Economic Report ER 80-4

An Evaluation of Product Price Measures for Use in Federal Milk Order Pricing

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by

Howard Leathers and Jerome W. Hammond*

INTRODUCTION

Transaction prices for many farm commodities are established with reference to a "base price." These "base prices" act as barometers of supply-demand adjustments in the industry and have been widely accepted by the industry and/or actually incorporated into government administrative programs to fix transaction prices. The transactions may be at other locations in the market area, at other levels of the marketing channel, or for other forms of the product. Country elevators in the Northern Plains use the Minneapolis Grain Exchange wheat price adjusted for location to fix their prices to farmers for wheat. The "Yellow Sheet" quotations on wholesale meat prices have been widely used by slaughtering and packing houses in pricing beef to customers. The Chicago Mercantile Exchange butter price adjusted for location is used by all buyers in setting their buying prices to creameries. The federal milk order system uses the average price paid by a sample of Minnesota and Wisconsin manufacturing milk plants (the M-W series) in fixing both fluid and manufacturing use milk prices in federal order milk markets.

In the future, federal orders may require an alternative to the M-W pricing mechanism. At the present, the M-W measures prices paid at a large number of plants for a substantial quantity of Grade B milk. However, the volume of Grade B milk is declining, and the M-W series may become an unreliable indicator of supply-demand conditions for the manufactured milk industry. Although other pricing mechanisms and procedures are possible, a frequently suggested alternative set of "base prices" for federal order programs are the prices for the hard manufactured dairy products. A product price formula with yields, processing costs, and the product prices could be used to estimate the value of milk used in manufacturing. The product price formulas could be used as a basis for prices in federal milk orders.

The M-W series as a base for pricing manufacturing milk in federal orders also has been criticized because it is not available until after the month for which it establishes the price. Currently, the M-W series for any given month is available on the 5th of the following month. Firms are therefore quoting prices for some dairy products (such as ice cream or cottage cheese) without knowing the purchase price for the

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input (i.e., the minimum price set by the federal order). Market prices for butter, cheese, and dried milk solids could be used to provide an early estimate of the M-W series for use in pricing Class I and II milk under federal orders.*

Using dairy product prices as the "base prices" for federal order pricing raises several questions. Which of the several product price series should be used? Are any of the existing measures of dairy product prices appropriate for use in formulas that fix prices which a processor must pay for milk? Or, should a special series be developed and reported for this purpose? These questions are significant because of the large quantities of milk that could be priced under these formulas. If product prices are used to price all federal order milk, then at least two-thirds of the nation's milk supply would have a price administratively tied to product prices.

Our primary purpose in this study is to examine alternative measures of product prices for possible use in administered formula pricing of milk. We will consider the question of how a price measure for this use should be defined and constructed as well as problems of collecting and validating the data. In our analysis we will:

1. Describe the industry structure and pricing mechanisms for manufactured dairy products.

2. Describe the existing measures of product prices and uses of these measures.

3. Identify desirable characteristics of a price series for use in federal order pricing.

4. Examine the potential for developing a f.o.b. plant price series for use in federal order pricing.

*The USDA on September 29, 1980, subsequent to completion of this report, announced a procedure for advance pricing of Class II pricing in 29 Federal order markets.

I. INDUSTRY ORGANIZATION

An evaluation of alternative product price measures, should be based on a clear understanding of the organization of the manufactured dairy products industry and the ways in which the markets function and prices are established and used.

Changes in Production

Since the Second World War, the manufactured dairy products industry has remained roughly constant in size, processing about 60 to 70 billion pounds of milk (butterfat equivalent) during each year. However, large quantities of milk have been shifted from butter production to cheese production. (See Figure 1.) Production of American cheese has grown less rapidly than production of specialty type cheeses - especially Italian type cheese (e.g., mozzarella, provolone, parmesan, etc.). In 1948, nearly 80% of the cheese made in the U.S. was American type cheese; Italian types made up less than 5% of the total. By 1978, Italian types accounted for 25% of the U.S. cheese production and American types made up less than 60% of the total. (See Figure 2.)

The upper midwestern states, especially Wisconsin and Minnesota, continue to be a major milk production area. Supplies of milk and dairy products produced in these states are marketed throughout much of the U.S. In 1978, these two states were ranked first and second among states in production of butter and cheese. (In 1979, California replaced Minnesota as the second largest butter producing state.) In 1978, Minnesota and Wisconsin produced about 45% of U.S. butter and 50% of U.S. cheese.

The Marketing Channels

The marketing channels for butter and cheese include five functions:

1. The manufacturing function
2. The assembly function
3. Secondary processing functions (aging, cutting, packaging, cheese processing, advertising, and distribution)
4. The wholesaling function
5. The retailing function

Commonly, a single organization performs more than one of these functions. For example, a national grocery chain may package, wholesale, and retail cheese. Furthermore, many organizations will not perform all

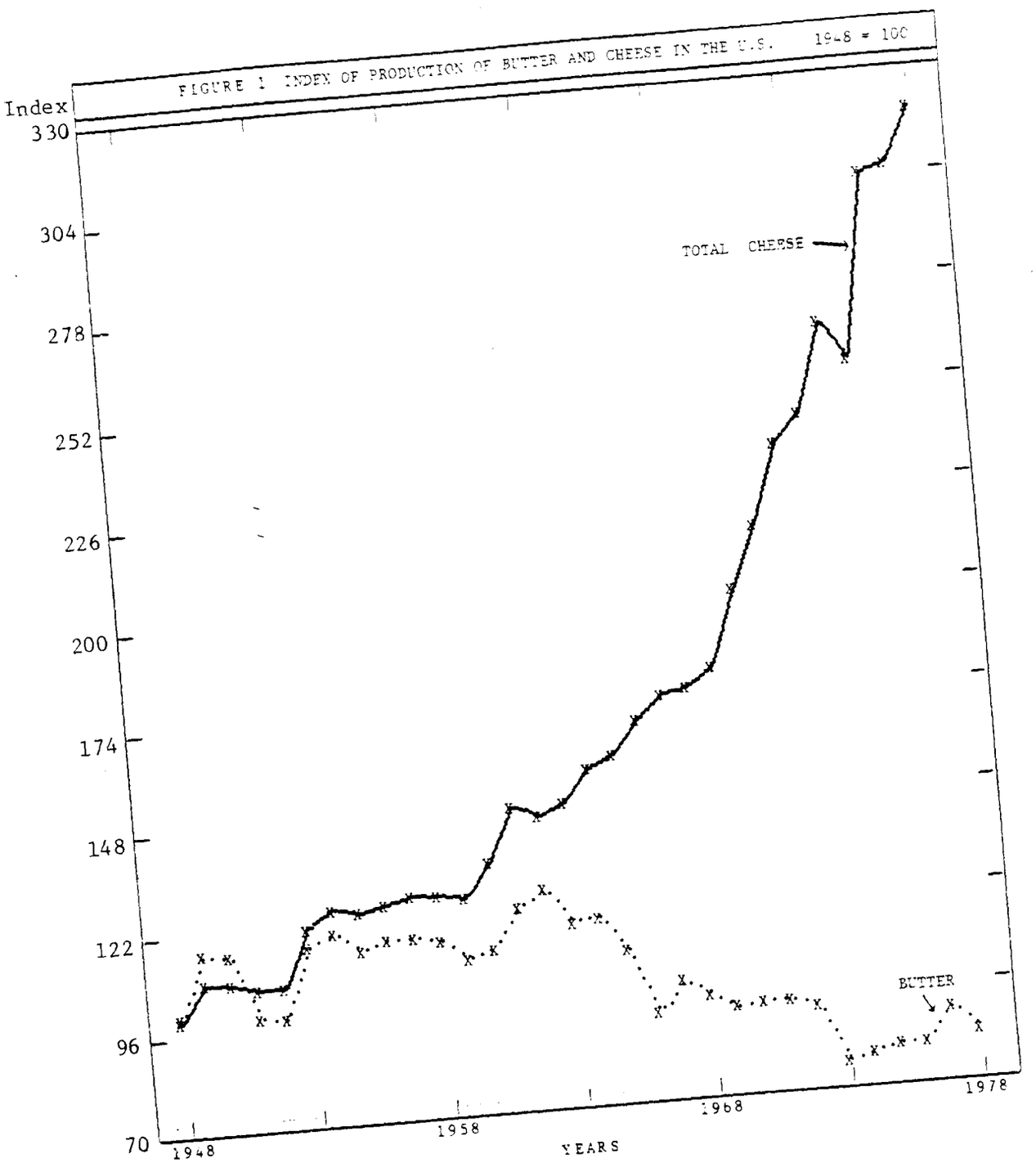
FIGURE 1 INDEX OF PRODUCTION OF BUTTER AND CHEESE IN THE U.S. 1948 = 100
Index
330
304
278
252
226
200
174
148
122
96
70
TOTAL CHEESE
BUTTER
1948
1958
1968
1978
YEARS

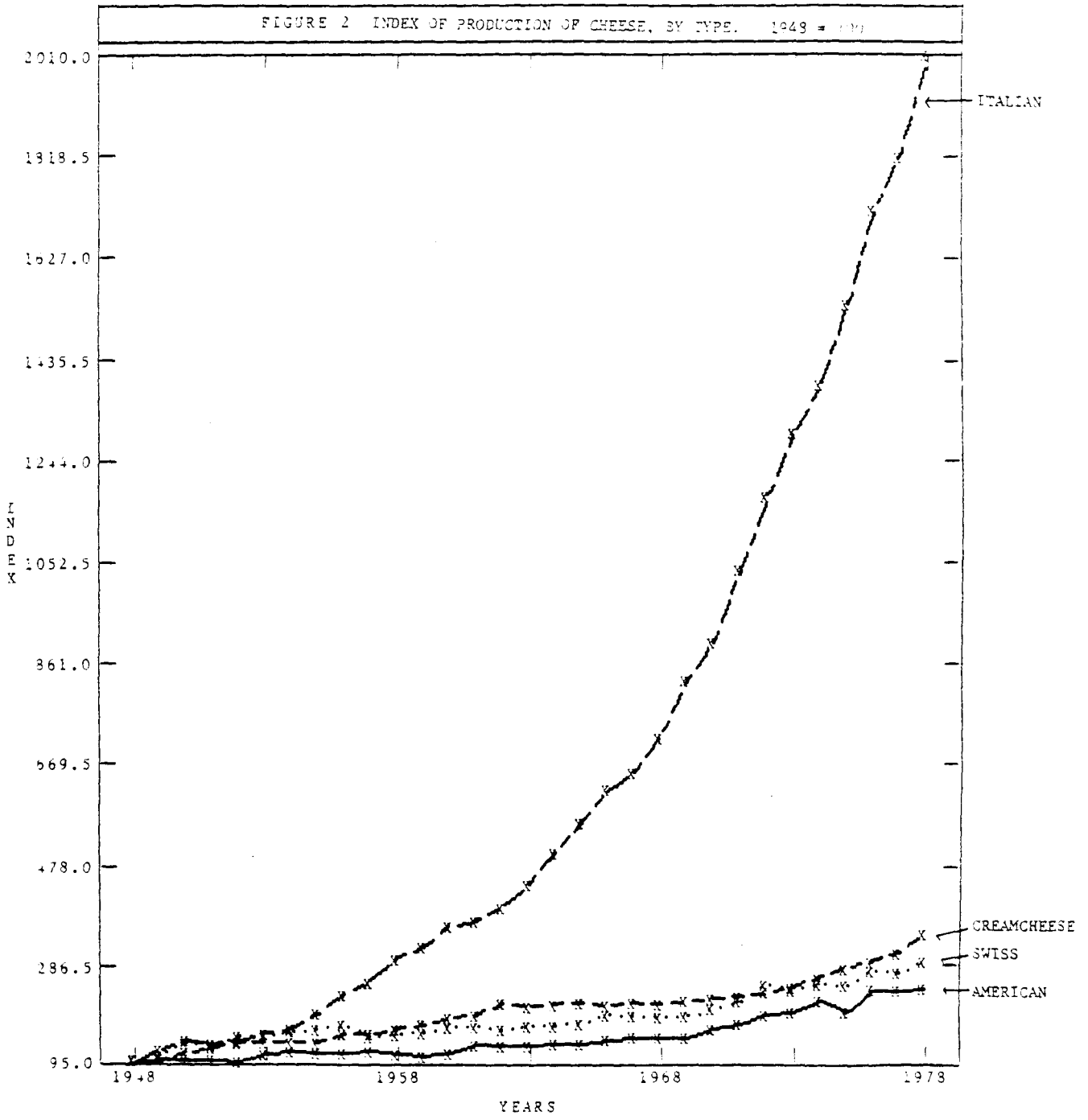
FIGURE 2 INDEX OF PRODUCTION OF CHEESE, BY TYPE.
2010.0
1818.5
1627.0
1435.5
1244.0
1052.5
861.0
669.5
478.0
286.5
95.0
INDEX
1948
1958
1968
1978
YEARS
ITALIAN
CREAMCHEESE
SWISS
AMERICAN

the same functions on every pound of product they handle. For example, a large cooperative may manufacture, assemble, and package some of the cheese it handles; some it will manufacture and assemble, but not package; and for some cheese, the cooperative may be strictly an assembler, buying cheese from small plants and reselling it to large packagers. Several tasks are performed at each level in the marketing chain, and several kinds of institutions and organizations are involved in performing each function. The channels for butter and cheese, the kinds of firms performing each function and approximate share of function by each type of firm are illustrated in Figures 3 and 4.

Manufacturers receive milk or cream and process it into butter and cheese. Cooperatives play an important role in the production of manufactured dairy products. In May 1977, cooperatives accounted for at least 60% of the butter and American cheese produced in Minnesota and Wisconsin. They have a long tradition of operating the manufacturing grade milk plants in these two states. Additionally, they have assumed a larger and larger role as suppliers of fluid grade milk to bottling plants. The large volumes of this milk not used for fluid uses must be channelled into manufactured dairy products. Most regional cooperatives operate their own manufacturing plants as outlets for milk not needed by bottlers. It assures the cooperatives of an outlet for the milk and increases their bargaining strength in selling milk to fluid processors. Outside the Upper Midwest large proprietary manufacturers of butter and cheese are also important in carrying out the market balancing functions.

Production of Italian cheese is somewhat different than for American cheese. The industry is fairly concentrated. Seven organizations, operating 15 plants, produce over 80% of Italian cheese in the Upper Midwest. Not surprisingly, some of these major manufacturers are major users or distributors of Italian cheese.

Italian cheese is produced mostly in private (non-cooperative) plants. Of the 28 Italian cheese plants surveyed by Lough, only three relatively small plants were cooperatives and only one was operated by a regional cooperative. 1/ The lack of cooperative interest in manufacturing Italian cheese is explained in part by the peculiar problems of marketing Italian type cheese. Buyers of Italian cheese prefer to be supplied by established manufacturers, who produce cheese of known and assured quality. This makes it hard for anyone to break into the Italian cheese business. It also is difficult to find a buyer who is willing to accept sharp seasonal

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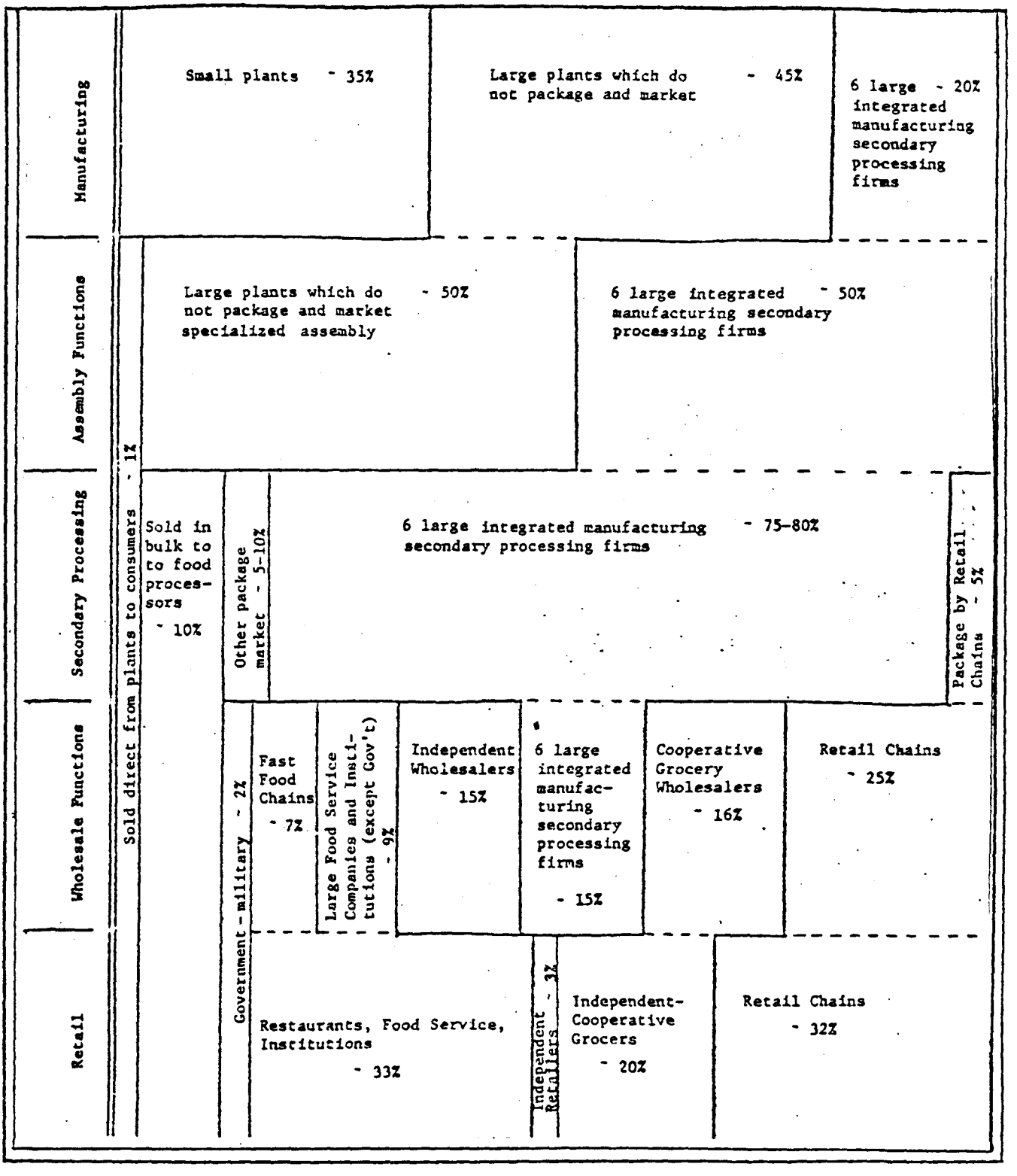
1/ Lough, Harold, The Cheese Industry, USDA, ERS, AER No. 294, July 1975, Webster Jones, Economics of Butter Production and Marketing, USDA ERS, AER No. 365, March 1975; Harold Lough, Dairy Manufacturing Plant Capacity and Utilization, USDA, ESCS, AER No. 427, July 1979.

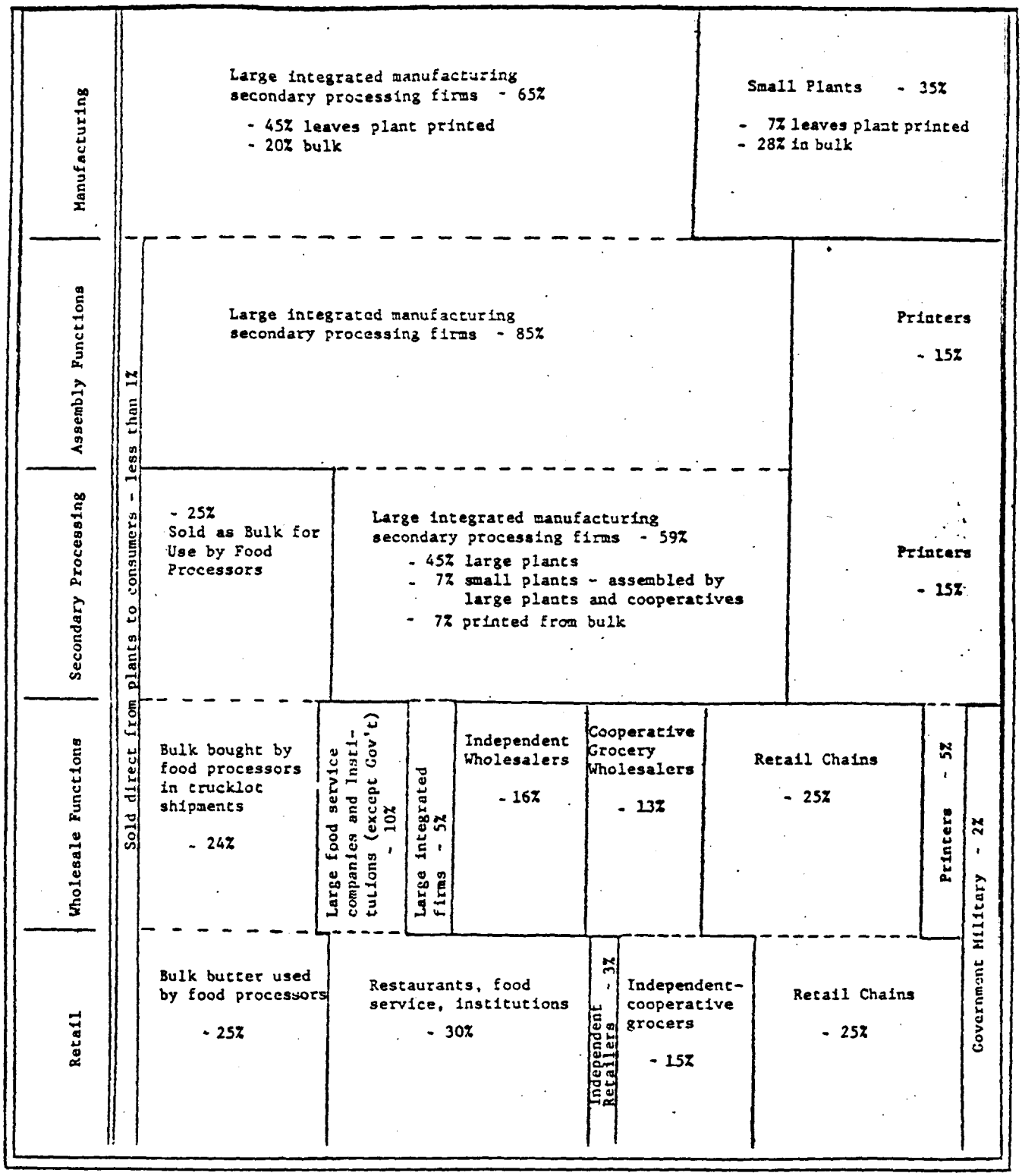
Figure 3. MARKETING CHANNELS FOR CHEESE IN THE U.S.
(Percentages show an approximate percent of all domestic cheese handled by each group.) [a]



[a]Approximations based on data assembled by ESCS, U.S. Department of Agriculture and information and discussions with industry personnel.

Figure 4

MARKETING CHANNELS FOR BUTTER IN THE U.S.
(percentages show a rough estimate of the percent of all domestic butter handled by each group.) a



[a]Approximations based on data assembled by ESCS, U.S. Department of Agriculture and information and discussions with industry personnel.

fluctuations in the quantity of cheese shipped. Lough's figures show that production of Italian cheese in May 1977 was only six percent higher than September production. In contrast, American cheese production in May was almost 50 percent higher than in September. A cooperative operating an Italian cheese plant would need to have a butter or American cheese plant as well, in order to handle the seasonal fluctuations in the quantity of surplus milk.

The number of plants making manufactured dairy products is continuing to decline. Changing techniques for milk hauling and handling since World War II have made larger plants more economic. The most important changes have been in techniques of milk transport—better roads, bigger trucks, faster loading and unloading of milk—which permit plants to receive milk from larger areas. Probably the most important advances in manufacturing have been automated closed vats and finishing equipment for cheese and continuous churns for butter.

Table 1. Plants Processing Dairy Products and Volume Per Plant, 1948-78

Product	1948	1978	Change 1948 to 1978	1948	1978	Change 1948 to 1978
	(Number)		(Percent)	(1,000 lb)		(Percent)
Butter	3,224	299	-91	375	3,325	+787
American cheese	1,750	507	-71	488	4,091	+738
Italian cheese	148	192	+30	294	4,559	+1,451
Swiss cheese	270	67	-75	262	3,125	+1,093
Total cheese	2,295	778	-66	479	4,524	+844
Evaporated milk[1]	137	23	-83	24,693	34,255	+39
Ice cream[2]	3,536[3]	1,062	-70	126[3] [5]	768	+510
Creamed cottage cheese	1,240	298	-76	201	2,927	+1,356
Nonfat dry milk	435	127	-71	1,567	7,247	+362
Total manufacturing plants	9,737[3]	2,457	-75	5,623[3] [7]	26,830	+377
Total fluid milk processing plants	8,527	1,300	-85			

[1]Beginning 1970 includes data for plants making condensed whole. [2]Regular plants, excluding counter freezers; total plants were 14,241 in 1948 and 11,933 in 1968; [3]1944 data. [4]1944 to 1975. [5]In gallons. [6]1961 data. [7]Whole milk equivalent.

Source: 1979 Producer Highlights, National Milk Producers Federation, Washington D.C., 1979.

Figures on plant size clearly document the shift to large plants. Average output of butter and cheese plants has grown about 800% during the past 30 years.

Average plant size does not tell the whole story. At present, butter and cheese plants can be categorized as "large" and "small" plants. Harold Lough, in his study of Minnesota and Wisconsin

manufacturing dairy plants in May 1977, found that 10 plants belonging to 9 organizations produced about two-thirds of the butter produced in the two states. 2/ Thirty-five cheese plants, owned by 21 organizations, produced over 65% of the American cheese produced in the two states.

Table 2. Share of Butter and Cheese Production According to Size of Plant in Minnesota and Wisconsin, May 1977.

	Large Plants			Small Plants			Total MN and WI	
	No.	Output per plant May 1977 (1000 lbs.)	Group as % of total prod. (%)	No.	Output per plant May 1977 (1000 lbs.)	Group as % of total prod. (%)	No.	Total prod. (1000 lbs.)
Butter	10	2870	66	81	182	34	91	43475
Cheese	35	2280	65	267	160	35	302	122434

Source: Calculated from information collected by Milk Market Administrators for use by Harold Lough in Dairy Manufacturing Plant Capacity and Utilization, op. cit.

Large firms differ from small single plant firms not just in size. The large firms usually perform the assembly function. Assembly functions include: gathering of product into carlot (railroad) quantities, grading, and storing products during the flush for release during shortage periods. Furthermore, assemblers absorb some of the risk of marketing--the risk that some products will spoil, and the risk that prices will drop during storage.

Assembly functions are performed by two types of organizations. One is the large manufacturing organization which produces enough product to make it economical for the firm to perform assembly functions for its own products before shipping carlots directly to secondary processors. Some large manufacturers, especially regional cooperatives, assemble butter and cheese from small plants and resell to a packager. The second type of assembly organization is the specialized secondary processor that buys products in less than carlot quantities from small plants. In these transactions, it is the secondary processor who performs the assembly functions.

2/ Lough, Harold, Dairy Manufacturing Plant Capacity. op. cit.

Once the product has been assembled, the path it takes through the marketing chain depends on the end use. Butter and cheese are sold to three different kinds of customers--retail, food service, and industrial. Industrial customers buy products in bulk form and use them in the manufacture of other food products. (Butter is used to make candy and baked goods; cheese is used to make frozen pizzas and cheese snacks, for example.) Products sold to industrial customers are usually shipped directly to the user in carlot shipments from either the manufacturing plant or a packaging company's warehouse.

Aging, cutting, printing, processing of cheese, and packaging are important secondary processing functions for butter and cheese sold to retailers and food service outlets. Cheese is aged or processed and packaged in small sizes (usually 1 pound or less) for retail customers. Food service customers--restaurants, institutions, delicatessens, and cheese shops--buy cheese in larger package sizes (up to 40 pounds).

In the cheese industry, there are six firms which perform the secondary processing functions for about 85-90 percent of the cheese made in the U.S.

Table 3. Marketing Shares--Cheese Marketing Firms

Firm	Estimated Market Share (percent)	Customer Emphasis
Kraft, Inc.	45-50	retail-branded
L.D. Schreiber	8-10	retail-private label and food service
Borden, Inc.	8-10	retail-branded
Swift and Co.	6-7	retail-private label and food service
Land O'Lakes	6-7	industrial
Clearfield Cheese	6-7	retail-private label

Source: Industry Estimates, published in Hayenga, W.A., Cheese Pricing Systems, NCIF Working Paper 38, University of Wisconsin, Madison, 1979.

All of these firms assemble cheese from small plants and buy cheese already assembled by large plants or organizations. Some also manufacture cheese. Hayenga estimates that 20% of cheese is produced in plants operated by large marketing firms. A small amount of cheese is packaged by national retail chains for sale in their own stores.

Butter also is packaged for retail sales (¼ pound and 1 pound prints) and food service uses (chips and reddies). The packaging of butter is done by two types of organizations. Increasingly, butter is packaged

directly from a continuous churn into retail and food-service size packages as well as bulk containers. Butter manufacturers package butter under their own label and will package butter on special order under the label of other companies. Pure packagers do not manufacture butter, rather they receive butter in bulk and print it into consumer size packages. The pure butter packager is becoming rare. Among those that remain are Berkshire (Chicago), and Zenith-Godley (New York). Some large butter manufacturers buy bulk butter and print it whenever their customers order more printed butter than the manufacturer has on hand.

The next function or link in the marketing channel is the wholesale function. It may be performed by the secondary processor or specialized food wholesalers. If performed by specialized wholesalers, the function includes buying cheese or butter from secondary processors, usually in carlot quantities; storing the product in a warehouse (and taking the risk of storage); and distributing the product, usually in less than carlot quantities. In some cases, the distribution is handled separately by a "jobber." Some food retailing chains, restaurant chains (including fast food outlets), and institutional food service organizations perform wholesaling functions. Independent wholesalers distribute butter and cheese to non-chain restaurants and grocers.

Special Order and Market Clearing Products

In discussing organization and pricing in the manufactured dairy products industry, it is useful to categorize products as "market clearing" products or "special order" products. "Market clearing" products are highly standardized products that can be readily sold to any of a large number of buyers. Therefore, the market can easily adjust to changes in supply or demand with relatively small price changes.

Currently, "market clearing" products are Grades AA and A butter in bulk, and American cheese in barrels. They are those products with the most elastic immediate-run demand curve. The relatively high elasticities of demand for bulk butter and barrel cheese are caused by several factors:

1. The products are easily storable at relatively low cost. Therefore if a wholesaler or secondary processor detect that the current price is a little low relative to expected future price levels, they will increase inventories, to reduce them in the future when price returns to "normal" or higher levels.

2. The market clearing products are produced in a "standard form" which may be bought by many potential commercial customers.

3. Under the dairy price support program, the Government stands ready to buy unlimited quantities of market clearing products of a specific quality at a specific price; the Government sells its accumulated stocks back at a fixed price above the purchase price.

"Special order" products are produced to specifications of the buyer. A buyer for printed butter, for example, will specify the label in which the butter is wrapped. A buyer of block cheese will have specific quality and moisture requirements, depending on how long the cheese is to be aged, and in what form (processed, flavored, natural, etc.) it is sold. A manufacturing plant will produce print butter and certain types of cheese only if the plant has a specific established buyer for the product.

Production and marketing of Italian cheese is typical of the special order cheese industry. Italian cheese is not a single homogeneous product; the category includes many disparate types of cheese. Even a single type of Italian cheese (mozarella for example) may be produced to several different specifications. Mozarella for sale directly to consumers will be of one quality and will have one set of characteristics; mozarella for sale to a fast food pizza chain will have another quality and another set of characteristics. Therefore, a plant does not make Italian cheese unless it knows where that product will be sold. There is no "spot market" for Italian cheese. Buyers buy from established known sellers, whose cheese making ability and reliability has been tested.

Swiss cheese is another speciality cheese, and the general structure of production and marketing is similar to that for Italian cheese.

Most cheese made in the Upper Midwest is American cheese. The American cheese industry includes both specialty cheese and market clearing products. Certain package styles, e.g., daisies, longhorns, midgets—are specialty package styles. Their manufacture is quite labor intensive and they are produced in a few relatively small plants. These styles are produced with a special market in mind—often this cheese is for aging. In quantity, these styles are not very significant; they comprise about 10-15% of the American cheese produced in the Upper Midwest.

On the other hand, American cheese in barrels is a market clearing product. When milk is not required to fill an existing order, it may be directed to a barrel cheese plant. Or, expressed differently, barrel cheese may be produced when the manufacturer does not know to what kind of customer the cheese will be sold. This is feasible because barrel cheese is a very homogeneous product. The various end uses of barrel cheese—processed cheese, cheese foods, cheese spreads, ready-to-eat foods—do not require that the cheese have any special characteristics.

Until recently, American cheese in 40-pound blocks was also a market clearing product. Improvements in handling and marketing efficiency of barrel cheese, combined with the decision of the Government to purchase cheese in barrels under the price support program, have made barrels an increasingly attractive container for storing and marketing uncommitted cheese. Forty pound blocks are increasingly manufactured to the specifications of a contracted buyer, and serve less and less as a market clearing product. During the 1978-1979 marketing year, CCC bought no block cheese under the price support programs; and bought 3.74 million pounds of barrel cheese.

In the future, 640-pound blocks may become an important form in which market clearing cheese is packed. At present, trading in 640's is restricted by the fact that different buyers have adopted different crate sizes and styles. The 640 crates are not interchangeable among the large buyers, as the 600-pound barrels are.

The butter industry is similar to the cheese industry in terms of market clearing and special order products. Print butter is produced to specifications of an established buyer ("specifications" here means especially the name on the package). Bulk butter can be easily stored and transported; can be traded between manufacturers or sold to printers; and can be printed to special order when the need arises.

Because there are so many outlets for bulk butter and cheese, these two products absorb the seasonal and short term fluctuations in milk supply and demand for dairy products. Production of these products will show, therefore, wide seasonal swings.

Nonfat Dry Milk and Dry Whey

Skim milk and buttermilk are byproducts resulting from the production of whey and butter and whey is the byproduct of cheese production. Because water is a major component of skim milk and whey, they are condensed or dried at or near the production plant to keep transport costs low and to make the products storable. These products are sold in powdered form.

Drying plants are typically very large operations. In May 1977, twenty-four plants belonging to 15 organizations produced 85% of all nonfat dry milk in Minnesota and Wisconsin. Average production of these plants was over 1.3 million pounds of NFDM during the month of May. In May 1978, average per plant production at whey drying plants in Minnesota and Wisconsin was over 1 million pounds of dry whey. The large drying plants are operated by large cooperatives (AMPI, Consolidated Badger, Land O'Lakes, Wisconsin Dairies, Mid-Am, NFO) and by large diversified food corporations (Borden and Beatrice). Of the 24 large NFDM plants mentioned above, 16 are owned by regional cooperatives, 2 by national food corporations, and only 6 by local cooperatives or independent proprietary plants.

Nonfat dry milk and dry whey may be sold directly to large users (candy manufactures for example) or to brokers who distribute the product to small users (for example, small bakeries).

II. PRICING ARRANGEMENTS

Transaction prices for butter and cheese are generally based on the prices established on the two national exchanges. In this section, we will examine the operation of these exchanges for arriving at prices and the adjustments that are made to exchange prices for prices in transactions throughout the market channel.

Commodity Exchanges

The important commodity exchanges in pricing dairy products are the Chicago Mercantile Exchange, where bulk butter is traded, and the National Cheese Exchange in Green Bay, Wisconsin, where there is spot trading in American cheese in blocks and barrels and in two grades of Swiss cheese. (Trading in Grades C and D Swiss was eliminated on November 30, 1979).

Commodities are traded on these exchanges under a strict set of rules. Quantity, package size, size of shipment, point of delivery, and terms of sale are all specified. Prices are quoted and published for the trading activities of members of the exchange. The quoted price is the price for the most recent sale or the most recent offer to sell at a lower price or bid to buy at a higher price. When these bids or offers occur, they form the basis for the reported prices. Bids, offers, and sales are posted during trading sessions on a blackboard, and the reporter needs simply to follow the trading in order to report an exchange price. No judgment on the part of the reporter is required.

Although cheese prices on the exchanges are specified for carlot shipments, they more nearly represent prices for unassembled product. Exchange prices are often the prices paid to manufacturing plants for unassembled product. The rules of the National Cheese Exchange require buyers to pay sellers an "assembly charge" (currently 2 1/4 cents per pound) to cover costs of assembly. Since the prices reported as cheese exchange prices do not include this assembly allowance, they necessarily represent a price for unassembled product. There is no equivalent provision on the butter exchange, thus the exchange price for butter more closely represents the price for assembled butter.

Very little butter and cheese is actually traded on the exchanges. In 1979, about 16 million pounds of cheese (one-half of one percent of total cheese production) and 3 million pounds of butter (three-tenths of one percent of total butter production) were sold on the exchanges. The low volume of trade on the exchanges has been a matter of concern to some students of dairy pricing who feel that the small volume makes the market vulnerable to manipulation which will influence all prices in trades which are based on the exchanges.

From time to time, there have been accusations that the exchanges were manipulated. In 1914, the Elgin (Illinois) Board of Trade was enjoined from publishing their butter prices as official. The reason given for the action was that the volume of trade on the exchange was so low that the price was subject to manipulation. A large cooperative was charged and found quilty of manipulating prices on the New York Butter Exchange for five days in 1946. 3/ In the early 1970's, another large cooperative claimed to have maintained cheese prices at an artificially high level for two weeks. By buying very heavily on the cheese exchange. it hoped to raise the price of cheese and thus to convince the government that an increase in milk price support was warranted and would not be too costly. 4/ Most recently, the Commodities Futures Trading Commission,

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3/ March, Robert, How Butter Prices are Established, unpublished notes for remarks before annual meeting of California Creamery Operators Assn., State Line, Nevada, June 14, 1976.

4/ Gould, R. J., "The National Cheese Exchange," in Pricing Problems in the Food Industry (with Emphasis on Thin Markets), M.L. Hayenga, Editor, N.C. 17 Mono. No. 7, North Central Regional Research Publication 261, University of Wisconsin, Madison, 1979.

in response to a complaint, found no evidence of manipulation of the Chicago butter market in late 1975 and early 1976 when the butter price dropped 27 cents in a two-week period.

Industry participants are generally satisfied with the exchanges. Any interested parties can observe the trading, sometimes identify the firms that are buying and selling, and, if they disagree with the opinions registered on the market, they can "put their money where their mouth is" and register their own opinion by making a bid or offer. As a practical matter, any industry participant can buy and sell on the exchanges. Members of the cheese exchange are actively involved in the cheese industry: the membership fee is less than a thousand dollars. On the Chicago Mercantile Excahnge, trading is carried out by brokers. Membership on this Exchange is very expensive (price of a seat currently may run to six figures); but for about one-tenth of a cent per pound, a broker will buy or sell a carload of butter for anyone with a line of credit. Because of the excahnge's visibility and because any interested party can register his opinion by trading on the exchanges, exchange prices are understood and generally trusted by those in the industry as good indicators of supply-demand conditions.

Transaction Prices

Exchange prices are almost exclusively used by commercial buyers and sellers at all trading levels as the basis for negotiating prices of butter (Grades AA, A, and B), Swiss cheese, and American cheese in barrels and Cheddar block. The block prices on the exchange are used widely in pricing of other American cheeses, specialty styles of Cheddar (longhorns, daisies, etc.), and other cheeses such as Italian, blue, etc.

The second element of product prices—the level of adjustment from the exchange price (usually called a "premium" if positive or a "discount" if negative)—depends on a number of different factors. Some of these factors such as quality and location are fairly obvious. High quality product will command higher premiums. Other things being equal, the closer the pricing point is to a major population center, the higher the premiums will be. Other factors influencing the level of the negotiated adjustment are less obvious.

- point in the marketing chain

- special services provided by seller

- non-money payments

- terms of sale

As butter and cheese move through the marketing chain, services are performed—assembly, grading, packaging, warehousing, etc. The firm providing them must be compensated. Therefore, we expect the amount of the adjustment to increase as more services are performed (i.e. as the

product moves through the marketing chain). For example, we would expect to see a cheese marketing firm pay a higher premium to a large manufacturer for cheese already assembled, than the premium paid to a small manufacturer for unassembled cheese. Similarly, we would expect a grocery chain, buying in carlot quantities, to pay a lower premium than that paid by a small grocer, who buys less than carlot quantities.

Prices are commonly established at four different levels in the marketing channel:

1. Price for less than carlot shipments of bulk products. (Manufacturing activities performed.)

2. Price for carlot shipments of bulk product. (Manufacturing and assembly activities performed.)

3. Price for carlot shipments of packaged product. (Manufacturing, assembly, and packaging activities performed.)

4. Price for less than carlot shipments of packaged product. (Manufacturing, assembly, packaging, and wholesaling activities performed.)

A price is established wherever ownership of a commodity is exchanged. Almost no amount of product will actually change hands four times at the four levels described above, with each activity performed by a different firm. But some transactions will occur at each level, and it is possible to measure a price at each of the four points in the marketing chain.

At any point in the marketing chain, the seller may perform "special services" or provide special product characteristics for the buyer. These services include: delivery on short notice; delivery of small shipments; delivery on certain days of the week. Consistency of quality, or quality control, also affects size of the premiums. Whenever the seller provides special services, the level of the adjustment to the exchange price will increase.

Conversely, the premium will be diminished whenever the buyer provides special services or makes non-money payments to the seller. There are several kinds of special buyer services or non-money payments to sellers, including:

1. The buyer may provide a guaranteed market by agreeing to accept all product manufactured at a plant.

2. The buyer may provide production process expertise to the seller.

3. The buyer may help the seller find facility and equipment financing.

4. The buyer may provide free, or at low prices, certain inputs into the production process.

Provision of a guaranteed market is a fairly common service in both the butter and cheese industry.

The second and third types of non-money payments listed above occur frequently in the cheese industry. When a large buyer seeks to expand its permanent supply of cheese, it may do so by finding an existing source of milk (a butter-powder plant for example) and encouraging that plant to convert to cheese production. In certain cases, the buyer will offer its cheese making expertise in designing the plant and identifying and correcting any quality or other problems that arise. The buyer also may provide or help arrange for financing of the conversion.

The fourth kind of non-money payment is more common in the butter industry. Buyers may provide packages which are filled and returned to them. In some cases, a large buyer may supply printing machinery as well as packages.

Terms of sale also influence size of premium. Where the seller offers credit, premiums will be higher. Terms of sale between large cooperative buyers and their own plants or cooperative-member plants may include a provision for an end-of-year or end-of-quarter check to the manufacturing plants. These checks distribute profits of the cooperative marketing operation to the member plants. Prices which are measured on a week-by-week basis will not reflect these payments.

Contract Sales and Spot Sales

Shipments of butter and cheese in bulk from manufacturing plants to packaging plants are either contract sales or spot sales. Large packagers of butter and cheese fill a large part of their needs from established sources. Some packaging-marketing organizations (especially cooperatives) operate their own plants. Most packaging-marketing organizations have arrangements with independent plants and cooperatives whereby the buyer will take all butter or cheese produced from the plant's own milk supply. These are "contract sales."

The quantity of butter or cheese required by a buyer during a period can never be anticipated exactly. When a buyer finds that established sources do not provide sufficient product to meet immediate short-run needs, the deficit is filled from one or more of three sources: depletion of the buyer's inventories; shipments from other large traders; and sales from plants whose production is not "committed" to a buyer. These last two are "spot sales."

In a contract, the buyer and seller agree to a level of premium or discount, to be added to or subtracted from the weekly exchange price. This agreed upon level will apply to all shipments from the seller to the buyer during a fixed period. In many cases, the contracts contain a quota

provision, under which the buyer may set a maximum quantity which will be accepted from the manufacturing plant during any week or month. It is not known how strictly these quota provisions are enforced. Several buyers indicated a willingness to accept product over the quota limit, as long as the manufacturing plant was not receiving "outside" milk from sources other than the plant's regular producers.

The contractual agreements between marketing firms and manufacturing plants are sometimes oral and sometimes written.

A buyer may have an oral understanding with a manufacturing plant that the plant will provide a specific amount of product monthly, or that the buyer will buy all butter or cheese produced at the plant, at a fixed premium or discount to the exchange. Large cooperative buyers, when crediting their own plants, or when reimbursing associated member plants, will pay a standard fixed amount over or under the exchange. Although there may be no written contract specifying the level of premium or discount, the conditions are closely followed.

The written contracts specify the conditions of delivery, the quotation to be used in setting the price and the premiums and discounts to be applied.

For spot shipments, either sales from an independent manufacturing plant to a packager or sales between large packaging firms, the premium or discount is negotiated for each shipment individually. Spot shipment premiums are the most volatile. The average level of these adjustments is almost certain to change from month-to-month in response to even very small changes in supply-demand conditions. The level of these adjustments, during periods of extreme price volitility may range as much as ten cents per pound over the course of a year. Spot transactions probably account for about 10% of plant shipments of butter and cheese in the Upper Midwest.

Premiums or discounts for oral contractual agreements may change every three to four months for cheese, or less often for butter. 5/ These changes will reflect, in part, changes in the cost of providing services not included in the base price, and, in part, changes in supply-demand conditions. The average of these premiums is also likely to change nearly every month (except when the government is buying heavily under price support), but the changes will not be as dramatic as changes in spot premiums. Month-to-month, we might expect to see changes of one to two cents per pound at a maximum. About 30% of the butter and 50% of the American cheese in the Upper Midwest is sold under this type of oral arrangement.

5/ Jacobsen, R. E., J. W. Hammond, and T. F. Graf, "Pricing Grade A Milk Used in Manufactured Dairy Products," Research Bull. 1105, Ohio Agricultural Research and Development Center, Wooster, Ohio, Dec. 1978, pp 39-41.

For shipments from member plants to large cooperative marketing agencies, the level of premiums or discounts may hold constant for a year or longer. Changes in this level will usually represent changes in the cost of providing services. For the most part, changing supply-demand conditions which are not immediately reflected in exchange prices are (for this type of transaction) reflected not in level of premiums, but in amount of quarterly or yearly "dividend" remitted to the manufacturing plant by the cooperative marketing agency. Probably 50% of butter and 30% of cheese in the Upper Midwest is sold in these types of transactions.

Premiums set in a written contract may be held constant for as much as five years. These premiums frequently vary among contracts by the cost of providing services. Sales in which premiums are fixed for long periods account for about 10 percent of the butter and cheese sold in the Upper Midwest.

The greater volatility in spot shipment prices relative to contract sales prices is explained by the product procurement and disposition procedures which are normally followed in the industry. A buyer who is short of bulk butter or cheese does not immediately go to the exchange and bid up the price; such an action would increase the price he paid for all product. Before going to the exchange, the buyer tries to purchase spot shipments either from small unattached plants or from other large sellers. The buyer may bid up the premium he is willing to pay in order to attract these extra shipments. The buyer also may offer higher premiums on newly negotiated short-term oral contracts in order to attract cheese which had been going to another buyer. When there are indications that tight supplies are not peculiar to a particular buyer, but are more general, buyers may go to the exchange. If no product is available at existing exchange price, the traders may bid up the exchange price.

The opposite price movements occur when supplies are plentiful and demand is slack. Plants with heavy inventories look to unload some product in spot shipments and premiums are reduced. If the conditions are general, the exchange price will drop.

Pricing Nonfat Dry Milk

Nonfat dry milk (NFDM) prices commonly rest at support levels, with CCC buying NFDM at a predetermined price. Thus the NFDM industry often regards the CCC support purchase price as the base price in negotiations. Adjustments are made for location or special services (such as shipments in less than carlot sizes). Whenever NFDM prices rise above support levels, a certain amount of confusion ensues in the pricing of NFDM. Industry participants look to the Dairy Market News reports for an indication of market prices at the same time the Dairy Market News reporters are canvassing industry participants about prices paid and received in trade. The lack of sources of solid information on market conditions leads to talk of

setting up a NFDM exchange, but the industry enthusiasm for this idea subsides when NFDM prices return to rest at support levels.

III. WHOLESALE PRICES SERIES FOR MANUFACTURED DAIRY PRODUCTS

The dairy product prices that result from trading on the commodity exchanges are just some of the "wholesale" prices that are reported for these products. "Wholesale" prices are reported for three levels in the market channel. They are:

- prices received by manufacturing plants
- prices received for assembled products
- prices received by wholesalers

Plant prices series are measures of prices received by manufacturers. A Central States price series for nonfat dry milk and dry whey are reported weekly by Dairy Market News, a report of the Market News Service of the U.S. Dept. of Agriculture. The information for these series is collected by telephone contacts with about 12 buyers and 16 sellers of nonfat dry milk and about 19 buyers and 26 sellers of dry whey. These firms are located in Missouri, Nebraska, Iowa, Minnesota, and Wisconsin. The prices are reported as a range for each week. A monthly average price is also computed and published in the Dairy Market News.

The Economics and Statistics Service (ESS) reports two f.o.b. NFDM price series. The Chicago Area NFDM price is a quantity weighted average of prices received, from the 26th of the previous month to the 25th of the current month, by all NFDM manufacturing plants in Iowa, Michigan, Minnesota, and Wisconsin. This price is used in calculating the butter powder snubber price under federal orders and the price series is carried monthly in the Dairy Market News.

The ESS also publishes, in the monthly Dairy Products, a national f.o.b. plant price series for NFDM and dried whey. This price series is a quantity-weighted average of prices received for products shipped during the calendar month by all plants in the United States which manufacture NFDM and dried whey. For both products, prices are published for human food use and animal food use. These prices and the Chicago area prices are computed from information submitted by plants to ESS.

All three sets of price series for NFDM and dried whey may include sales by the plant in carlot and trucklot quantities. To the extent that prices for such shipments are included, these plant price series are a mixture of "plant prices" (paid by packaging-marketing companies for unassembled products) and "assembly point prices" (paid to large manufacturers for products already assembled in carlot quantities).

The exchange prices are for bulk butter and cheese which has been assembled into carlot shipments. However, the cheese price quotations do not include an allowance to cover cost of assembly. Exchange prices are determined in trading which takes place every Friday at the Chicago Mercantile Exchange (for butter) and the National Cheese Exchange in Green Bay. As mentioned above, the exchanges are open forums where any interested party can buy or sell in order to register an opinion about the price levels, and where trading is subject to a well defined set of rules and terms.

The assembly point prices for cheese measure the price level in transactions between the large organizations performing assembly functions. These prices represent prices paid for spot shipments of cheese in trucklot quantities. For barrel cheese, the spread between the assembly points price and the exchange price will widen to more than the amount allowed for assembly by the exchange when supplies are tight and will narrow to less than the assembly allowance when supplies are heavy. For cheddar blocks and other types and styles whose prices are based on the cheese exchange, the spreads between assembly points price and exchange price respond in similar ways to changing supply and demand. The spreads may be considerably larger than the assembly allowance because of special characterisitcs of the cheese sold at assembly points. This price is reported as a range of prices on a weekly basis in Dairy Market News. A monthly average of the prices is also computed and reported in Dairy Market News.

The Chicago Wholesale Selling Price for butter was originally intended to measure prices of bulk butter traded in the city of Chicago. When there was an active butter printing industry in Chicago, it was fairly easy to pick up information on which to base this price measure. However, bulk butter trading in Chicago has disappeared along with the printers. Now the only regular trading in bulk butter in Chicago is sales of bulk butter in samll shipments from wholesalers or brokers to small bakeries and candy and food manufacturers. There are also carlot shipments of butter into Chicago wholesalers, but most of the butter in these transactions is print butter. The Dairy Market News reporters, in order to broaden the coverage of the wholesale butter price, now include information on prices for which bulk butter is traded in the Wisconsin and Minnesota area. These prices are adjusted for location to get a Chicago bulk butter price. Consequently, this series is more closely akin to an "assembly points" price for butter, adjusted for location to a Chicago price. The Chicago wholesale selling price for butter is reported as a range of prices. When the market rests at supports, this range includes the CCC purchase price for butter in Chicago.

A variety of price series in the Dairy Market Statistics measure prices paid by retailers, restaurants, and food serivce institutions for print butter and packaged cheese in less than carlot shipments. These price series include print butter prices (Eastern Area, Central States, and California), foreign cheese prices (New York, Chicago, and San Francisco), and wholesale selling prices for cheese (Eastern Area, West Coast cities, and Midwestern Area). The price measures are calculated from data collected by phone and

from price lists of major marketing companies and wholesale distributors. Weekly price ranges and the monthly average prices are reported in Dairy Market News.

IV. USES OF PRODUCT PRICE MEASURES

Measures of product prices are used both as indicators of the value of dairy products and as indicators of the value of milk used in manufactured dairy products. As noted above, published price series are used as a basis for negotiating prices in trades and are used to analyze the supply-demand conditions for manufactured dairy products. Some Federal milk orders have used product price series to calculate the pay prices for milk. Some current consideration is being given to using product price formulas in conjunction with the M-W price to obtain an estimated value of milk for manufacturing which might then be used as a basis for pricing milk in all classes under federal orders.

The manufactured dairy products industry, the fluid milk industry, and government forecasters use product prices as an indicator of changes in supply and demand conditions. Firms dealing in manufactured dairy products use product prices to help plan inventory and production levels and to estimate the general level of prices paid to producers. Firms dealing in fluid milk products view changes in product prices as early indicators of changes in the M-W series which is the basis for minimum prices under federal orders. Government economists attempting to estimate future milk supply situations use product prices in their analyses.

Both the price support program and the federal milk order program use product price measures to estimate the value of milk to manufacturing plants. The historical relationship between product prices and milk prices received by farmers is an important factor in determining make-allowances and purchase prices for dairy products under the price support program. Current product prices are monitored to see whether the price support program is effective in setting floors under product prices (although the ultimate test of the effectiveness of the price support program is whether or not the target price for manufacturing grade milk is being paid on average).

In federal orders, the Chicago wholesale selling price for butter is used to calculate the value of butterfat and set butterfat differentials. In the past, formulas have used product price measures to fix prices for milk used in manufactured products in Federal orders.

Currently, the federal order minimum prices for milk in all uses is based on the "M-W price series," which measures the competitively determined price paid for Grade B milk in Minnesota and Wisconsin. As the number of

Grade B farmers dwindles; those concerned with the operation of federal orders are looking for an alternative to the M-W price as a mover of class prices. One alternative that has been suggested is the product price formula procedure which computes the value of milk in manufacturing as follows. 6/ First, the gross value of milk used to make butter-powder and of milk used to make cheese are computed by multiplying yields (pounds of product per 100 pounds of milk) by product prices. Second, net values are calculated by deducting processing costs. Third, a value of milk to manufacturing is computed as the weighted average of the value of milk used in cheese and in butter-powder (the weights are the percentages of milk used to manufacture each of the two products—butter and cheese).7/

The pros and cons of using product price formulas or a competitive pay price series as a basis for pricing milk under federal orders are discussed in Jacobsen, Hammond, and Graf. A competitive pay price, such as the M-W directly measures the value of milk to manufacturing plants. A product price formula measures the value indirectly and introduces the problems of accurate measurement of product prices, yields, and make allowances. But the competitive pay price alternative is not without drawbacks.

A major criticism of the M-W price series for use in federal order pricing is that it is not available till the fifth day of the following month. Class II and Class III prices for each month in federal orders are fixed at either the M-W price for that month or the M-W price for that month plus a small differential. The Class I price for each month is set at the M-W price for the second preceding month plus a fixed Class I differential. Thus, for manufactured dairy products, firms are selling products without knowing the exact price for the milk used in those products. This is particularly true of the soft manufactured products. For Class I prices, the two month lag can and sometimes has resulted in Class I prices moving in the opposite direction of that implied by basic supply-demand conditions.

6/ Jacobsen, R. E., J. W. Hammond, and T. F. Graf, "Pricing Grade A Milk Used in Manufactured Dairy Products," Research Bul. 1105, Ohio Agricultural Research and Development Center, Wooster, Ohio, Dec. 1978, and Milk Pricing Advisory Committee, "Milk Pricing Policy and Procedures, Alternative Pricing Procedures, Part II," U.S. Department of Agriculture, March, 1973.

7/ This third step is necessary only if butter-powder and cheese are priced in the same class. If federal order markets adopted a four-class system with different classes for butter-powder and cheese, separate formulas could be used to compute the class prices in those two classes.

To reduce the problem of the pricing lag in the M-W prices, it has been suggested that product prices could be used to compute a preliminary estimate of the M-W price. Weekly and daily product prices as described above are available immediately. Since these product prices largely determine what plants can pay for milk, it seems reasonable to use them to estimate what plants will pay for milk. Butter, nonfat dry milk, and cheese are the major users of manufacturing use milk. Thus, changes in product prices for the early part of any month from the preceding months can be used to adjust the preceding months manufacturing milk price to estimate the current months price.

A proposal by industry groups for a preliminary estimate of the M-W series uses product prices for the first 15 days of the month to compute a gross value of a hundredweight of milk to processors. 8/ The difference between this gross value and a computed gross value for the first 15 days of the preceding month is used to adjust the actual M-W price for the preceding month. This preliminary estimate of the M-W series could be available a day or two after the 15th of the month for which it is computed. It would permit pricing of Class I milk on the basis of the preliminary M-W estimates for the immediately preceding month rather than the two month delay now required. Processors of Class II and III products would have knowledge of raw product acquisition price for part of each month prior to the time that they are manufacturing and selling milk products.

The preliminary estimates of the M-W price would not precisely duplicate the M-W price. Nevertheless, if the annual average of these prices do not provide excessive returns to manufacturing plants under federal orders or cause those plants to operate at a loss, then they may be an acceptable alternative to the current M-W price.

In the remainder of this paper, we will examine existing product price series with respect to using them in product price formulas. We will also consider the feasibility and desirability of developing a new product price series for use in federal order pricing. This appraisal should be useful to policy makers in the event that the M-W price becomes unacceptable for this use.

8/ As contained in notice of hearing for "Milk in the St. Louis-Ozarks and certain other marketing areas," signed July 10, 1980, and published in the July 15, 1980 Federal Register (45 FR 47432); and a supplemental notice of hearing issued July 21, 1980, and appearing in the July 25, 1980, Federal Register (45 FR 49584).

V. USING PRODUCT PRICE SERIES FOR FEDERAL ORDER PRICING

Desirable Characteristics

Before we can evaluate the existing measures of product prices for use in developing measures of the value of milk, we need to identify those characteristics a product price measure should have if the measure is to be used in product price formulas. An ideal price measure should be:

- a representative average of prices paid during the month
- timely
- free from danger of manipulation
- an accurate reflection of changes in the actual level of prices in trade
- consistent from month-to-month in definition of the price being measured.

The government should have a single number, rather than a range of prices, to use in product price formulas. If the price measure is reported as a range, and nothing is known about the distribution of prices within the range, an average price cannot be calculated. The Dairy Market News, at times, has carried a "mostly" price to indicate the most common price within a range. In order to know that the price is reasonably representative it would be preferable to compute a price which is a weighted average of prices paid or received for a product.

Product price formulas also require measures of monthly average product prices which can be made available quickly. Currently, the M-W price series and the butterfat differentials for a month are published on the fifth of the following month. This allows as few as two work days, in some instances, for preparation and publication of the prices. To be no less timely, a product price formula replacement for the M-W would be published on or before the fifth, and the product prices would have to be available (occasionally) less than two days after the end of the month. This could be a problem if the prices are reported in writing or checked by auditors.

It is vitally important that the product price formula measure be one which cannot be influenced unfairly by some individual (or group) to his (or their) advantage. Since product price formulas might be used to set prices for all milk priced under federal orders, it is important that the entire dairy industry be confident of the credibility of the price measure. In measuring prices, we must take care to avoid even the appearance that the price measure can be manipulated.

People in the dairy industry perfer price measures determined in open trading (such as Exchange prices) to price measures based on telephone conversations or confidential data. However, the latter type of price measures may be perfectly acceptable for administration of product price formulas. Government users, if they are suspicious about a reported price, can take a closer look at the raw data, or can discuss openly their suspicions with the people that collect the data and put the price series together. If the confidential price data are carefully monitored, the resulting price measure should be perceived by the industry as being an "honest" measure of product prices.

The monitoring of reported price data could be done by auditing the books of processing and manufacturing plants to verify prices paid and received. Milk market administrator's offices are uniquely suited to perform such auditing, since these offices already audit milk receipts and disposition at many of these plants.

As to the accuracy of a product price measure, it is more important that a price series accurately measure changes in actual prices. Once a product price formula has been devised which generates a good measure of the value of milk, changes in the value of milk will be reflected in changes in product prices. From time to time, the formula itself (processing margins, the relative weights given in the formula to milk going to the various products, yield figures) will need to be reestimated. But the underlying logic of a product price formula is that these elements will remain constant for an extended period of time. Yields and margins are the "parameters" in the product price formula. It is the product prices that are the "variables," which may change from month-to-month, and which are the primary "movers" of the computed value of milk.

If we are to avoid monthly estimation of the parameters in the product price formula, we must have a measure of product prices which remains consistent from month-to-month with respect to the measures of yields and processing costs. For example, if the processing costs and yields are estimated for carlot shipments of barrel cheese, the price measure should be for carlot shipments of barrel cheese. Therefore, the product must be very clearly identified. We should specify product quality, package size and style, shipment size, pricing point, type of transaction, and special services included in the price. If a product is not well defined, a reported price change may reflect a change in the definition of the product rather than a change in supply-demand conditions.

A price measure for use in calculating the value of milk should be defined as broadly as possible. The M-W price series reflects prices paid for Grade B milk by plants making a wide variety of manufactured dairy products. It might seem, therefore, that an ideal product price formula to replace the M-W would be based on product price measures which reflect prices received for all manufactured products. Surely, a formula built around such a measure of product prices would give the most

accurate and complete estimate of average value of milk to manufacturers. This could create an additional data problem for computation of the price. For example, for a price series which measures a price for a very broad group of products; the product mix—the relative amounts of print butter, bulk butter, barrel cheese, Italian cheese, etc.—could change from month-to-month. The quantities and changes in them would be required to determine the proper weighting of each price in the average.

For federal order pricing of producer milk the price measure also should be measured at a point in the marketing chain which is as close as possible to the manufacturing firm, preferably the average of prices received by the plant. As a product moves through the marketing chain—as more and more services are added to make the product a "consumer" product—its price becomes less indicative of milk value to the original manufacturing plant. Using product prices that are as close as possible to the processing plant reduces the possibility of including changes in product prices that have no impact on what plants actually pay for milk.

Note that the characteristics which we would like to see in a product price series for use in federal orders milk pricing are in some cases characteristics particular to that use. For example, in a price series to be used as a basis for price negotiation, industry representatives reported that they would prefer a price measure reported weekly, determined in a public forum, and representing prices paid in spot transactions only. For federal order pricing, an average monthly price is more appropriate.

Acceptability of Existing Product Price Series

How acceptable are the existing wholesale dairy product price series for use in ederal order product formulas? The pro's and con's for federal order pricing of each of the major price series for butter, cheese, and dry milk products are presented in Table 4. The information in the table indicates that an advantage of the exchange prices for butter and cheese is that the product is well defined. Other price series are not as clearly defined as to product characteristics, terms of sale, etc., which affect the price level. Thus, the user has no way of knowing the premium or discounts that are included in these prices. Exchange prices have the advantage that they result from public trading, therefore, there are few problems of determining the accuracy or honesty of a price quotation. All the other price series are based on prices reported by firms to market news reporters or to statisticians. Most of the prices reported voluntarily require judgment on the part of the reporter in arriving at a price. Plant records are not audited, thus, there currently is no determination of the accuracy of the reports.

There are some shortcomings of all these price measures as indications of the value of milk for federal order pricing. This does not mean that the prices are useless and their collection is unnecessary. Desirable characteristics for a series for federal order pricing may be different than desirable characteristics for other uses. The industry is particularly reliant on a price series that reflects the basic supply-

Table 4. Advantages and disadvantages of selected dairy product price series for use in federal order pricing formulas.

Price	Description	Pro's and Con's
BUTTER:		
1. Chicago Exchange	- Grades AA, A, B - Bulk packages (60 lb. blocks) - Carlot shipments - F.o.b. Chicago - Price is reported weekly in Dairy Market News, measures price established in Friday trading on the exchange - Reported as a single price	Pro's: - Reported as a single price - Available immediately every Friday - Price for a well defined product Con's: - Thin market—few traders - Doesn't reflect changes in average premiums paid and received
2. Chicago Wholesale Selling Price a/	- Grades AA and A - Bulk packages - Carlot shipments - F.o.b. wholesalers dock, Chicago - Reported in Dairy Market News, prices for Tuesday, Thursday, and Friday - Measures average price received reported by Chicago wholesalers and asking price for LTL shipments into Chicago by major manufacturers in Wisconsin. - Reported as a range of prices for weekly reporting (except when government is buying at support, at which time butter support price for Chicago is reported). A monthly average price is computed and reported for each month.	Pro's: - Available on a "same day" basis Con's: - Thin market. Because there is very little butter changing hands in Chicago, reporters collect prices negotiated in sales "up-country" (in Wisconsin). These prices are adjusted for transportation costs into Chicago. - Wholesale selling price does not accurately reflect week-to-week changes in the level of premiums for butter, in part because these premium changes turn up in quarterly or yearly rebates or adjustments. - prices are collected by phone and not verified.

Table 4 (Con't.)

CHEESE:		
National Cheese Exchange	- Wisconsin State Brand, USDA Grade A, moisture premium basis, for cheddar - Grades A & B Swiss - 40-pound blocks, barrels, blocks of Swiss - Carlot shipments - F.o.b. Greenbay, Wisconsin - Price reported weekly in Dairy Market News, measures price established in Friday trading on the exchange - Is reported as a single price	Pro's: - Reported as a single price but not a monthly average - Available immediately every Friday - Price measured for a well defined product - All sides of the market are represented Con's: - Doesn't reflect changes in average premiums paid and received
Wisconsin Assembly Points a/	- Wisconsin state brand, USDA Grade A, moisture premiums basis, cheddar - Barrels, 40 pound blocks, daisies, longhorns, midgets - F.o.b. Wisconsin assembly points - Price reported weekly in Dairy Market News measures price in trading during the week preceding the Friday - Reported as a range of prices for weekly reporting. An average monthly price is computed and reported once each month	Pro's - Available weekly - To some extent, reflects changes in premiums paid and received Con's: - Price is not for a well defined product; special services and transport are not specified - Price data are collected by phone and not verified;

Table 4 (Con't.)

F.O.B. Plant Prices b/	- Nonfat dry milk-human food -animal food - Dried whey-human food -animal food - No package size specified - No shipment size specified - F.o.b. manufacturing plants in the U.S. - Data submitted in written reports to ESS. - Price measured for each calendar month - Published in Dairy Products - Reported as a single price weighted average of prices received	Pro's: - Measures average price received by all plants in the U.S. - Reported as a single price Con's - Not well defined as to product specifications - Not available before end of each month

a/ Price information reported by Dairy Market News reporters is to the extent possible, cross checked with buyer or seller contracts and questionable price information which cannot be verified to a reporter's satisfaction, is excluded. Reporters try to obtain information on volumes as well as price in order to appraise the adequacy of coverage and evaluate prices and trends. However, volumes are not regularly obtainable.

b/ Price information reported by ESS (Crop Reporting Board) represents a weighted average of monthly volumes sold and average monthly prices received by all manufacturing plants.

demand conditions at the time of transaction. The weekly price quotations of the exchanges meet this requirement more closely than other price series. On the other hand, the exchange prices do not include premiums or other adjustments.

The Relationship Between Product Prices and M-W Prices

How significant are product prices in the determination of manufacturing milk prices? In competitive markets, long-run product prices should equal costs of all inputs. Since milk accounts for a large share of total product price, then one would expect a close relationship between product price movements and milk price movements. If there is, in fact, a close relationship between the price movements, then a product price formula should be a good substitute for the M-W series in federal order milk pricing.

To determine the degree of relationship between product prices and the M-W milk prices we computed statistical correlations between them. Four correlations were computed. Two of them measured the relationship between butter and nonfat dry milk prices and the M-W milk price. Two of the correlations measured the relationship between cheese and dry whey prices and the M-W milk price. For one butter-powder correlation, the Chicago wholesale bulk butter price was used. In the other, the eastern cities print butter price was used. The butter prices should represent trading at two different levels of the marketing channel, (1) bulk butter sales by assemblers and (2) sales of print butter by secondary processors. The result of these correlation analyses for the period, Sept. 1976 through Feb. 1980, are as follows:

$$P_{M-W} = \underset{(-3.17)}{-1.2088} + \underset{(2.41)}{2.2106}P_{wb} + \underset{(.007)}{11.4495}P_{ndm} \qquad (1)$$

$$R^2 = .97431$$

$$P_{M-W} = \underset{(-.92)}{-1.5014} + \underset{(10.56)}{1.2215}P_{rb} + \underset{(.55)}{13.0474}P_{ndm} \qquad (2)$$

$$R^2 = .97268$$

where

P_{M-W} is the monthly Minnesota-Wisconsin manufacturing milk price, in \$/cwt.

P_{wb} is the monthly average Chicago area wholesale bulk butter price, in \$/lb.

P_{rb} is the monthly average Eastern cities print butter price in \$/lb., and

P_{ndm} is the monthly average Chicago area f.o.b. plant price for nonfat dry milk in $/lb.

The numbers in parentheses are the t-tests of the coefficients.

The M-W price was also regressed against cheese and dry whey prices. The results for the period January 1977 through June 1980 are as follows:

$$P_{M-W} = \underset{(-.86)}{-0.170759} - \underset{(-.89)}{0.0057806}\, P_{wh} + \underset{(63.12)}{0.094274}\, P_{ex} \qquad (3)$$

$$R^2 = 0.9912$$

$$P_{M-W} = \underset{(1.86)}{0.791902} - \underset{(-.68)}{0.00991939}\, P_{wh} + \underset{(27.43)}{0.082315}\, P_{ap} \qquad (4)$$

$$R^2 = .9553$$

where:

P_{M-W} is the monthly Minnesota-Wisconsin manufacturing milk price in dollars per hundredweight.

P_{wh} is the price for edible dry whey, f.o.b. Wisconsin plants, in cents per pound.

P_{ex} is the monthly average Exchange price for cheese in 40 lb. blocks in cents per pound.

P_{ap} is the monthly average assembly point price for cheese in 40 lb. blocks in cents per pound.

The regressions indicate a high degree of correlation between monthly milk prices and milk product prices. For the butter-powder industry, 97.4 percent of the variation in the M-W series was associated with variation in the Chicago area wholesale butter price and the Central States price of nonfat dry milk. Using the print butter price instead of the bulk wholesale price resulted in a decline in the correlation by only .2 percent to 97.2 percent.

The coefficients on the price variables and the intercepts have the expected signs in equations (1) and (2). The price coefficients indicate that the M-W price increases with increases in product prices. The negative intercept can be considered as an estimate of the processing cost which needs to be deducted from gross product value per hundreweight of milk.

If product prices are fully reflected in the M-W price we would expect the coefficients in equation (1) and (2) to equal the butter and

nonfat dry milk yields per hundredweight of milk, about 4.3 pounds of butter and 8.9 pounds of nonfat dry milk. Both equations have coefficients that differ considerably from those values. They indicate that butter prices have not been fully reflected in the M-W price, while changes in nonfat dry milk prices generate even larger increases (hundredweight equivalents) in the M-W price.

The regression with cheese and whey prices yield some unexpected results. The sign of the whey coefficients is opposite of the expected sign, but in both regressions the coefficient is not significantly different from zero. Because whey can be costly to dispose of, it is not surprising that the whey price is not positively related to the prices farmers receive. More surprising, at least at first glance, is the fact that the intercept, which should represent processing margins, is not significantly different from zero in regression (3), and is significant, but positive, in regression (4). Part of the reason for this is that the M-W measures prices paid by all kinds of plants for manufacturing grade milk. As the demand for cheese has burgeoned, the M-W occasionally may represent a price lower than the price paid by all manufacturing milk plants.

Though values of some of the coefficients are inconsistent with product yields, The high degree of correlation between milk prices and milk product prices indicates that product formula prices for federal order pricing would lead to prices that are simular to those now generated with the M-W prices. The pricing formula could be one or a combination of the estimated regression equations as estimated above. One could also derive a formula that reflects actual product yields and processing costs. This approach will be examined in the next section.

Product Price Formulas

To illustrate the impact of a product price formula for federal order pricing, we generated prices with a number of alternative product prices. A comparison of these prices is found on the attached tables.

The butter formula used is:

formula price = (4.2 times butter price) plus (8.2 times Central States NFDM price) minus (processing costs)

The cheese formula used is:

formula price = (9.45 times cheese price) plus (5.5 times Wisconsin dry whey price minus 8¢) minus (processing costs)

The formula prices are in dollars per hundredweight of milk, the product prices are in dollars per pound and processing costs are in dollars per hundredweight of milk. The combined formula is a weighted average of a butter formula price and a cheese formula price, the weights being the percentage of milk used to produce each product.

Processing costs were calculated as follows for each formula price. For the period December 1976 through November 1977, the gross value of products was determined (the gross value is the formula price without subtracting out any processing costs). The apparent margin was calculated for each of these twelve months by subtracting the M-W from the gross value. A simple 12 month average of apparent margins was calculated. This average processing cost was inflated by the index of wages paid in food processing industries (base period December 1976-November 1977=100) in order to get the processing costs for each month.

Although the formulas do not duplicate the M-W prices exactly, some yield average prices that in the long run are quite similar to the M-W. A cheese formula or a combined butter-and-cheese formula appear to do the best job of duplicating the competitive M-W price series (Tables 5, 6, and 7). The butter formula using the Chicago mercantile price for Grade AA butter consistently yielded prices below the M-W series for the period January 1978 through June 1980. It fell as much as $.44 and averaged $.25 per hundredweight below the M-W price.

A formula using the Green Bay Cheese Exchange barrel price averaged the M-W price for the 30 months, Table 6. It ranged from $.37 below to $.44 per hundredweight above the M-W price. Formulas using the Wisconsin assembly point block prices and the assembly point barrel prices also yield prices that very nearly averaged the M-W price, Table 6.

Of the combined butter-cheese formula price the formulas using the wholesale block cheese price and the wholesale butter price did the best job over the long-run of duplicating the M-W price. It averaged $.03 per hundredweight less than the M-W prices for the 30 months, Table 7. However, the formula prices ranged from $.39 below to $1.17 per hundredweight above the M-W price.

VI. DEVELOPING A NEW PRICE SERIES FOR USE IN PRODUCT PRICE FORMULAS

If the existing manufactured dairy product price series prove to be unsatisfactory for federal order product price formulas, a new product price series could be developed. An f.o.b. plant price series has been proposed as having desirable characteristics for formula pricing. Jacobsen, Hammond, and Graf say, "For product price purposes, it is desirable that monthly weighted average prices, f.o.b. plant be obtained for the products."9/ The series would be computed from prices reported by plants. The advantages of such prices are:

9/ Jacobsen, R. E., J. W. Hammond, and T. F. Graf, op. cit.

Table 5. Butter formula prices for manufacturing milk using Chicago Mercantile Exchange prices and Chicago area wholesale selling prices for Grade AA butter, January 1978-June 1980. a/

Month	Formula Price for Milk Using: Exchange AA Butter Price	Wholesale AA Butter Price	Minn.-Wisc. Mfg. Milk Price (3.5% butterfat)
	- - - - - - - - - - $ per cwt. - - - - - - - - - -		
1976			
January	8.73	8.76	8.91
February	8.72	8.75	9.00
March	8.91	8.86	9.09
April	9.19	9.20	9.24
May	9.20	9.23	9.25
June	9.23	9.23	9.26
July	9.37	9.29	9.33
August	9.68	9.66	9.68
September	9.80	9.78	9.90
October	9.90	10.39	10.18
November	10.24	10.56	10.44
December	10.18	10.68	10.60
Monthly Avg.	9.43	9.53	9.57
1977			
January	9.84	9.83	10.55
February	9.82	9.79	10.52
March	10.15	10.09	10.59
April	10.34	10.34	10.63
May	10.29	10.33	10.67
June	10.32	10.33	10.76
July	10.46	10.41	10.87
August	10.88	10.82	11.09
September	11.04	10.99	11.32
October	11.08	11.06	11.25
November	11.12	11.07	11.27
December	11.10	11.07	11.34
Monthly Avg.	10.54	10.51	10.91
1978			
January	11.01	10.99	11.37
February	11.09	11.03	11.35
March	11.19	11.13	11.59
April	11.48	11.58	11.68
May	11.61	11.64	11.66
June	11.66	11.66	11.68
January thru June Average	11.34	11.34	11.56
30 month Average	10.25	10.29	10.50

a/ All formulas use the Central States nonfat dry milk price.

Table 6. Cheese formula prices for manufacturing milk using Green Bay Cheese Exchange and Wisconsin Wholesale Assembly Point Prices for cheddar blocks and barrels, January 1978-June 1980.

Month	Formula Price for Milk Using: Green Bay Exchange Block Price	Wisconsin Assembly Point Block Price	Green Bay Exchange Barrel Price	Wisconsin Assembly Point Barrel Price	Minn.-Wisc. Mfg. Milk Price (3.5% butterfat)
	$ per cwt.				
1978					
January	9.27	9.23	9.19	9.14	8.91
February	9.29	9.22	9.39	9.31	9.00
March	9.23	9.15	9.37	9.31	9.09
April	9.17	9.11	9.31	9.28	9.24
May	9.15	9.10	9.30	9.26	9.25
June	9.21	9.15	9.36	9.32	9.26
July	9.32	9.22	9.47	9.39	9.33
August	9.86	9.76	10.08	10.01	9.68
September	9.99	9.90	10.20	10.14	9.90
October	10.44	10.35	10.62	10.57	10.18
November	10.40	10.45	10.58	10.68	10.44
December	10.32	10.58	10.51	10.60	10.60
Monthly Avg.	9.64	9.60	9.78	9.75	9.57
1979					
January	10.26	10.52	10.21	10.34	10.55
February	10.14	10.41	10.38	10.02	10.52
March	10.28	10.50	10.38	10.35	10.59
April	10.39	10.65	10.52	10.62	10.63
May	10.35	10.62	10.38	10.45	10.67
June	10.42	10.67	10.44	10.49	10.76
July	10.63	10.81	10.70	10.65	10.87
August	11.10	11.28	11.37	11.36	11.09
September	11.35	11.62	11.51	11.64	11.32
October	11.15	11.38	11.17	11.23	11.25
November	10.97	11.07	11.13	11.03	11.27
December	10.93	10.98	11.19	11.10	11.34
Monthly Avg.	10.64	10.88	10.78	10.77	10.91
1980					
January	11.00	11.03	11.29	11.27	11.37
February	11.01	11.02	11.15	11.18	11.35
March	11.38	11.33	11.22	11.14	11.59
April	11.50	11.50	11.57	11.57	11.68
May	11.58	11.44	11.57	11.69	11.66
June	11.49	11.41	11.56	11.68	11.68
January thru June Average	11.31	11.29	11.39	11.42	11.56
30 month Average	10.38	10.45	10.50	10.49	10.50

Table 7. Combined butter and cheese formula prices for manufacturing milk using exchange prices and wholesale prices for AA butter and cheddar cheese, January 1978-June 1980. a/

Month	Formula Price for Milk Using: Exchange Prices for Block Cheese & AA Butter	Wholesale Prices for Block Cheese & AA Butter	Exchange Prices for Barrel Cheese & AA Butter	Wholesale Prices for Barrel Cheese & AA Butter	Minn.-Wisc. Mfg. Milk Price (3.5% butterfat)
	$ per cwt.				
1978					
January	9.14	9.11	9.08	9.05	8.91
February	9.15	9.10	9.23	9.17	9.00
March	9.15	9.08	9.26	9.20	9.09
April	9.16	9.13	9.28	9.25	9.24
May	9.16	9.12	9.27	9.25	9.25
June	9.21	9.17	9.33	9.30	9.26
July	9.33	9.23	9.46	9.37	9.33
August	9.82	9.73	9.99	9.93	9.68
September	9.94	9.87	10.11	10.06	9.90
October	10.31	10.36	10.44	10.50	10.18
November	10.33	10.47	10.45	10.59	10.44
December	10.23	10.60	10.34	10.50	10.60
Monthly Avg.	9.64	9.58	9.78	9.75	9.57
1979					
January	10.13	10.41	10.03	10.16	10.55
February	10.03	10.29	10.19	9.89	10.52
March	10.20	10.41	10.25	10.23	10.59
April	10.34	10.57	10.41	10.50	10.63
May	10.32	10.55	10.33	10.40	10.67
June	10.38	10.59	10.38	10.43	10.76
July	10.57	10.71	10.63	10.58	10.87
August	11.05	11.17	11.26	11.23	11.09
September	11.26	11.48	11.36	11.47	11.32
October	11.09	11.31	11.07	11.14	11.25
November	10.90	11.03	10.97	10.91	11.27
December	10.88	10.95	11.04	10.98	11.34
Monthly Avg.	10.66	10.88	10.78	10.77	10.91
1980					
January	10.93	10.99	11.13	11.13	11.37
February	10.97	11.00	11.05	11.08	11.35
March	11.30	11.27	11.14	11.08	11.59
April	11.45	11.49	11.47	11.50	11.68
May	11.50	11.47	11.54	11.65	11.66
June	11.50	11.45	11.55	11.65	11.68
January thru June Average	11.31	11.29	11.39	11.42	11.56
30 month Average	10.33	10.44	10.40	10.40	10.50

a/ All formulas use the Central States nonfat dry milk price.

- The price measured f.o.b. manufacturing plant is the first point in the marketing channel at which the product changes hands. Such prices are "nearest" the farm milk prices and are least likely to change as a result of changes in prices of non-milk inputs (labor, energy, packaging, etc.)

- F.o.b. plant price series should represent the prices actually received by plants; they include the effects of all premiums and discounts.

- F.o.b. prices could be measured for a large volume of transactions.

Several questions would need to be answered with respect to development of a new f.o.b. plant price series:

(1) What are the definitions of the product for which the prices are to be measured?

(2) How can it be assured that the reported prices are not being manipulated or inaccurately reported?

(3) Will firms voluntarily report prices or will mandatory reporting be required?

A well-defined product for price measurement is essential for product formula pricing. It is important because the definition will influence factors in the formula. For example, if the butter price is for printed butter, the formula will have a higher make allowance than if the formula is designed for a bulk butter price. Premiums and discounts included in price, location of product, quality, package size and type, degree of processing, special services and time of sale should be exactly defined and held constant in measuring prices. Very narrow definition of the product according to one or more of these characteristics severly limits the quantity of product to which the price applies. If we want, for example, an f.o.b. butter price in Minnesota and Wisconsin (a fairly broad geographical restriction), we might define the price as follows: Grade AA (approximately 60-70% of total butter in the two states); in bulk (about 30% of total); sale in carlot shipments (20% of total); to regular customers (15% of total); to customers who do not provide any special services (less than 15% of total); to customers who pay cash, with no future adjustments to price (less than 10% of total).

The problems of constructing an f.o.b. plant price series were demonstrated in a survey undertaken as part of this project. The original intent of this survey was to compile monthly data on product prices received, f.o.b. plants in Minnesota and Wisconsin, and to calculate weighted average price measures from these data. Personal visits were made to

33 organizations producing, among them, about two-thirds of the butter and cheese and four-fifths of NFDM in the Upper Midwest. About 300 questionnaires were mailed to all other plants producing butter and American cheese in the two states. The response to the survey did not indicate strong interest in voluntary reporting of f.o.b. plant prices on a regular basis.

The rate of response to the questionnaire gave credibility, if any was needed, to plant operators' statements that price information was regarded as highly confidential. One-third of the plants visited provided price information, but less than 10 percent of the mailed questionnaire were returned.

The questionnaires which were returned also indicated some of the difficulties of obtaining useable information. Prices received at plants operated by large cooperatives were reported as the price at which the plants were credited on the books of the cooperative for product transferred to the cooperative's marketing division. No actual exchange of ownership established these prices; thus, the reported price could be simply an arbitrary, "bookkeeping" price. Plants producing more than one product often reported combined prices with the plants' books showing gross returns from all sales of products, not sales by category. Similarly, it is difficult for some plants to identify prices for particular shipment sizes, quality characteristics, and package styles.

If the industry refuses to submit, voluntarily, accurate price information, it is conceivable that the government could require the reporting of price information. 10/ Compulsory price reporting almost certainly would necessitate an audit verification program. As mentioned above, the federal order program could expand its current auditing program to check information submitted on product prices. Market administrators have the auditing and administrative expertise to undertake such a project; however, it could be quite expensive.

The state of California currently collects and reports an f.o.b. plant price for powder. Monthly information is submitted in writing and is verified by audit. Weekly information is collected by telephone. The audit of the monthly information acts as a check on telephones price reports. California has found the audit program to be fairly troublefree, but their collection of prices is made easier than would be the case in the Upper Midwest by the fact that there are only eight powder plants in the state which are surveyed, and by the fact that powder prices

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10/ This paper will not be concerned with what legal authority is needed for compulsory price reporting or whether such authority exists. According to Jacobsen et. al. op cit. (p. 41): "Market news has no authority to require price reporting. Federal milk orders could be amended to require product price information essential to administration of the order program."

rest very often at support levels.

If a Government audit program (to verify data submitted on mandatory price reports) becomes essential for the development of a reliable basis for prices under federal order program, it might gain the support of dairy cooperatives. Some cooperative leaders have endorsed a similar plan, put forward in Jacobsen, et al., that market administrators regularly audit plants regulated under the Chicago and Upper Midwest orders for information on product prices and yields, and production costs.

Perhaps, faced with the choice of either providing product price information, in order to maintain a reliable price mover of federal order prices, or eliminating the federal order system, firms would agree to provide the requested information. However, the leading cooperatives (with the exception of one) did not reply enthusiastically to our requests for historical product price information. Proprietary plants and small cooperatives are even less willing to discuss prices paid and received, and strongly resist government audits of their financial records.

To simplify data collection and computation for an f.o.b. plant price series the transactions for inclusion in the average could be restricted to spot shipments only of bulk butter and barrel cheese—a fairly small portion of total sales. All contract sales would be excluded from this price measure. Spot sales would consist primarily of shipments between large plants or marketing firms, and shipments from small plants who are not under contract to ship to an established buyer. Price information of this type could be collected by phone by Dairy Market News reporters. Because spot sales are a relatively small part of their business, and because of the temporary nature of premiums negotiated in spot sales, the industry may be much more willing to divulge accurate information about spot sales prices. The cheese price would be exactly the same as the currently reported Assembly Points price; although perhaps the definition of the price would be clarified somewhat.

For both butter and cheese, the price information requested should be defined carefully. For example, prices reported should be for Grade AA butter in bulk and American cheese in fiber or metal barrels. Only carlot or trucklot shipments and only spot shipments, for which the price is not set by a standing contract should be included. The pricing point should be f.o.b. the seller's plant or warehouse in Wisconsin or Minnesota.

For the cheese price, the reporters should contact the six large packaging-marketing companies, regional cooperatives, and large independent cheese plants. For the butter price, the reporters should contact regional cooperatives, large private butter plants, and butter printers. The reporters should request information on number of carlots which the price represents for each contact. This would allow market news to publish a weighted average spot price f.o.b. shipping points in Wisconsin and Minnesota.

The feasibility of this suggestion could be determined by a pilot program in which reporters attempted to get this type of information from existing contacts. If industry would cooperate with Dairy Market News, the resulting price would provide an early indicator of changing supply-demand conditions and would be very useful to industry in planning production and inventory. Such a price might also be used, in conjunction with exchange prices to provide preliminary estimates of the M-W series.

SUMMARY AND CONCLUSIONS

Dairy product price formulas have been used in the past and are being proposed again for use in fixing milk prices under federal orders. The interest in using a product formula to fix both fluid use and manufacturing use milk prices arise because the current price mover, the Minnesota-Wisconsin manufacturing price series (M-W series) may disappear. As a significant factor in milk markets, the M-W series is calculated from prices paid for Grade B milk.

There is also interest in using product prices to provide a preliminary estimate of the M-W series. This preliminary estimate could be computed at about the middle of the month for which it is estimated rather than the 5th day of the following month. The preliminary estimate would permit Class I prices to be fixed with only a one-month lag to the M-W price rather than the two-month lag that is now in use.

Whatever product price series are used for a product price formula, the product price series for use in the formula should have several characteristics: (1) it should represent the average of prices received during the month, (2) it should be timely, (3) it should not be subject to manipulation, (4) it should be consistent from month to month with respect to the product price that is being measured.

There are several regularly published price series for each of the major manufactured dairy products. There are commodity exchange prices for butter and cheese which are the reference prices for trade at almost all other levels of the marketing channels. These are the prices that represent the last trade, bid, or offer on the exchanges. There are wholesale price series for butter, cheese, nonfat dry milk and dried whey that are trading prices reported to the U.S. Department of Agriculture. Most are reported weekly as ranges of prices. Monthly average prices are currently reported using the midpoints of the price ranges.

To determine how product price formula pricing in federal orders would affect the class prices, we developed prices from formulas and compared them to the Minnesota-Wisconsin prices for the period January 1978, through June 1980. The monthly butter-powder formula prices using the Chicago Mercantile prices for butter departed from the M-W prices by an average of $.20 per hundredweight for the entire period. It ranged from $.73 below to $.20 above the M-W price.

The cheese formula did a much better job of duplicating the M-W price. The formula using the Green Bay Cheese Exchange price yielded the same average monthly price for the period January 1978 through June 1980. It ranged from $.37 below to $.44 above the M-W price. A combined butter-powder and cheese formula also yields values that average very near the M-W price over the long-run.

The feasibility of developing new f.o.b. plant price series was investigated. The idea was that plants would report their selling prices

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