is physically collected by Federal order Market Administrator staff. Prices are for the most common brand of fluid milk as measured by shelf space, and the most common brand may be a store brand. Prices do not include special sales, coupon redemptions, or tie-in sales (e.g., get 50 cents off a gallon of milk with the purchase of a box of cereal).

AMS notes the following about its selected cities series:

> "The "selected cities" retail price information collected by MA's (ed. note, *Market Administrators*) has been helpful in answering congressional and other inquires concerning retail prices. It has been a valuable complement to information reported by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor. When using the "selected cities" data series, it is important to remember that for a particular city these prices are believed to be reflective of price level and change over time. However, in making city-to-city comparisons using this data series, it is important to remember that price differences may be affected by brand market share and retail pricing policy variations."[3]

[2] The series is restricted to cities served by regulated federal order distributing plants. Consequently, it does not include any California cities.

[3] Rourke, John P. and Mary F. Taylor, ***Retail Milk Prices Reported by Market Administrators: 1997-2000 Summary and Comparison***, Dairy Programs, Agricultural Marketing Service, U.S. Department of Agriculture, May 2001.

The selected cities series is not designed for sophisticated research purposes and has flaws that are recognized by AMS. Most important, the series is not purported to represent weighted average city prices for milk, and may reflect pricing peculiarities associated with the limited number of outlets and brands surveyed. There are better sources of information on the scope of prices within a city available through purveyors of scanner information.

But while more comprehensive, scanner information is very expensive and has its own flaws. Obtaining scanner data for whole milk in 32 cities would be cost-prohibitive. Some retail outlets do not provide scanner data. And restrictions imposed by purveyors on what may be disseminated from scanner data limits its usefulness.

So, while imperfect, the selected cites series data has some distinct advantages in comparing retail milk prices across cities and over time. Most important, the data set is consistent in terms of the cities included and the methods employed in collecting the data.

The second AMS data series used in this analysis is cooperative over-order prices, the announced cooperative Class I price series. AMS reports monthly prices charged to fluid milk distributors by dairy cooperatives and cooperative bargaining federations. AMS describes these data as follows:

> "The cooperative price represents Class I prices announced for the beginning of the month by cooperative associations in various city markets. The information relates to the major cooperative in each of the city markets and does not apply to all of the Class I sales in these city markets. These data are common market knowledge in the sense that the information represents basic Class I price announcements by the cooperative sent to all handlers who buy milk from them. These announced over-order prices represent charges for various services performed by the cooperative. Announced prices may not include handling or service charges applicable to milk from supply plants. In some instances, the announced over-order prices are not uniform in that competitive credits may be allowed. These prices have not been verified as having been actually paid by handlers."[4]

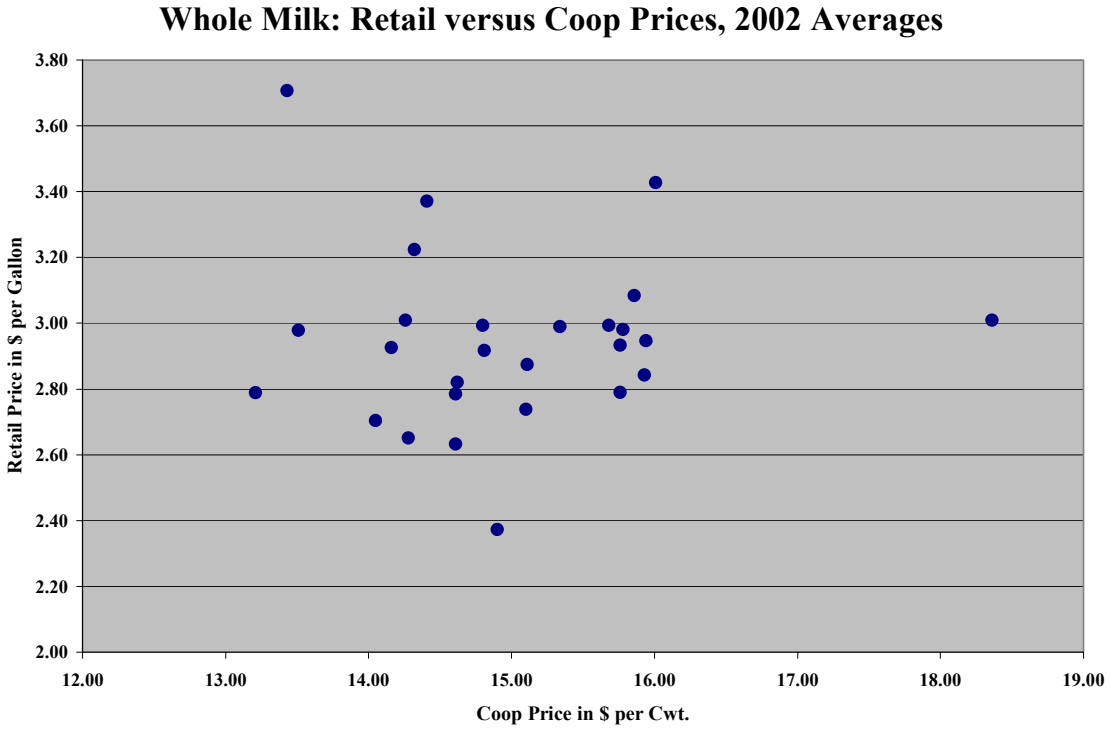
The cooperative prices are not an inclusive measure of the cost of milk to fluid plants because some fluid handlers procure milk directly from producers. And as noted by AMS, the prices quoted may not apply to all or even a majority of sales by the cooperative federations. Moreover, the raw milk cost to processors depends on the butterfat content of the finished product. Nevertheless, announced cooperative prices are a reasonable proxy for the cost of raw product to fluid milk bottlers, and certainly better

[4] Footnote to Table 31 in ***Dairy Market Statistics, 2002 Annual Summary***, Agricultural Marketing Service, U.S. Department of Agriculture, April 2003.

in that regard than announced federal order Class I prices. Plus the AMS announced cooperative Class I price series includes most of the same cities as their selected cities retail price series. Consequently, the two series can be used together to estimate the spread between processor costs and retail sales prices.

Do retail milk prices mirror milk costs across cities?

To address this question, matched cities from the selected cities retail milk price series and the announced cooperative Class I price series were used to compare average annual prices and costs for the years 1997-2002. The scatter plot indicating the relationship between retail whole milk prices and announced cooperative prices for 2002 is shown below. The same pattern is observed in other years.

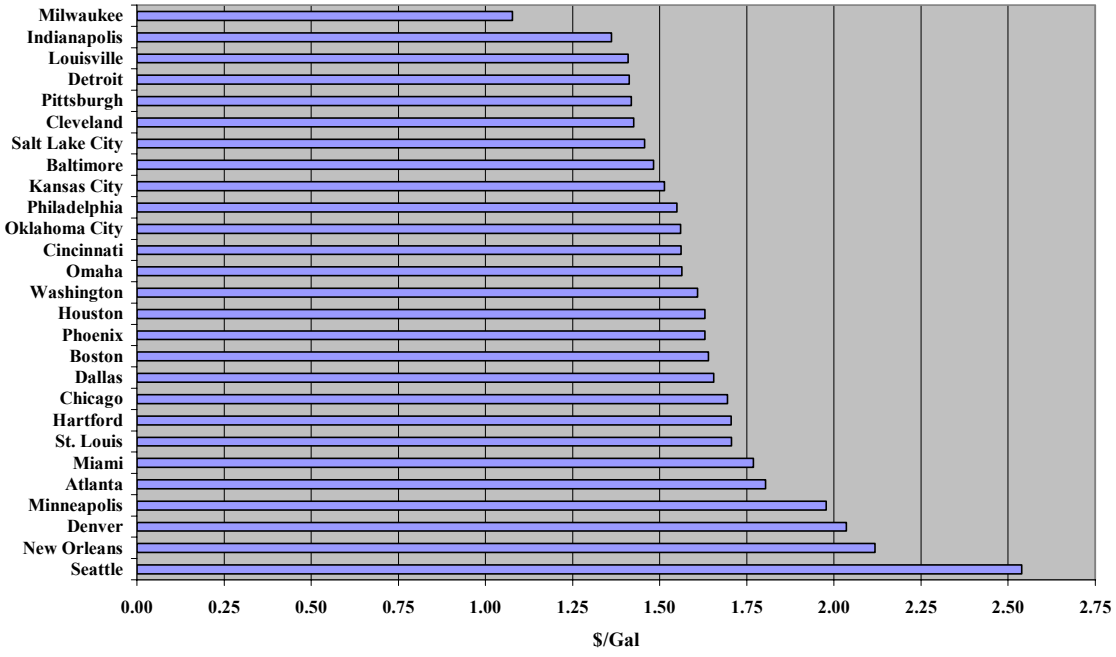


This chart suggests that raw milk costs, at least as measured by cooperative prices, are irrelevant in explaining differences in retail prices for whole milk. The highest retail price in 2002 was observed in a market (Seattle) with the second lowest raw milk cost. The highest raw milk cost was in Miami, where the retail price was just slightly above the all-city average. The lowest retail price was in Milwaukee, which had a cooperative price about equal to the all-city average. The lowest raw milk cost was in Salt Lake City, where the retail whole milk price was just slightly below the all-city average. The simple regression of retail prices against cooperative prices yields an R^2 value of 0.00.

This surprising lack of any correlation between retail whole milk prices and processor costs among cites is attributable to highly variable retail price-processor cost spreads. These spreads are shown in the chart below, where cooperative prices per hundredweight have been converted to prices per gallon by assuming 11.5 gallons per hundredweight.

Note that most of the spreads fall in a narrow band between $1.25 and $1.75 per gallon. The single exception on the low side is Milwaukee ($1.08). Minneapolis, Denver, New Orleans, and Seattle stand out on the high side, with spreads ranging from $1.98 to $2.54.

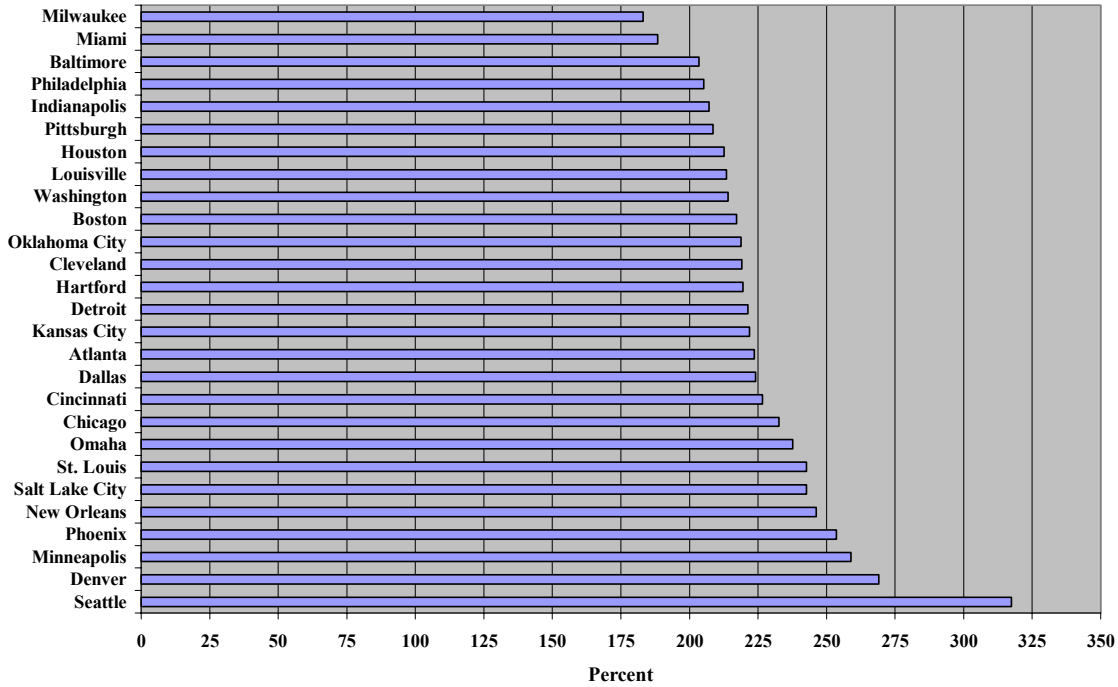
Marketing Margins for Whole Milk in 2002:
Retail Price minus Coop Price



Expressing retail prices as a percent of processor milk costs shows a slightly different pattern. For 15 of the 27 paired cities, the retail whole milk price as a percent of the cooperative price is in a narrow band between 200 and 225 percent. For six other cities, the percentage is between 225 and 250. Miami joins Milwaukee as having relatively low price spreads when measured in this fashion. Again, Seattle stands out on the high side, with the average annual retail whole milk price 317 percent of the cooperative price per gallon. The comparable percentages in Phoenix, Minneapolis and Denver exceed 250 percent.

Note that these percentages do not represent the percent markup by retailers of milk; they include processor/distributor margins as well as retailer margins. It is also important to stress that the announced cooperative Class I prices may not represent milk costs to processors supplying milk to stores in the cities if the processors are located elsewhere.

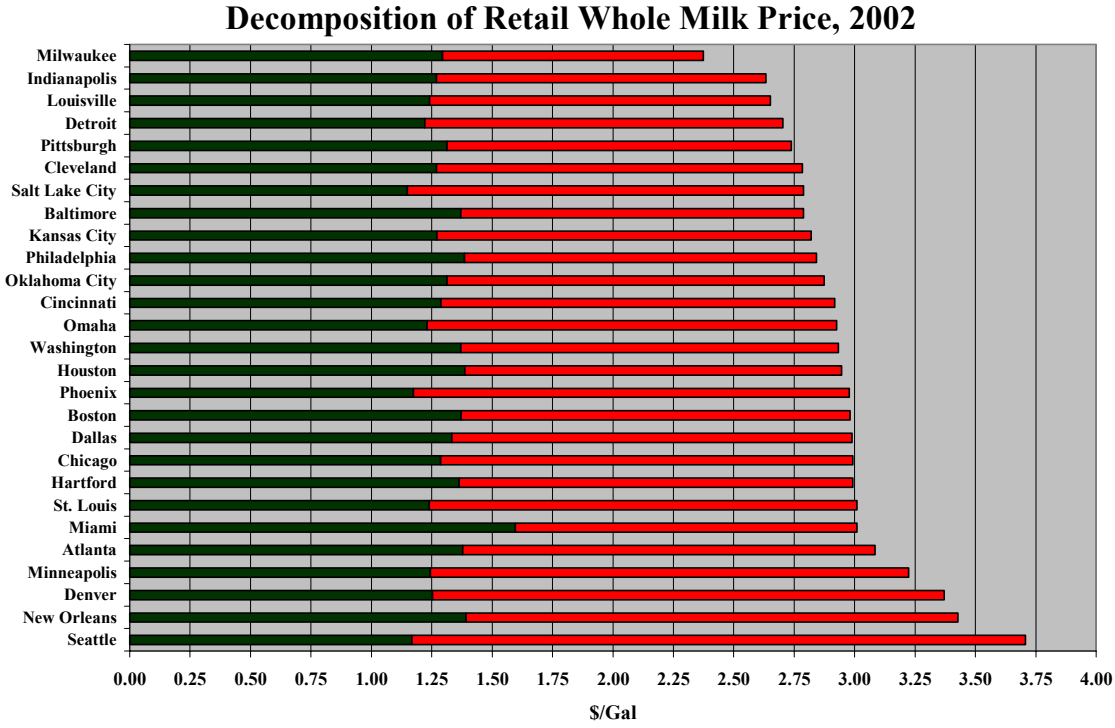
Retail Whole Milk price as a Percent of Processor Milk Cost, 2002



A third way of looking at the relationship between retail milk prices and processor costs is to decompose the retail price into its component parts — the cost of milk to processors and the difference between the retail price and the cost of milk.

This decomposition is illustrated below. It confirms the pattern shown in the scatter chart in demonstrating the lack of correlation between cooperative prices and retail prices. Relatively low retail milk prices in markets with high cooperative prices are about as common as relatively high retail milk prices in markets with low cooperative prices.

A brief summary of this analysis is that, across the range of cities included, retail milk prices bear little apparent relationship to the cost of milk to fluid milk processors. Because of large variability in price-cost spreads, it is not possible to accurately predict the retail price for a city based solely on the cost of milk to processors supplying fluid milk to stores in that city. Whether the variation in spreads is due to variation in handler margins or retailer margins cannot be determined from this simple analysis.



Do retail milk prices change with changes in the cost of milk to processors?

The inter-market comparison looks at average prices for a single year and focuses on the level of margins. A different question is how markets differ with respect to the sensitivity of retail milk prices to milk costs over time irrespective of the margin.

To address this question, monthly retail whole milk prices were compared with monthly announced Class I cooperative prices for the 79-month period January 1997-July 2003. This analysis was limited to the 26 cities common to both the selected cities series and the announced cooperative Class I price series over the entire time period.

The strength of the relationship between monthly retail whole milk prices and cooperative prices was tested by regressing city retail prices against cooperative prices for each paired city. This logically assumes causality between the cost of milk to fluid milk processors and retail prices — in other words, retail prices are assumed to change in response to changes in processor milk costs.

The results of these paired regressions are shown in the table below. The cities are ordered according to the magnitude of the regression slope coefficients, which are defined as the estimated change in the retail whole milk price associated with a one unit change in the announced cooperative Class I price. For example, the coefficient for Milwaukee (0.39) indicates that, on average, a month-to-month increase in the cooperative Class I price of 10 cents per gallon ($1.15 per hundredweight) results in an

increase in the retail whole milk price for Milwaukee of 3.9 cents per gallon. The t-value in the third column of the table is an indicator of the precision of the coefficient estimate, that is, how confidently one can state that the coefficient value is different from zero. T-values less than about 2.00 indicate that the coefficient is not statistically different from zero at the 95 percent level of significance — i.e., there is no relationship between retail and coop prices.

City	***Regression Slope Coefficient***	***t-value***
Phoenix	-0.22	-1.32*
Cincinnati	-0.10	-0.26*
Seattle	-0.08	-0.44*
Hartford	-0.08	-0.58*
Louisville	-0.04	-0.22*
Boston,	-0.03	-0.21*
Cleveland	-0.01	-0.14*
Houston	0.11	0.64*
Atlanta,	0.17	0.96*
Minneapolis	0.18	1.83*
Detroit	0.32	2.21
Miami	0.33	5.74
Salt Lake City	0.34	2.70
St. Louis	0.34	3.44
New Orleans	0.37	1.46*
Baltimore	0.38	5.38
Milwaukee	0.39	4.81
Washington, DC	0.42	3.77
Omaha	0.50	3.86
Kansas City	0.54	6.35
Oklahoma City	0.60	4.58
Chicago	0.60	4.09
Philadelphia	0.62	5.78
Denver	0.72	4.92
Dallas	0.76	4.95
Pittsburgh	0.92	16.10

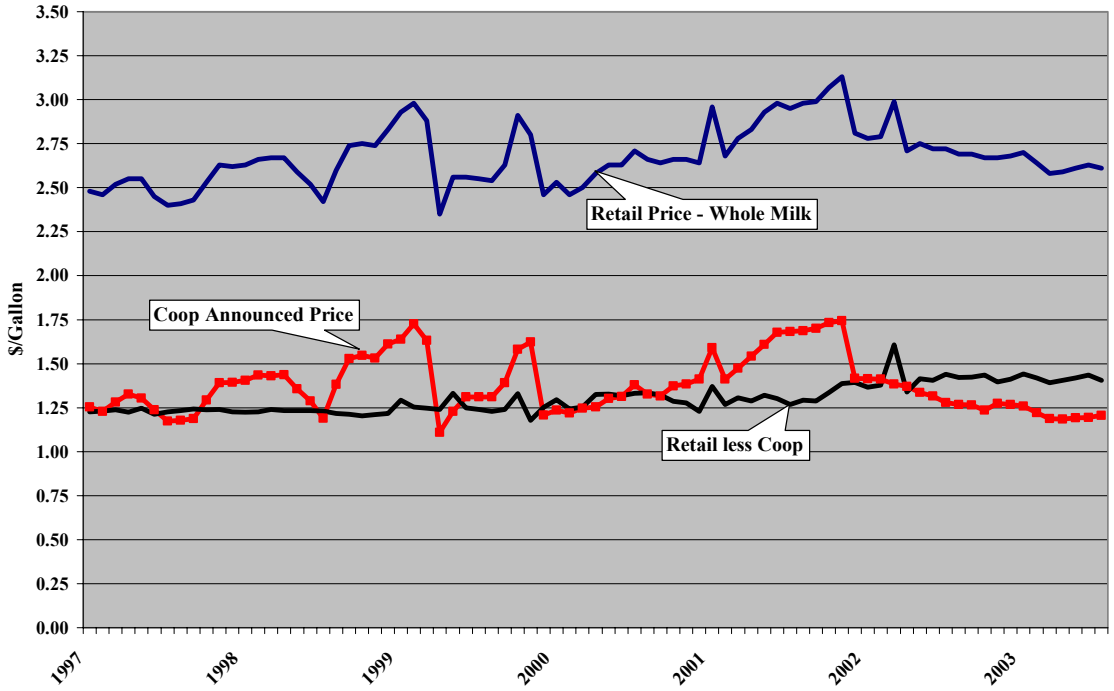
*Coefficient not significantly different from zero at 95% level of confidence

The relationship between retail whole milk prices and the cooperative Class I prices varies across the 26 markets. In 11 markets, the relationship is not statistically significant as indicated by the t-value associated with the regression coefficient. In other words, retail prices are not responsive to changes in the cooperative price in 11 of the 26 markets.

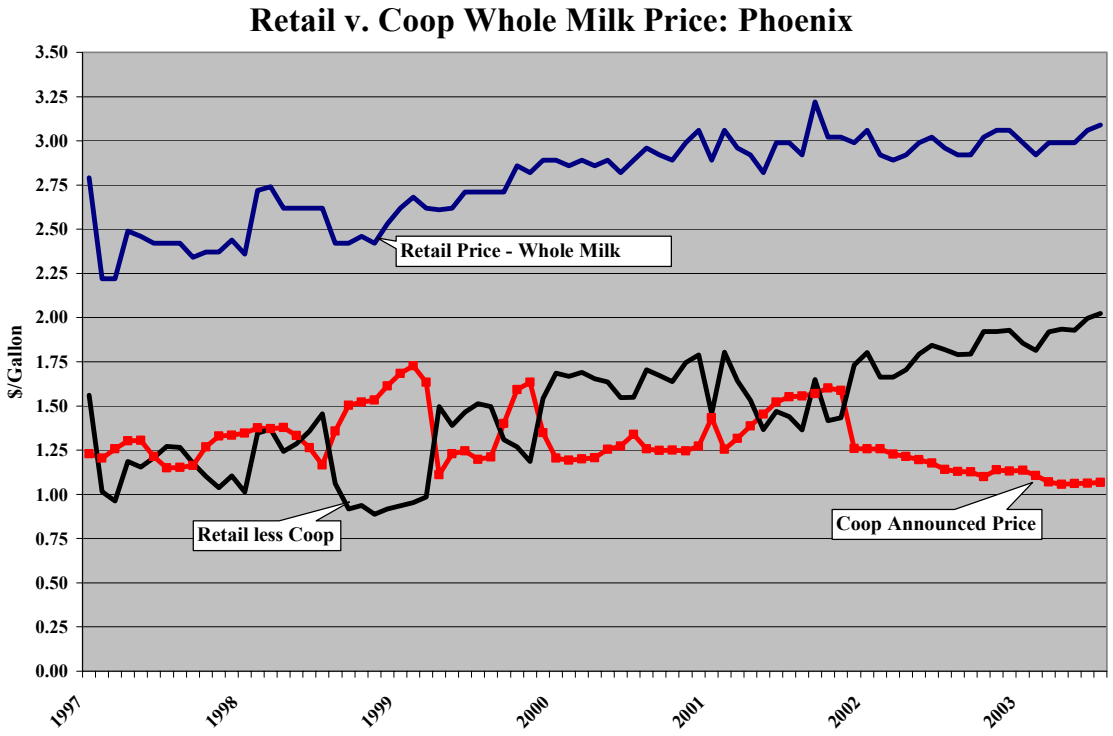
In the remaining 15 markets, the hypothesis that changes in the cooperative price "cause" changes in retail prices is not rejected. The change in retail price associated with a 10 cents per gallon change in the cooperative price ranges from 3.2 cents per gallon in Detroit to 9.2 cents per gallon in Pittsburgh.

Extremes in terms of the sensitivity of retail whole milk prices to changes in the cooperative Class I price are illustrated below. The Pittsburgh retail price moves practically in lock-step with the cooperative price over the entire 79-month period. The overall margin between the two price series is nearly constant at about $1.25 per gallon from 1997 through 2001, rising to about $1.40 since then.

Retail v. Coop Whole Milk Price: Pittsburgh



The retail price in Phoenix appears to be independent of the cooperative price, rising steadily throughout most of the period. With low and gradually falling cooperative Class I prices between December 2001 and July 2003, the gross margin between the two price series increased by about $0.50 per gallon.



With few exceptions, the responsiveness of retail whole milk prices to processor milk costs as measured by announced cooperative Class I prices is weak or non-existent. The process of price transmission from farmers, as represented by their fluid milk bargaining associations, to consumers is flawed in many markets.

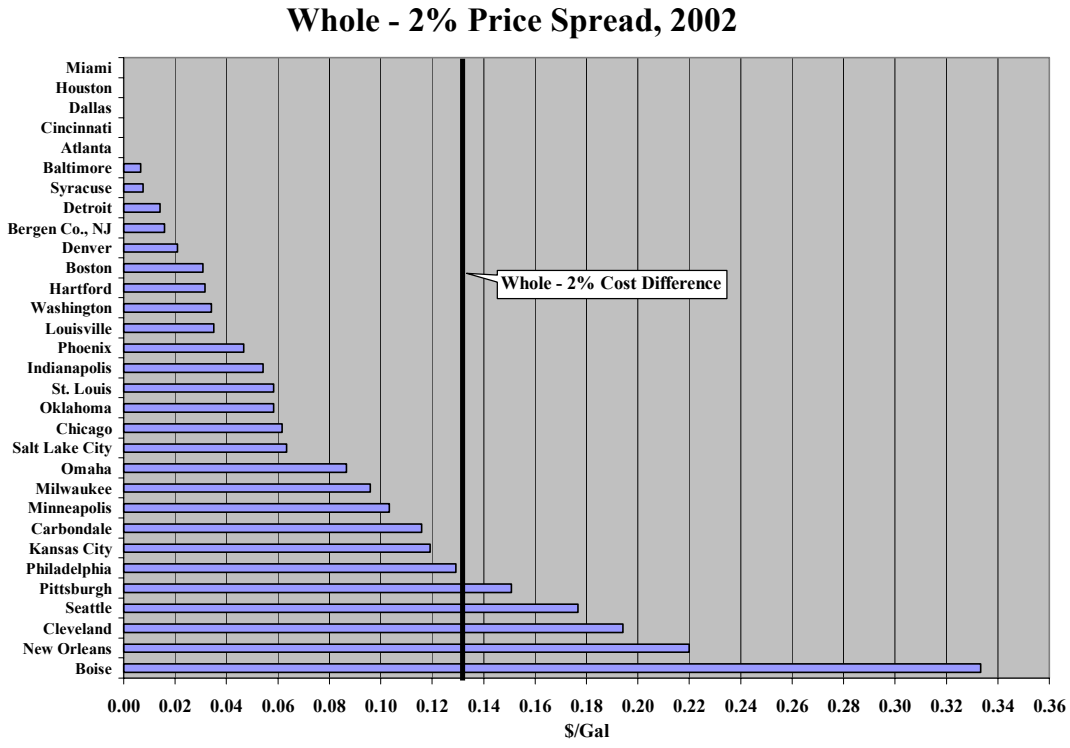
This is a sobering, though not surprising, conclusion supported by other research. The implication for dairy farmers is that lower farm level milk prices do not uniformly translate into lower retail milk prices. Consequently, lower farm milk prices do not necessarily stimulate increased consumption, meaning that the bulk of the adjustment to a temporary surplus back to supply and demand balance must come from the supply side. Farm milk prices are lower for a longer period of time, more farmers are forced to liquidate, and there is more farm financial stress.

It is not possible from this rather crude analysis to isolate why retail fluid milk prices conform so poorly to Class I milk costs or to identify what entities in the supply chain are responsible for the absence of response. This analysis does suggest that some answers may be found by comparing the nature of processor and retailer competition across cities. What is different between Phoenix, where retail prices have recently moved in the opposite direction to milk costs, and Pittsburgh, where retail prices conform closely to milk costs?

Do retail price differences among milk types reflect differences in milk costs?

The last question relates to differences in prices for milk of different butterfat content. The AMS selected cities series includes retail prices for whole milk and reduced fat (2 percent) milk in gallon containers. The cost of milk to processors is less for 2 percent milk because they account to their federal order pools for pounds of butterfat and pounds of skim milk and skim milk is much cheaper per pound than butterfat. Using 2002 federal order all-market averages for fluid milk composition and Class I skim milk and butterfat values, milk cost for whole milk was $0.13 per gallon more than for 2-percent.[5]

The figure below shows the 2002 annual average retail price spread between whole and 2 percent milk for cities in the AMS selected cities series. Spreads ranged from zero in five cities to 33 cents in Boise. In more than half of the cities, the price spread was less than half the difference in milk costs.



The reasons for this wide disparity in whole-2 percent retail price spreads are not obvious. Where there is little or no price difference, it is possible that retailers prefer to simplify pricing regardless of product costs. Or processors may cost-average and quote a uniform price to retailers across different types of milk.

[5] Average butterfat content in 2002 was 3.27 percent for whole milk and 1.96 percent for 2 percent milk. Average 2002 federal order minimum prices were $0.0969/lb for Class I skim milk and $1.2363/lb for Class I butterfat.

Where differences in price exceed differences in costs, it is possible that local cream markets place a premium on butterfat relative to federal order butterfat prices, leading to cost differences larger than indicated by federal order prices. Or whole milk may be perceived as a superior good by consumers, underlying a retail pricing strategy contrary to what is expected based on marking up milk costs.

Summary

AMS paired cities data for retail milk prices and announced cooperative Class I milk prices were used to evaluate three aspects of fluid milk margins. The cooperative prices were used as a proxy for the cost of milk to processors.

Average annual retail prices for whole milk across cities were shown to be statistically unrelated to processor milk costs. Monthly retail prices for whole milk were shown to imperfectly follow changes in processor milk costs in most markets, and in 11 of 26 markets, the relationship between retail prices and processor costs was statistically insignificant. Finally, the spread between retail prices for whole milk and 2 percent milk did not closely match differences in processor costs in most of the cities examined.

This report raises several questions but doesn't answer any. It is intended to promote further research on the makeup of marketing margins for milk. The absence of predictable, economically plausible relationships between retail prices and farm milk prices in many markets represents a serious public policy concern.