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Voluntary Over-Order Milk Premium Agreements and Implications for Policy Choices

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While policies define minimum farm-level milk prices based on end use, milk for fluid consumption is often priced above these minimums even in the presence of excess fluid quality milk. Cooperative action through marketing agencies-in-common facilitates these over-order premiums. We examined the premiums that resulted from voluntary agreements in Michigan. The premiums enhanced farm price and offset minimum price variation. A critical consideration is the distribution of premiums across participants. Formal policies like state marketing orders and compacts may replace or complement voluntary premium agreements. As a replacement, these formal policies trade off flexibility in both premium level and distribution for stability.

Dairy farmer cooperatives are organized to market milk, bargain for higher milk prices for member farmers, and often to operate processing facilities to produce manufactured dairy products. The Capper-Volstead Act of 1922 provided limited exemption from anti-trust laws to cooperative associations, allowing farmers to legally form cooperatives to collectively market products. This same authority allows agricultural cooperatives to form marketing agencies-in-common, a combination of cooperatives and individual farmers who market products under a common agreement, to coordinate price conduct in commodity markets (Cropp, Jesse, and Dobson 1993).

In most regions of the United States, federal milk marketing orders mandate that milk of fluid quality, Grade A milk, be priced at least at federally established minimum prices. Production in excess of beverage milk needs is sold in lower-priced, manufactured dairy product markets. Marketing agencies-in-common are able to bargain for a premium in some markets so that the actual price of milk used in fluid or beverage products, Class I use, exceeds the policy-mandated minimum price.¹ The price premium, defined as the difference between the monthly minimum federal order Class I price and the sale price, is termed an "over-order" premium.

The Producer's Equalization Committee is a Michigan marketing agency-in-common that collects fluid milk price premiums and voluntarily pools them across a majority of member organization milk. Alternatives to voluntary over-order premium agreements have existed in the form of state marketing orders and, since the 1996 FAIR Act, interstate milk compacts (the Northeast Dairy Compact, the only compact authorized, expired September 30, 2001). These alternative policies essentially make over-order premiums a formal policy built onto federal milk marketing order minimum prices.²

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Cooperative over-order pricing was a heavily researched topic in the late 1970s and early 1980s because of cooperative consolidation and anti-trust litigation (see especially Jesse and Johnson 1985; Masson and Eisenstat 1980). The primary themes of past research included measuring cooperative market power and explaining over-order milk price with an interest in concluding whether "undue price enhancement" occurred (Babb and Bessler 1983; Jesse and Johnson 1985; Jesse, et al. 1982; Masson and Eisenstat 1980; Dobson and Salathe 1980; Masson, Masson, and Harris 1978). Results and conclusions were mixed—largely based on the lack of a universally accepted measure of market power and framework to measure cooperative market services (Jesse and Johnson 1985).

This paper makes three contributions to the understanding and analysis of over-order Class I milk prices. First, a model of over-order premiums in milk markets is used to quantify the economic welfare effects of these premiums using data from the Michigan marketing agency-in-common. Second, using a time-series of data specific to the Michigan premium pooling agreement, we describe and analyze the firm-level distribution of revenue gains from Class I premiums. The Michigan premium pooling agreement was altered over time to reflect market realities, and we account for and explain these changes and the resulting net premiums. Third, this analysis allows for an assessment of the voluntary premium benefit distribution relative to alternative formal government policies like compacts.

Evaluating the voluntary over-order premium agreement mechanics and effects reveals the importance of these premiums in providing for market-wide balancing. In addition, the nature of the agreements allows discretion in premium level determination as well as in pooling premiums both across and within participating cooperatives. Formal government policies may limit pricing and pooling flexibility.

The Michigan Milk Market

In Michigan, dairy cooperatives formed a marketing agency-in-common in 1956. This agency, the Producers' Equalization Committee (PEC), eventually encompassed virtually all Class I milk and some milk used for perishable manufactured products marketed in the lower peninsula of Michigan (Federal Order 40 during the time period considered).³ The PEC bargains for a milk price premium above the federally mandated minimum price for Class I milk. Each month the PEC announces, collects, and pools the over-order premium with member organizations and farmers. Participation in the Michigan marketing agency-in-common has included virtually all market Class I premiums, including those collected from both cooperative members and independent farmers since 1992.

Through their processing activities, dairy cooperatives manufacture dairy products for sale and also assist in balancing out seasonal swings in milk production. Balancing is the act of converting milk in excess of fluid needs into storable products like butter, non-fat dry milk powder, and cheese. Balancing primarily takes place during spring flush production months (May and June in Michigan). Michigan cooperatives maintain excess manufacturing capacity to handle this seasonal high level of milk production. Most proprietary firms that buy milk from farmers in Michigan do not operate facilities to manufacture dairy products that contribute to market-wide balancing activities, leaving this task to cooperatives.⁴ Because of economies in size present in dairy product manufacturing, it is more efficient for a few, large balancing facilities to exist in markets Michigan's size than for each firm to operate separate facilities.

Farmer pay price is determined by the uses and prices of the milk sold. Without market-wide pooling, the cooperatives, which have significant sales of milk for manufactured product use, would have a lower average pay price to farmers than the proprietary firms, which largely purchase fluid milk for sales. The advantage that the proprietary firm has in pay price would be expected to attract farmer-producers from cooperatives if there were no revenue pooling. This same situation occurs with respect to premiums. One important aspect of marketing agencies-in-common is their role as facilitators of premium pooling.

About 70 percent of the 3,529 Michigan dairy farmers in 1998 belonged to one of two cooperatives. The remaining 30 percent of Michigan dairy farmers belonged to other cooperatives or contracted milk production to one of several proprietary milk processors or brokers. Over the period 1985 through 1998, proprietary firms controlled an average of 21 percent of the Class I milk market, with cooperatives handling the remaining 79 percent (table 1). Cooperatives had a larger share in the manufactured milk class uses relative to proprietary firms. The importance of these market shares and the organizational utilization rates becomes clear when the distribution of premiums is considered.

Michigan cooperatives operated the PEC marketing agency-in-common without the participation of other proprietary processing firms and the farmers that contract directly with those firms from 1956 to 1992. Michigan independent farmer participation in over-order premium agreements coincided directly with political pressure to formalize the over-order premiums into a state marketing order. While Michigan proprietary firms cannot formally join the PEC, since 1992 they have purchased selected services, such as balancing, from the PEC. In a legal sense, the proprietary firms, and the independent farmers that market milk to these firms, are purchasing services through the over-order premiums that they pool. In practice, these purchases result in premium sharing with cooperatives. Periodic disagreements about the level and distribution of over-order premiums have led to "price wars," during which time the premium has sometimes gone to zero and at other times has been collected but not pooled by some organizations (Banderob 2000).

Using the announced PEC premium level, PEC agreement pooling specifics, and production and marketing information from the Michigan cooperatives, we use a constructed data set of net premiums for major market participants for our analysis. Fluid milk premiums that the PEC collected and pooled ranged from a high of \$1.87 per hundredweight in December 1990 (not adjusted for inflation) to a low of zero during the "price wars," for example in 1992, when the PEC agreement was void and often under negotiation. The average premium value from June 1985 to December 1998 was \$0.84 per hundredweight with a standard deviation of \$0.20 per hundredweight.

Next we consider the market welfare effects of fluid premiums. Then we examine the distribution of the premium across participating organizations, which facilitates discussion and comparison to alternative government policies.

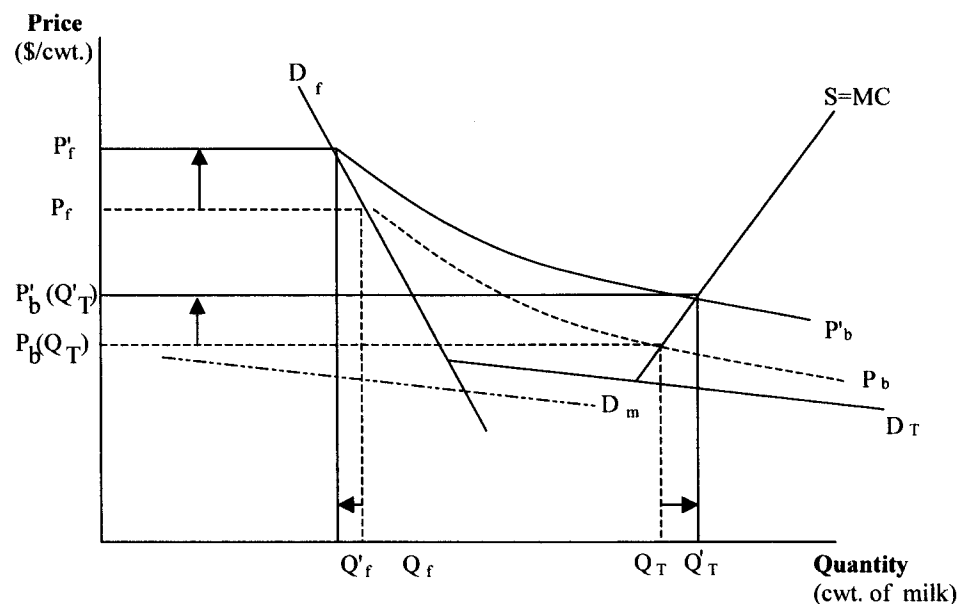
Table 1. Average Monthly Michigan Milk Market Share, 1985–1998

	Class I	Class II	Class III	Total
	(%)			
Proprietary firms	21	1	13	14
Cooperatives	79	99	87	86
Total	44	15	40	100

Market Effects of Over-Order Premiums

The over-order premiums depend on (1) a sufficiently inelastic demand for milk in fluid consumption, (2) a sufficiently elastic demand for milk used to make manufactured dairy products (like butter and cheese) to absorb excess fluid quality milk, and (3) marketing order provisions to provide minimum classified prices that serve as a basis for setting the premium level (see Bailey 1997 for a description of Federal Milk Marketing Order mechanics during the time period considered in this paper; Jesse and Cropp 2000 analyze the Order changes from reform that occurred January 2000). To understand the market effects of fluid premiums, consider the operation of a representative milk market with and without fluid premiums (figure 1). (The model used to illustrate the over-order premium builds off of previous work on marketing orders from Kessell 1978, Kwoka 1977, Ippolito and Masson 1978, and Dahlgran 1979). A single milk market—a marketing order—may be simplified to two classes of milk, which we will term milk used for “fluid” and “manufactured” uses. The actual milk market is three or four end-use classes, but this merely complicates the exposition without qualitatively changing the results. The demand curves, D_f and D_m , represent the demand for fluid and manufacturing milk. The curve labeled D_T is the aggregate demand for milk, $D_f(P_f) + D_m(P_m)$, where P_f is fixed either at the minimum price from the order or at the minimum price plus the over-order premium for a given month (see also Balagtas and Sumner [2000] for further explanation *vis-à-vis* compacts). Beverage milk demand is quite inelastic reflecting the relatively local nature of the market and that fluid milk is considered more of a consumer necessity than manufactured dairy products. The demand for milk used in manufactured dairy products is very elastic for a single market or marketing order,

Figure 1. Effects of a Fluid Over-Order Premium in a Marketing Order



as the products are storable and the market is national and, therefore, able to absorb the excess milk from any given marketing order.⁵

The minimum federal order fluid price is P_f . In the absence of the marketing agency-in-common, the market fluid price equals the minimum federal order fluid price because milk in excess fluid milk product needs is available for these uses. The competitive equilibrium in the market for fluid milk is at (Q_f, P_f) . In this situation, the effective blend price is a weighted average $P_b = \frac{(P_f Q_f + P_m Q_m)}{(Q_f + Q_m)}$, where Q_m is the difference between Q_T and Q_f . P_b asymptotically approaches the aggregate demand curve D_T . The resulting total milk production where P_b intersects the supply curve is Q_T .

A marketing agency-in-common like the PEC collects a fluid premium by setting the price for milk used in fluid products above the federal order minimum price. The premium is defined as $(P'_f - P_f)$. At this price, the fluid market equilibrium with the premium in place is (Q'_f, P'_f) . The blend price increases to P'_b and total production is Q'_T . The milk produced beyond fluid needs, $(Q'_T - Q'_f)$, flows to the manufacturing market.

PEC over-order premium effects on the milk market relative to a marketing order at the minimum fluid price include a decrease in fluid sales, accompanied by an increase in total milk production and an increase in total market revenue (figure 1). The total revenue generated by the product of the blend price with the premium and resulting output is greater than the product of the competitive blend price and competitive output conditional on the degree of inelasticity of fluid milk demand. Specifically, $[P'_b(Q'_T)Q'_T] > [P_b(Q_T)Q_T]$, as the increase in total market revenue offsets the increasing weight of a higher manufacturing utilization with the fluid premium in place. This is true as long as the new blend price function is above the old blend price function where it intersects the supply (marginal cost). Because the new blend price, P'_b , places a lower weight on the fluid price and, therefore, converges to the manufacturing demand at a faster rate, it intersects the market supply curve below the old blend price function, P_b . However, in practice, because the fluid demand is quite inelastic, the shift in the blend price caused by an increase in the fluid price results in a blend price above the old blend, as is supported by the increase in total milk market revenues with fluid premiums (table 2).

Using demand and supply elasticities to parameterize the locally linear model illustrated in figure 1, we can calculate the effects of fluid premiums on the Michigan market. Consider the prices and end uses for milk produced in the southern Michigan market in 1998. The Class I utilization averaged 48% and, therefore, 52% of milk went into manufactured products (USDA-AMS, *Dairy Market News* 1999). The fluid milk price minimum had a weighted average minimum price of \$15.34 per hundredweight (cwt.). The PEC fluid premium collected averaged \$0.95/cwt. for all 1998 Class I milk. Combining Class II and III prices into a single manufacturing class results in a price of \$13.91/cwt. for 1998. Production totaled 43.25 million hundredweight, or 100 pounds, of milk in 1998. With the premium in place, the blend price was \$15.04/cwt. This price represents the average and marginal revenue for a Michigan milk producer in 1998.

Wohlgenant (1989), and Johnson, Stonehouse, and Hassan (1992) estimate fluid milk demand elasticity of approximately -0.2 . Following the method of Ippolito and Masson (1978), we calculate the demand elasticity for milk used in manufactured dairy products facing Michigan producers as:

$$\eta^{MI} = \frac{1}{s} \eta^{US} + \left(1 - \frac{1}{s}\right) \epsilon^{ROC},$$

where η^i indicates the manufacturing milk demand elasticity in Michigan or the United States, s is the Michigan share of U.S. manufacturing milk production, and ϵ^{ROC} is the

Table 2. Michigan Market Effects of Fluid Premiums*

	without premium ¹	with premium ²	change ³	% change ³
Quantity of milk	----- (million cwt.) -----			%
Q_f	21.17	20.93	-0.24	-1.13
Q_m	21.39	22.32	0.93	4.35
Q_r	42.56	43.25	0.69	1.62
Price	----- (\$/cwt.) -----			%
P_f	15.34	16.29	0.95	6.19
P_m	13.92	13.91	-0.01	-0.01
P_b	14.62	15.04	0.42	2.87
Total revenue	----- (million \$) -----			%
TR_f	324.75	340.95	16.20	4.99
TR_m	297.75	310.47	12.72	4.27
TR_r	622.50	651.42	28.92	4.65
Welfare	----- (million \$) -----			
Producer surplus			18.02	
Fluid milk consumer surplus			-20.00	

* These calculations assume $\eta_f = -0.2$ and $\epsilon = 1.0$ as well as average 1998 prices and quantities.

¹ Prices and quantities without premiums are estimated.

² Prices and quantities with premiums are actual.

³ The change and relative change values represent change from the minimum prices and resulting quantities to the existing 1998 case with premiums included in the fluid market.

supply elasticity of milk production in the United States without Michigan. In 1998 Michigan supplied 22.32 million hundredweight of milk to manufacturing uses (uses other than fluid milk). This constituted 2.2 percent of U.S. milk production used in manufacturing purposes. With a supply elasticity of 1.0 of milk production in the rest of the country and a U.S. manufacturing milk demand elasticity of -0.3, the demand elasticity for manufacturing milk in Michigan was approximately -58.⁶

Assuming constant elasticity supply and demand schedules, the 6.19% increase in fluid milk price that the PEC premium added resulted in a 1.13% decline in fluid milk demanded (table 2). (Note that the figures are drawn with linear supply and demand curves for simplicity). Fluid revenues increase by 4.99% (\$16.2 million). The manufactured milk price was less than a penny lower (rounded up here) with the resulting 4.35% increase in quantity of manufactured milk in Michigan. Because the rest of the country absorbed the manufactured milk into a large market with elastic demand, the price was essentially unchanged, and the revenues from manufacturing milk increased by 4.27%. Total market revenue increased almost \$29 million—an increase of 4.65%.

Michigan producers, on the whole, benefit from the fluid premium, while Michigan fluid milk consumers are worse off. We can quantify these welfare changes for the Michigan market in 1998 using our linear model. The lost fluid consumer surplus is the region to the left of the fluid demand curve bounded by the minimum fluid price on the bottom and the fluid price with the over-order premium on the top. This loss totaled \$20 million for 1998 relative to the fluid market without premiums. Total producer surplus is the area above the supply curve bounded by P'_f and P_b . Producer surplus increased \$18.02 million in 1998 relative to the situation for Michigan farmers without the fluid premium.

We are primarily concerned with the Michigan effects of the premiums. However, since the increased milk production flows into the national market, milk prices for those products are marginally depressed, and consumers of manufactured dairy products have an increase in consumer surplus. Recall that the manufactured dairy product demand curve in figure 1 is the national market manufacturing demand that Michigan producers face. The change in national price of milk for manufacturing use from the Michigan fluid milk premium totals less than a cent per hundredweight. This puts a lower bound of change in national manufactured dairy product consumer surplus from the increased Michigan production at around \$10 million.

Price Enhancement and Stability

A primary goal of over-order premiums is price enhancement. In this respect the Producer's Equalization Committee (PEC) in Michigan has been successful. From 1986 through 1998, the PEC collected more than \$223 million in Class I premiums.⁷ The annual premiums collected contributed from a low of 2.4 percent of Class I revenue in 1985 to a high of 7.9 percent in 1997 with an average contribution of 5.4 percent (table 3). The total premiums collected were smaller during 1985 and 1992 because disagreements between member organizations resulted in no pooling of premiums for six months each year. Averaged over the entire calendar year, the average Class I PEC premium for 1985 was \$0.36/cwt.; for all of 1992, it was \$0.54/cwt.

The 1985 PEC agreement set the fluid premium using a fixed pricing schedule. For each price range, the premium was variable between \$0.58 and \$0.72/cwt. to achieve a goal price. In this way the total fluid milk price for PEC cooperatives jumped discretely \$0.15/cwt. at a time over the relevant price range. For example, for minimum federal order fluid milk priced between \$12.30 and \$12.44/cwt., the PEC fluid milk price was \$13.02/cwt., with the premium set between \$0.58 and \$0.72/cwt. as required. Following

Table 3. Annual Michigan Fluid Premiums and Order Class I Revenues, 1985–1998

Year	Class I Revenue*	Average yearly Premium	Total Class I premium revenue	Total Class I revenue	Premium/ (total CI revenue)
	(thousand \$)	(\$/cwt.)	(thousand \$)	(thousand \$)	(%)
1985	276,016	0.62	6,710	282,726	2.4
1986	264,669	0.65	11,910	276,579	4.3
1987	261,648	0.65	11,316	272,964	4.1
1988	252,698	0.94	15,912	268,610	5.9
1989	280,408	0.79	13,117	293,525	4.5
1990	292,131	1.05	17,104	309,235	5.5
1991	248,119	1.21	19,757	267,876	7.4
1992	274,916	1.08	9,077	283,993	3.2
1993	270,405	1.00	20,144	290,549	6.9
1994	278,861	1.00	20,077	298,938	6.7
1995	277,037	0.83	17,167	294,205	5.8
1996	317,915	0.88	18,246	336,161	5.4
1997	277,374	1.23	23,712	301,085	7.9
1998	321,219	0.95	18,351	339,570	5.4

Note: These values are not adjusted for inflation.

* Total Class I revenue is defined as the product of the Class I price and Class I quantity.

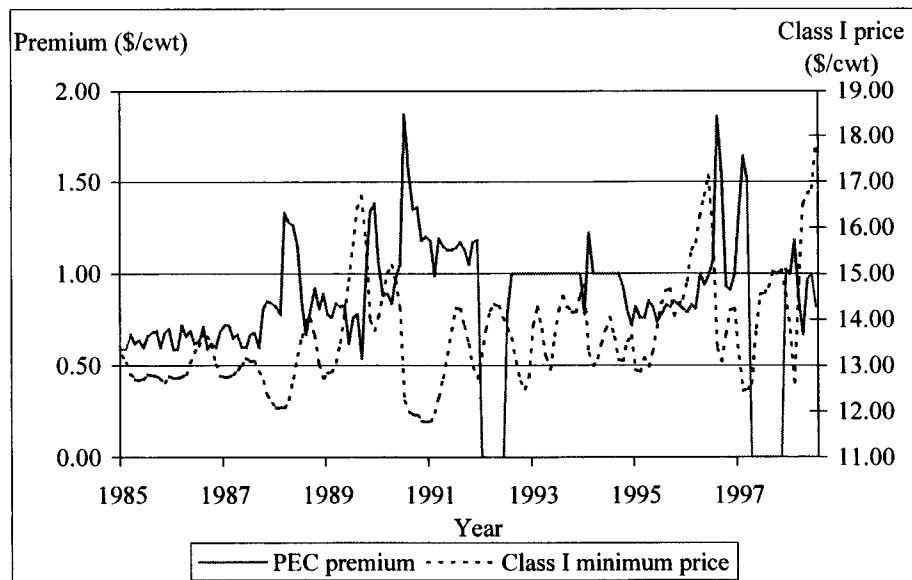
Source for deriving federal order statistics: USDA-AMS, *Federal Milk Order Market Statistics*.

the schedule, where the minimum federal order fluid milk price was \$12.45 to \$12.59, the PEC price (with premium included) jumped to \$13.17/cwt., while the premium still varied between \$0.58 and \$0.72/cwt. The 1992 and 1998 PEC agreements did not follow an explicit price schedule. However, premiums often were in the neighborhood of \$1.00/cwt., except in the case of large minimum price changes.

The premiums also offer some degree of insulation for milk producers from variation in minimum milk prices. The fluid price volatility that occurs in federal orders is caused mainly by variability in manufactured product markets, which determine the base price used to derive the minimum class prices. Federal orders do not insulate class or blend prices from extreme variation in the base price because the class prices are linked to the base price by fixed differentials. The ability to adjust premiums facilitates their use to stabilize farm milk revenue. Specifically, a premium increase (decrease) can at least partially offset a decline (increase) in the federal order minimum milk price. This results in a premium that generally moves opposite the milk price-stabilizing farm milk price (figure 2).

The pricing schedule adopted by the PEC from 1985 to 1992 removed the subjective nature of the premium level. It also meant that within certain price ranges, premiums and the fluid minimum price move penny for penny in opposite directions followed by discrete jumps. The result is that the premium offsets some price volatility; however, by allowing a degree of fluid price changes, market price signals are not completely obscured. The 1992 and 1998 agreements also generally maintained the inverse relationship between the minimum price and the premium. The minimum federal order Class I price from 1985 to 1998 had a coefficient of variation of 0.10. The fluid premium added in the coefficient of variation was 0.09 revealing that some level of price stabilization was achieved.

Figure 2. Class I Minimum Price and Over-Order Premium, 1985–1998



Premium Pooling, Distribution, and Agreement Stability

With the whole market effects of fluid premiums in mind, we turn our attention to the distribution of these premiums across member organizations. While the PEC has existed in some form since 1956, the rules governing premium collection and pooling have not been constant. The PEC pooling agreement has been altered periodically with market and member changes. Before including proprietary firm premiums in 1992, the PEC had operated under the same agreement since 1985 with all the premiums collected and pooled by Michigan cooperatives. Post-1992, the collected and pooled premiums came from proprietary firms as well—with one re-negotiation of pooling provisions in 1997 (see Banderob, Wolf, and Hamm [2000] for a detailed accounting of PEC history). Details of the agreements discussed in this section highlight the importance of flexibility in an agreement, the ability of voluntary agreements to change with the market, and the relative value of pooling premiums across member organizations.

Because milk prices are pooled and blended across farmers who market essentially identical milk, cooperatives and proprietary milk processors are concerned about the change in total revenue and the resulting blend price for their organizations provided by fluid premiums. Throughout the discussion of pooling agreements below, we refer to the "net payoff" for the cooperative or proprietary firm from the PEC. This net payoff can be interpreted as the change in member organization blend price due to premium collection and pooling (without accounting for other changes above the minimum price such as quality or volume premiums). The relevant value of PEC pooling agreements for a cooperative or firm is the net payoff versus the premium available without the pooling agreement or versus the other potential premium pooling rules.

Premiums Prior to Proprietary Firm Participation

The PEC agreements before 1992 included only cooperatives. Though proprietary firms participated in the market and paid over-order premiums, they were not pooled. The PEC calculated a blend premium equal to fluid premiums collected, divided by total cooperative milk including all milk for manufactured uses. The net payoff a cooperative member received from the PEC was the product of the blend premium and the milk volume of total cooperative milk sales.

We are primarily concerned about the distribution of Class I premiums across PEC member organizations. These premiums are then blended and either paid out to farmers or retained as profit by the cooperatives and proprietary firms. Because proprietary firms in the Michigan fluid milk market collected but did not pool over-order premiums, their net premium from 1985 to 1992 was the entire PEC premium. Alternatively, non-participating proprietary firms could have charged smaller premiums on the sale of fluid milk to increase market share at cooperative expense. As net producer price is the critical factor in determining farm contracts, proprietary firms could pay smaller premiums to farmers (as they had less manufactured milk to blend the fluid premiums over) and increase their farm milk supply at cooperative expense. Without proprietary firm participation in the PEC, these firms were able to free-ride on the PEC premium bargaining. Since proprietary firms had a higher fluid utilization and did not pool across manufactured milk, their premium on a per hundredweight basis was larger and could result in a higher pay price to producers and/or higher profits for these firms.

The average fluid premium collected by cooperatives during 1985 through 1992 was \$0.88/cwt., with a standard deviation of \$0.27/cwt. The net premium averaged across all cooperative milk was \$0.35/cwt. (table 4). Cooperative net premium payoffs differed

Table 4. Average Premium by PEC Agreement, 1985–1998

Agreement year	1985	1992	1998	1985–1998
			(\$/cwt.)	
Class I premium	0.82	0.97	0.94	0.84
Proprietary firm blend premium	0.74	0.56	0.63	0.64
Cooperative blend premium	0.35	0.43	0.43	0.37

by only one or two cents per hundredweight. In contrast to PEC cooperatives, proprietary firms had average premiums of \$0.74/cwt. across all marketed milk (assuming PEC premium levels were the standard for proprietary firms).

PEC Premium Pooling with Proprietary Firms

In 1991, Michigan dairy farmers received the lowest milk price in more than ten years. PEC members, began an effort to force proprietary firm participation in the PEC through state legislation. At that time, milk from independent producers shipping to proprietary firms had approximately 20 percent Class I market share on about 30 million pounds of monthly Class I milk. The proprietary firms purchased the other 80 percent from cooperatives. Cooperatives argued that Class I product sales generated profits for proprietary firms that were not pooled with cooperatives, which had higher manufactured product utilization. For example, in January 1992, proprietary firm participation would have increased over-order premium revenues for PEC cooperative members by \$362,700.

In December 1992, with momentum seemingly building for a state marketing order that would mandate proprietary firm premium inclusion in the PEC, the proprietary firms and their independent farmer clients voluntarily pooled premiums with the PEC. This action could logically be attributed to proprietary firm belief that a voluntary arrangement is preferable to a state marketing order that would have formalized and mandated pooled premiums on fluid milk sales. The resulting PEC agreement included changes to encourage proprietary firm participation including changing the pooling mechanism that allowed firms to retain a portion of the over-order premiums. Part of this change was prompted by legal considerations from the inclusion of proprietary firm premiums, which for the first time contributed directly to a pool that purchased market services from PEC cooperatives. The average fluid premium collected by the PEC from December 1992 through August 1997 was \$0.97/cwt. (table 4). The cooperative premium across all milk marketed averaged \$0.43/cwt. The proprietary firm premium averaged \$0.56/cwt. In comparison to the 1985 agreement pooling and payment provisions, the proprietary firm payoff under the 1992 agreement decreased as premiums were pooled. Conversely, net payoffs to the cooperatives increased as they shared in increased fluid premiums.

After nearly five years of pooling premiums with PEC cooperatives, proprietary firms left the 1992 PEC agreement in September 1997. PEC cooperatives continued to collect and pool Class I premiums. Proprietary firms did not pool premiums, instead free-riding on the PEC premium. Cooperatives renewed efforts to establish a state milk-marketing order that would have forced pooling of all fluid premiums.

Following eight months without premium pooling, and with a state milk marketing order again gaining legislative support, proprietary firms returned to the PEC in May 1998, conditional on modification of the PEC pooling mechanism. Modifications included allowing all firms and organizations to retain a larger percentage of Class I premiums.

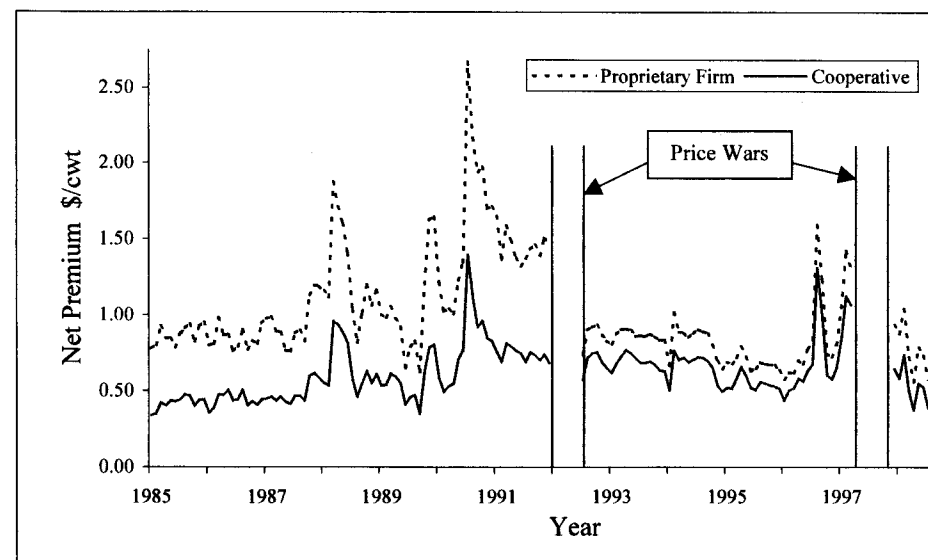
Proprietary firm total PEC payoff increased under the 1998 agreement because they keep a greater portion of collected premiums not pooled. The result of the 1997 price war was another shift in distribution of PEC premiums at the expense of cooperatives that maintain balancing capacity. The average Class I PEC premium in 1998 was \$0.94/cwt. (table 4). The average cooperative premium was \$0.43/cwt. while proprietary firm premium averaged \$0.63/cwt.

Net Premiums Across Agreements

To facilitate comparison across agreements, figure 3 displays PEC fluid premiums per hundredweight of milk marketed (across all classes) by firm using the net results derived using the actual pooling mechanism in place under each agreement. Net premium payoffs are converted to a per hundredweight basis and expressed in constant 1998 dollars. The figure illustrates the difference between cooperative and proprietary firm payoffs over time. Cooperative payoffs are combined for simplicity, though they were not exactly identical across cooperatives. The cooperative-proprietary firm gap is greatest when proprietary firms did not participate in the PEC prior to the 1992 agreement. The divergence between cooperative and proprietary firms before the 1992 agreement illustrates the motivation for the re-negotiation that occurred. The changing relative premiums over time illustrate the flexibility that voluntary agreements afford.

State Orders and Compacts

Fluid milk premiums are collected and pooled by cooperatives in many U.S. fluid milk markets. Existing milk marketing order policies facilitate the premiums by announcing the minimum fluid milk price that serves as a benchmark for setting the premium

Figure 3. Michigan Cooperative and Proprietary Firm Net Premiums, 1985–1998

and releasing monthly market price and quantity information used by participating organizations. The PEC has experienced periodic disagreements, most of which have been related to the premium pooling provisions. These disagreements have been costly in some cases as they resulted in periods without fluid premiums.

One method to eliminate these disagreements is to formalize the over-order premium price and pooling rules into a state milk marketing order.⁸ A state order could operate to collect and pool the fluid premium, building off the existing federal order rather than replacing it. Depending on the particular language, a state order could conceivably operate exactly as the existing voluntary agreement does but without concern of firms withholding premiums or in any other way withdrawing from the agreement. Indeed, a state marketing order of this type was considered as recently as 1997 in Michigan but was not formalized after the voluntary premium agreement was altered to the satisfaction of participating organizations.

While a state order is one method to afford stability in fluid milk price premium agreements, an alternative organization was created in the 1996 Farm Bill in the form of the Northeast Compact. The Northeast Compact, a state and federal legislative agreement to regulate the price of fluid milk, operated much like the state marketing order described above, but encompassed six New England states (and qualified milk from other areas). In effect from July 1997 through September 2001, the compact essentially set a fluid price floor at \$16.94 per hundredweight. The difference between the compact and federal order minimum fluid price was collected as a compact premium and distributed across eligible milk. Several articles and reports are available to summarize the details and effects of the Northeast Compact (see Bailey 1999 and 2000; Balagtas and Sumner 2000; Wackernagel 1998; and Nicholson, Resosudarmo, and Wackernagel 1999). Following deductions to off-set government costs like price support and school lunch programs, the compact premium revenues are pooled across all eligible milk that participates. A critical difference with regard to the Northeast Compact mechanics is that the premiums cannot be re-blended by cooperatives and are a separate item on the milk check.

Consider the differences in net premiums across organizations depending on the pooling agreement. We have already discussed the PEC pooling agreement, which results in a portion of premiums transferred to cooperatives with market balancing activities. In contrast, the Northeast Compact pools premiums across all market milk (after government deductions). Relative to current PEC pooling procedures, Michigan milk cooperatives would receive more premium revenues under compact premium pooling rules at current utilization rate and premium level (because current PEC pooling procedures exclude some cooperative milk when dividing revenues across eligible milk). However, a compact is "interstate" by design. Therefore, to actually determine whether Michigan farmers or cooperatives are better off we must know what other milk is in the compact and what the resulting fluid utilization rate is. An Upper Midwest compact would likely not be desirable to Michigan if it included Wisconsin and Minnesota with relatively low fluid utilization compared to Michigan, which would dilute any fluid premium. In contrast, Michigan participation in a Southeast Compact would be more desirable because those states tend to have higher fluid utilization rates than Michigan (less excess fluid quality milk). Would Michigan dairy farmers be better off under a compact? The answer depends on the premium level, the fluid utilization in the regions included compared to the Michigan fluid level, and the distribution of the premium across farms and organizations.

The obvious benefit that a compact yields relative to a voluntary over-order premium is price and pooling agreement stability. The price paid for this stability is loss of control and flexibility afforded by the voluntary organization. Of course, it was the threat of a formal policy that brought the proprietary firms in Michigan into the voluntary premium pooling agreement. Viewed in this light, deterioration in voluntary premium level or premium distribution could rationally lead to membership in a compact.

A state marketing order might not pool premiums as the existing voluntary agreement does, instead specifying premium level without premium pooling. If the state marketing order formalized current pooling arrangements, the gain would be agreement stability. The potential loss includes government bureaucracy inertia and inability to react to a dynamic market environment. Michigan lawmakers have considered formalizing the premium structure into a state marketing order that would build off the federal marketing order on at least a couple of occasions (1992 and 1997) (Banderob 2000). While they did not enact this legislation the potential remains.

Table 5 presents the average fluid premium blended across all milk for cooperatives and proprietary firms for the actual PEC pooling rules discussed above, the compact rule applied to Michigan, and the "no pooling" rule where each organization retains their own fluid premium. Michigan cooperatives clearly benefit from the existing agreement relative to the no pooling model. The compact pooling mechanism favors Michigan cooperatives relative to either the PEC or no pooling scenarios. However, a compact would necessarily include other states beyond Michigan, and the results would then differ.

Conclusions

Cooperatives and proprietary fluid-milk marketing organizations through marketing agencies-in-common can increase the price of fluid milk above the policy mandated minimum level within certain constraints. Existing marketing order pricing policies facilitate premiums by setting minimum price and by providing access to market price and quantity information. Although these price premiums decrease the quantity of fluid milk consumed and increase the amount of milk used in lower-valued manufacturing uses, the farm blend price increases. Due to the inelastic demand of fluid milk, total market revenues increase as a result of the higher fluid prices and offset the increase in production and manufactured dairy product utilization under reasonable supply and demand elasticities. From 1986 through 1998, the Michigan marketing agency-in-common collected more than \$222 million in Class I premiums. The premiums collected averaged 5.4 percent of fluid milk revenues and 3 percent of total market revenues.

Market participants, especially cooperatives, market a blend of milk by class use, making the premium pooling mechanism crucial to assessing the benefits from these

Table 5. Average Premium Across Alternative Policies, 1985–1998

Premium Pooling Agreement	PEC ¹	Compact ² (\$/cwt.)	No pooling ³
Proprietary firm blend premium	0.64	0.39	0.76
Cooperative blend premium	0.37	0.39	0.35

¹"PEC" reflects the actual average premium realized under the changing PEC pooling rules.

²"Compact" assumes that the Michigan market average fluid premiums were pooled across all market milk as in the NE Compact.

³"No pooling" assumes that all cooperatives and firms retain their own fluid premiums.

price premiums. The voluntary PEC premium pooling mechanism has changed over time to reflect market realities. However, in general, Class I premiums have been pooled across all milk including that for manufactured dairy products, which results in a payment transfer of premiums to organizations that operate manufacturing facilities or sell milk for manufacturing uses. Because potential legislation encouraged proprietary firm participation in the voluntary agreement, virtually all southern Michigan Class I milk premiums are pooled.

Michigan possesses characteristics that facilitate a Class I premium agreement. A significant fluid production and consumption market is present in the same state. This condition is not met in the case of the Northeast Compact, which must necessarily cross state boundaries adding complication in policies and practice. In addition, Michigan has a strong cooperative presence and a large majority of farmers that are cooperative members, which increases their influence and bargaining power.

This paper sheds light on critical decision factors for cooperatives, farmers, and policy makers considering either a formal state order or compact to manage premiums. Starting an analysis with the existing premium structure allows for an accurate assessment of the costs and benefits of a formal government premium policy. While twenty-five states currently have some type of enabling legislation to join the Northeast or a proposed Southern Compact, premiums similar to those formalized in compacts can and do exist voluntarily in marketing orders. In light of the existence of voluntary plans, there may be reason for farmers, cooperatives, or firms in a market to prefer the voluntary premium level and distribution without explicit government intervention.

Notes

1. All milk is in fluid form when it leaves the farm. We use the terms fluid, beverage, and Class I milk interchangeably throughout to mean milk consumed in fluid form. We deal only with premiums above the Class I minimum price for milk consumed in fluid form. Marketing agencies-in-common may also be organized to market milk used for manufactured dairy products but often have less success in negotiating a premium than their beverage milk counterparts (Cropp, Jesse, and Dobson 1993).
2. The Northeast Interstate Dairy Compact set the minimum price of milk for fluid use as the higher of the federal minimum fluid price or \$16.94/cwt. with the difference collected as a premium (Northeast Compact Commission 2001). Over-order fluid premiums existed in Boston before the Northeast Compact, which was implemented in July 1997. The voluntary over-order premiums co-existed with compact premiums to some extent but at much lower levels than the previous over-order premiums.
3. In federal milk marketing orders during the time period considered, Class I milk included milk used for fluid and beverage purposes; Class II milk included milk used in "soft" dairy products such as sour cream, yogurt, and ice cream; and Class III milk used for manufactured products (butter, cheese, and non-fat dry milk).
4. Nationally, a recent U.S. Department of Agriculture-Rural Business-Cooperative Service report shows a shift away from operating processing facilities strictly for balancing toward major dairy product processing plants (Liebrand 2001).
5. The federal Price Support Program stands as an open offer to purchase manufactured dairy products (butter, cheese, and non-fat dry milk) at a price that was usually below the standard market prices (\$9.90/cwt. in recent years). The presence of this policy helps to ensure that excess milk can be absorbed in the national market.
6. Depending on the length of run considered, U.S. milk supply elasticity estimates range from 0.5 to 2.0 from the results of many different studies of dairy supply response (see Chavas and Klemme 1986; Helmberger and Chen 1994; Ippolito and Masson 1978, among others). We use 1.0 as a representative value in our calculations.

7. We ignore the Class II premiums (e.g., milk used for soft-products such as ice cream) in our analysis. Across the thirteen years for which data were available, Class I premiums accounted for almost 90 percent of total premiums collected.
8. A state marketing order currently handles premiums several states including Pennsylvania and Virginia (see Alexander et al. for more information). California operates a state marketing order in lieu of a federal order that does not involve premiums.

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