



The development of a milk pricing formula at the processor-distributor level for Montana
by Marlow Clayton Vesterby

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
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Abstract:

This study is an attempt to develop a formula pricing system for milk at the processor-distributor level in Montana.

Retail prices of milk in Montana have been regulated since 1939 by a system of holding hearings, the evidence of which is analyzed by the members of the Milk Control Board. Pricing orders are then promulgated whenever it is felt that prices need changing.

This study proposes that improvements in the efficiency of establishing price can be made through the use of a formula pricing system.

In brief, a formula pricing system should: 1. reduce the cost of regulation, 2. provide price changes in a more timely manner, 3. maintain a stable level of prices between areas, 4. emphasize price changes more on current economic conditions, and 5. make it easier, in terms of administration, to establish prices.

The formula is set up by using various economic indices, representing factors affecting the price of milk, to show whether the price of these factors increases or decreases in relation to a base period. These economic indices are then summed to give an overall formula index which is related to prices per hundred weight.

A revised producer formula is incorporated with the processor-distributor formulas, so that prices can be calculated at both the producer and wholesale levels for Class I, Grade A, fresh fluid milk.

The body of this thesis sets up the criteria for a pricing formula that might be used in actual practice.

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Of course, any errors or omissions in this study are the responsibility of the author.

M. C. V.

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ABSTRACT

This study is an attempt to develop a formula pricing system for milk at the processor-distributor level in Montana.

Retail prices of milk in Montana have been regulated since 1939 by a system of holding hearings, the evidence of which is analyzed by the members of the Milk Control Board. Pricing orders are then promulgated whenever it is felt that prices need changing.

This study proposes that improvements in the efficiency of establishing price can be made through the use of a formula pricing system.

In brief, a formula pricing system should: 1. reduce the cost of regulation, 2. provide price changes in a more timely manner, 3. maintain a stable level of prices between areas, 4. emphasize price changes more on current economic conditions, and 5. make it easier, in terms of administration, to establish prices.

The formula is set up by using various economic indices, representing factors affecting the price of milk, to show whether the price of these factors increases or decreases in relation to a base period. These economic indices are then summed to give an overall formula index which is related to prices per hundred weight.

A revised producer formula is incorporated with the processor-distributor formulas, so that prices can be calculated at both the producer and wholesale levels for Class I, Grade A, fresh fluid milk.

The body of this thesis sets up the criteria for a pricing formula that might be used in actual practice.

CHAPTER I

INTRODUCTION AND STATEMENT OF PROBLEM

The Present Situation Regarding Milk Pricing

Since 1939, the prices of fresh fluid milk have been regulated in Montana by the Montana Milk Control Board, both at the producer level and the retail level. At present, the state is divided into 12 marketing areas. Before prices can be changed, a public hearing must be called for the marketing area concerned. Evidence having a bearing on the costs of production, processing and distribution of milk is presented, as well as evidence on consumer purchasing power and other relevant information. After the Board examines and weighs all the evidence a decision is made whether or not a change in milk prices can be justified.

Problems Involved

The hearings are public and must be conducted in a legal manner, using the services of lawyers and a court recorder. They must be held in the marketing area where prices are in question, often at distances of over 400 miles from the Control Board offices at Helena. These and other factors result in a cost of \$1,000 or more per hearing.^{1/}

Often a change in milk prices cannot be made when it is justified because: first, nobody may ask for a hearing until long after the price change is due; second, it may not be practical for the Milk Control Board

^{1/} Information received from interviews with Mr. K. M. Kelly, Administrative Supervisor, Montana Milk Control Board, Helena, Montana.

to take time from a busy schedule to hold a hearing when it is needed; and third, it may be some time before the Board can evaluate the results of the hearing, decide on price changes and see that the necessary changes are promulgated. Also, new orders are often held up by court decisions.

Because of lack of sufficient information it is difficult for the Board to make objective decisions concerning price changes. Lack of information concerning processor-distributor costs, difficulties in ascertaining the factors affecting differences in prices between marketing areas, especially transportation costs, and problems of determining consumer purchasing power, all serve to present obstacles to establishing appropriate prices.

Another disadvantage of present pricing methods is the problem of determining rational patterns of price differentials between the 12 marketing areas. Since prices are presently changed in one area at a time, there is often a price differential between areas which is not always justified. If basic pricing differentials could be established between all areas and justified according to economic criteria, such as transportation costs, and other factors, then these basic differentials would remain in effect even though the formula price were applied statewide. Price differentials would not be created just because of time lags in holding hearings between areas. However, the formula system itself would not correct irrational price differentials between areas. These differentials would have to be corrected before the formula were placed into effect.

Why Price Regulation in the Dairy Industry?

The question arises whether price regulation is necessary in the dairy industry at all. Would the industry be better off without price controls?

The assumption is made in this project that price regulation is necessary at both the producer and processor-distributor levels. Certain arguments can be advanced in favor of price regulations. But they must be stated in terms of the objectives desired, which vary greatly according to the economic interests, ideas and feelings of those proposing them.

For example, it is well known that milk processor-distributors enjoy both an oligopoly and oligopsony position in the market. There are relatively few processor-distributors in relation to the number of producers and consumers. Economists have long recognized that firms in this position have a degree of control over the prices they pay for inputs and the price they receive for their products. They are thus able to enjoy profits above those which they would receive in a purely competitive situation.^{2/} In a strict economic sense these profits are not justified. The point here is that these conditions tend to cause retail prices to be higher and producer prices to be lower than would be the case in a purely competitive situation. This would be especially true with regard to "immature oligopolies".^{3/}

^{2/} If the reader wishes to obtain more information regarding the oligopolist a good source is; Boulding, K. E., Economic Analysis, pp. 638-649.

^{3/} Clark, Jr., D. A., Economic Aspects of Government Milk Price Regulation, California Agricultural Experiment Station, No. 63-4, Berkeley, Nov., 1963, p. 5. A "mature oligopoly," according to Clark, would recognize that an aggressive pricing policy would be met by retaliatory measures, and therefore it would tend to follow a policy of "live and let live".

The . . . ('immature oligopoly') exists when the individual firms take aggressive action in their eagerness to get new business and resort to destructive trade practices and price wars . . . [The long-run consequences] include the threat of an insufficient supply of safe and wholesome milk, the financial collapse of some milk producers and distributing firms, and the increase in concentration of remaining firms. ^{4/}

In order to help prevent these destructive trade practices from occurring in Montana, it is argued that appropriate price regulation is an effective tool.

Price regulation in the dairy industry also tends to stabilize the market. The production of milk is marked by seasonal fluctuations, while consumption is more constant. Demand for milk is relatively inelastic, such that in the absence of price controls a change in supply would bring about a proportionately larger change in price.^{5/}

The following quotation by Beal and Bakken serves to strengthen the previous statements.

The natural inclination of distributors under conditions of cut-throat competition is to pass on their losses as much as possible to producers. Therefore, the price situation in many major markets of the United States was seriously demoralized. The 'all or nothing policy' of organized groups of farmers endeavoring to prevent lower prices resulted in a series of milk strikes. Thousands of gallons of milk were destroyed,

^{4/} Ibid.

^{5/} Graf, T., McBride, G., Story, R., and Jacobson, R., An Investigation of the Dairy Problem and Analysis of Selected Program Alternatives, New York State College of Agriculture, A. E. Ext. 267, Cornell University, Ithaca, Sept., 1963, p. 7. These authors state that ". . . an increase in supply of 1 percent would be expected to reduce the farm price of milk by 3 or 4 percent in clearing markets." Clark, op. cit., p. 4, states that "The demand for milk for fluid purposes is conceded to be quite 'inelastic.'"

both by farmers who deliberately 'dumped' their own product and by organized groups of farmers endeavoring to prevent independent producers from supplying the market. In some instances, there were violence and bloodshed. Because these strikes failed . . . the next step was to seek assistance through legislative controls. ^{6/}

Price regulation at the producer level is presently being used in nearly every state ^{7/} and few students of milk marketing would advocate abolishing these controls.

At the wholesale and retail levels it is difficult to determine the amount of influence over price that the processor-distributor has. The assumption is made that processor-distributors, in the absence of price controls, do have an influence on wholesale and retail prices; the basis for this assumption is the economic theory regarding the oligopolist. ^{8/}

The manner in which the processor-distributor would exert influence over prices can only be hypothesized. But it seems a reasonable hypothesis that those distributors with the greatest financial reserves and the greatest efficiency of operation would first, lower prices below costs in order to force the less efficient and those with lower financial reserves

^{6/} Beal, G. M., and Bakken, H. H., Fluid Milk Marketing, p. 189-190.

^{7/} Government's Role in Pricing Fluid Milk in the United States, U. S. Dept. of Agriculture, ERS-239, Washington D. C., May, 1965, 39 pp. Of the 48 contiguous states, 47 had some form of pricing regulations. Only North Dakota was left unmentioned. Federal Orders were used in all, or parts, of 36 states. Twenty had some form of state control and nine utilized combinations of both. Fifteen states were listed as having some type of wholesale price regulation; however, this may not be complete since not all 48 states were included in the survey at the wholesale level.

^{8/} Boulding, op. cit., pp. 638-649.

out of business. Second, they would raise prices to a level that would allow them profits above the competitive level.

This project assumes that competition is desirable in the dairy industry. Price regulation is a relatively effective method of achieving the effect of competition through the establishment of prices at those levels which more nearly approximate the levels that would occur if the industry were in a competitive situation. Regulations will not guarantee the least efficient a profit, but they will discourage the most efficient from selling under costs in order to force others out of business and capture the market. This, it would seem, is in the public interest.

Minimum price controls at the retail level also make it difficult for out-of-state processor-distributors to establish a market in Montana. Selling milk at lower than average retail prices is one of the primary methods available to a firm to introduce their product in a new area. This becomes impossible in an area with minimum retail prices established by law. When all brands must be sold at no less than the established minimum price, there is no incentive, in terms of price discounts, for consumers to purchase one brand over another. Thus, if all milk is sold at no less than the minimum price, it would be impossible for any one particular processor-distributor to sell below this price, and possibly below his costs, in order to capture a share of the market.

Federal Orders

There is reason to believe that if price regulations at the state level fails to accomplish the desired results, a movement would soon be initiated

toward Federal milk marketing orders.^{9/} In a research project conducted at Montana State University in 1963, the view was expressed that Federal Orders would be more efficient than present methods of establishing price.^{10/} However, it was also stated that ". . . revisions of the state order would, in all probability, be more readily accepted than a Federal Order by the Montana dairy industry as a whole."^{11/}

^{9/} Opinion expressed by a number of producers throughout the state.

^{10/} Litschauer, J. G., The Development of a Hypothetical Federal Milk Marketing Order for the Great Falls-Hi-Line Area and a Comparison of this Order with the Montana Milk Control Law in its Present State of Effectiveness, an unpublished thesis, Montana State University, Bozeman, Aug. 1963, p. 92.

^{11/} Ibid, p. 90.

CHAPTER II

THE CONCEPT AND OBJECTIVES OF FORMULA PRICING

The Formula Pricing Concept

The concept of formula pricing is not new. Federal milk marketing orders have been using various types of formulas for years. "In recent years, all markets under Federal milk regulation have used a 'formula' method for determining Class I prices at the producer level." ^{1/}

Presently there are two general types of Class I pricing formulas.

These are:

A. "Economic Formulas" which relate Class I milk prices to selected economic factors, and

B. "Manufacturing Milk Formulas" which relate the price of Class I milk to the value of milk used for manufacturing purposes.

The objective of this project is to devise an economic formula for determining changes in processor-distributor margins.

Basically, the pricing formula combines various index numbers, representing current economic factors that influence the price of milk, into an overall formula index which indicates whether prices should be raised or lowered when compared with a base period. There is a good deal of variation in how this can be accomplished, which will be discussed in Chapters III and IV.

^{1/} Report to the Secretary of Agriculture by the Federal Milk Order Study Committee, United States Department of Agriculture, Washington, D. C., April, 1962, p. II-1-10.

Objectives

The benefits to be derived from a formula pricing system, that cannot be obtained from the present method of setting prices through hearings, are given below.

A. A milk pricing formula would reduce the cost of establishing prices. Theoretically, hearings would be held only when considered necessary to change certain aspects of the formula itself or to change price differentials between areas, or other aspects of the Milk Control Law.

B. It would provide price changes in a more timely manner. Prices would be examined, using the formula, on a periodic basis with the most recent economic data available. A quarterly basis is proposed. Presently, the Milk Control Board cannot change prices until it has held a hearing and decided upon the results. This is often long after price changes are due, in an economic sense.

C. Prices would remain in a stable relationship between marketing areas. Once basic adjustments are made between areas, any formula price change would raise or lower prices for all areas by the same amount.

D. The pricing formula would more closely approximate current conditions through the use of indices. There would be an objective, analytic determination of prices rather than the more subjective method now used.

E. The formula would be easier to calculate and administer since its use would involve administrative procedures, rather than legal hearings. The Board members would not be required to give as much of their time to

weigh evidence of hearings.

However, there are some things that formula pricing would not do:

A. Formula pricing can go a long way in preventing processor-distributors from selling under the established price. But there is the problem of various methods of violation. Some of the more common violations are:

1. Secret rebates and discounts returned to retailers and consumers,
2. Servicing and maintenance of coolers in stores,
3. Gifts of discounted or free ice cream, butter or a few extra cartons on delivery routes,
4. Excessive prices paid to retailers for cooler rental,
5. Trading stamps, and
6. Reduction of unregulated prices while maintaining the regulated prices of fresh milk.

B. Formula pricing would probably not directly benefit or harm the less efficient processor-distributor any more than the present system.

C. The formula pricing system is not foolproof and would have to be closely watched to ensure that all the different components were up-to-date and that the calculations were correct.

D. The amount of enforcement necessary would probably not be any less than present requirements, but more resources would be available for enforcement.

CHAPTER III

THE WEIGHTS

Two Basic Assumptions

Two assumptions are made at this point that are basic to this study:

1. The assumption is made that milk is a beneficial product and that it is desirable to assure an adequate and stable supply at reasonable prices. In fact, to many people, milk is almost synonymous with mother, country and apple pie and should therefore be protected zealously. This can be clearly evidenced by the many federal, state and local regulations that exist concerning nearly every aspect of the industry.

2. The second assumption is that price regulation is necessary at the retail level to help achieve an adequate and stable supply of milk at reasonable prices. Evidence in favor of price regulation at the wholesale and retail level has already been presented, but this evidence is subject to much argument, and in the final analysis the assumption must simply be made upon subjective grounds that price regulation is necessary. Without this assumption there would be no justification for this project.

The Major Hypothesis

The major hypothesis is that a method of pricing milk in Montana at the wholesale level can be developed, which would be more efficient than the present method.

To determine just what is meant by "more efficient", one must consider the problems and objectives stated in Chapters I and II. Briefly, it would seem that a method of pricing milk would be more efficient if it:

1. Reduced the cost of establishing prices,
2. Provided price changes in a more timely manner,
3. Kept prices at a stable level between marketing areas,
4. More closely approximated current economic conditions, and
5. Were easier to calculate and administer.

More is said about efficiency in Chapter VII.

This study only concerns prices at the wholesale level for Class I homogenized fresh fluid milk in half gallon paper containers.^{1/} No attempt is made here to set up a pricing system for any other class of milk or dairy products. Formula pricing for other classes of milk products may be desirable, but that is a matter outside the realm of this study. Perhaps future research projects might study this problem.

This study is further confined to the processor-distributor level. The final retail price is derived by combining the results of the producer^{2/} and processor-distributor formulas and adding a retail margin established by the Board. Here again, some other method might be found, possibly a formula

^{1/} According to the General Official Order Regulating Transactions Involving the Purchase and Resale of Milk Within the State, Official Order # 641, Montana Milk Control Board, June 15, 1964, Helena, Montana, page 2; Class I products ". . . include all bottled or packaged milk, raw, pasteurized and homogenized, low fat, buttermilk, and chocolate milk." Class II products ". . . include whipping cream, coffee cream, half and half, and skim milk." Taking the formula price for Class I milk in half gallon containers as a starting point, the prices of the above mentioned products can be determined by using present price differentials established by the Milk Control Board.

^{2/} Ward, Edward H., Pricing Formula for Montana Milk, Montana Agricultural Experiment Station, Montana State University, Bulletin 569, May, 1962.

system, to establish the margin between wholesale and retail prices.

Thus, the project is confined to research in a specific area, which is necessary at the present stage, considering the complexity of the problem, availability of data, and time and funds available with which to work.

Now the question might be asked, "How can the major hypothesis be tested?"

The literature on milk pricing, reveals that formula pricing is used extensively at the producer level. However, at the retail level there is little price regulation and even less formula price regulation. But it seemed possible that a formula system might also be used to price milk at the retail level. Thus, the study proceeds on the assumption that a formula pricing system would be the "best" method of achieving the desired objectives.

Since few states regulate the price of milk at the wholesale level,^{3/} and only one state is known to use a pricing formula similar to that proposed in this thesis,^{4/} there are few set rules or procedures to follow in establishing a wholesale pricing formula. Even if there were, it would be unlikely that they would apply equally to Montana.

The formula system removes some of the human factors of pricing milk by automatically basing price changes upon changes in current economic

^{3/} Governments' Role in Pricing Fluid Milk in the United States, op. cit., listed 15 states as having the authority to price wholesale milk as of November, 1964.

^{4/} At the time of writing, that one state was Georgia. Refer to Purcell, J. C., Elrod, J. C., and Penny, N. M., The Formula Basis of Pricing Fluid Milk in Georgia, Evaluation and Recommendations, Georgia Agricultural Experiment Station, Mimeo Series N. S. 99, April, 1960.

factors having a relation to the price of milk.

By measuring and combining these factors in the form of indices, an overall index is developed, which indicates whether the price should be changed. This concept is easier to understand as one follows the detailed methods of constructing a formula as described in this paper.

Since economic pricing formulas use indices to represent various economic factors affecting the price of the product, the next step was to consider what factors do affect the price of milk and to weigh their effects.

There are two sides to a pricing formula and both must be considered-- supply and demand.

Deriving the Weights

Supply Side

Costs of Processing and Distributing--Several sources were used to analyze costs of processing and distributing milk. Cost studies published in several states by Agricultural Experiment Stations were compared.^{5/} A

^{5/} Some of these were: Cost of Processing and Distributing Milk in the South, Southern Cooperative Series Bulletin No. 45, June, 1955; Allred, W. M. and Ward, E. H., Costs, Quality, and Prices of Fluid Milk in Rural Areas of Utah and Montana, Utah Agricultural Experiment Station Bulletin No. 365, Dec., 1953; Bartlett, R. W. and Gothard, F. T., Measuring Efficiency of Milk Plant Operation, Illinois Agricultural Experiment Station Bulletin No. 560, No., 1952; Blanchard, W. H., McBride, G., and Rippen, A. L., A Cost Analysis of Fluid Milk Packaging Operations, Michigan Agricultural Experiment Station Technical Bulletin 285, Mar., 1962; Korzan, G. E., Costs of Distributing Milk in Montana Markets, Montana Agricultural Experiment Station Bulletin No. 462, July, 1949; Strain, J. R., Christenson, S. K., Relationships Between Plant Size and Cost of Processing Fluid Milk in Oregon, Oregon Agricultural Experiment Station Technical Bulletin No. 55, Nov., 1960.

cost study conducted by the California Bureau of Milk Stabilization to aid in price regulation in California was studied.^{6/} And most important, the costs of 11 of Montana's 34 processor-distributors were analyzed. These costs from the several different sources were used as a basis to determine how costs could be classified and weighed to represent costs of processing and distributing in the formula. The 11 cost studies of Montana's processor-distributors were obtained from the Montana Milk Control Board and represent 32.4 percent of the total processor-distributors in the state. They are assumed to represent a fair sampling as to size and location.

Grouping all the costs of processing and distributing milk necessarily involves certain subjective value judgments. For example, supply costs undoubtedly represent many items not included in the index of "chemicals and allied products" from the Survey of Current Business, which represents supplies in the formula. It is also possible that there may be some costs of processing and distributing which haven't been figured as supply costs because they were not explicitly differentiated in the cost studies. The cost studies were designed for use by the Board for their own purposes, which did not always require the same analysis needed here. If the cost studies had been broken down into more detail it would have been easier to separate them into the various cost classifications used here. Also, it might have reduced the percentages attributed to "other costs".

6/ Unit cost Reports, California Bureau of Milk Stabilization, Sacramento, California; compiled periodically, unpublished.

For formula purposes, the costs were classified into groups that could be most easily represented by various indices. The classifications used are:

1. labor,
2. containers,
3. equipment,
4. vehicles,
5. supplies, and
6. others.

The average costs of 11 Montana processor-distributors are shown in Table I. A comparison of these costs and costs of processing-distributing from two other sources are shown in Table II.

Labor

Wages and salaries are easily obtained from the Montana Milk Control Board cost studies. They represent an average of 47 percent of the costs of processing and distributing milk of the 11 cost studies analyzed.

Grouped together with wages and salaries were:

1. Employee retirement plans,
2. Health and accident insurance programs,
3. Life insurance benefits, and
4. Christmas bonuses.

This was justified due to the fact that as wages and salaries change, these items usually change in approximately the same proportion.^{1/}

^{1/} To be technical one could say that a certain amount of the increase is due to increased demands of employees for larger benefits. However, it is assumed that changes of this nature would be small over a period of a few years.

TABLE I. COSTS OF PROCESSING AND DISTRIBUTING MILK IN MONTANA*

Distributor	Cost Items					
	Labor	Containers	Equipment	Vehicles	Supplies	Other
	(Percentages of Total Costs)					
A	44.88	14.99	16.42	14.67	0.52	8.52
B	41.98	14.41	12.18	9.18	2.30	19.95
C	48.01	9.06	12.54	12.62	2.82	14.95
D	45.76	11.98	10.80	11.37	5.44	14.65
E	51.81	10.58	10.05	14.71	1.56	11.29
F	48.35	19.02	5.59	11.14	4.38	11.52
G	44.29	14.05	7.57	11.25	1.03	21.81
H	42.62	11.74	13.31	7.20	3.09	22.04
I	44.87	15.52	13.05	7.88	1.83	16.85
J	47.31	16.79	8.42	12.51	1.54	13.43
K	51.50	15.51	5.92	7.74	1.58	17.75
Average	46.48	13.96	10.53	10.93	2.37	15.70

*Calculated from 11 cost studies of Montana processor-distributors conducted by the Montana Milk Control Board, Helena.

